ARCHITECTURAL [PHYSIO]THERAPY

A DYNAMIC HEALING PROCESS

by

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Sketches by O. Ferguson-Losier

ABSTRACT

Rehabilitation facilities are not providing patients with appropriate environments for physical healing. By isolating physical therapy to a room, these spaces do little to promote movement, invigorate the senses, and assist patients with their recovery .

The connective system of rehabilitation facilities, such as corridors or hallways, could allow physical therapy to expand through the building and provide patients with interactive and dynamic sessions.

This thesis will investigate the idea of designing for physical rehabilitation by examining theories of healing spaces in order to achieve complete well-being. These theories will be used in conjunction with the gradual process of healing through mobility and exercise in order to design the circulation system of a physical rehabilitation centre, based in Dartmouth, Nova Scotia.

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TABLE OF CONTENTS

Abstract	i
Acknowledgements	ii
Introduction	1
Thesis Question	5

CHAPTER 1 - THE BODY AND WELL-BEING

The Body	6
Complete Well-Being	8
Qualities of Healing Places	11
Endnotes	14

CHAPTER 2 - THERAPEUTIC REHABILITATIVE DESIGN

Transitional Care	15
Physical Therapy	17
Illustrative Example 1: <i>Bridgepoint Active Healthcare</i>	19
The Benefits of Exercise	24
Illustrative Example 2: <i>Groot Klimmendaal</i>	25
The Aspect of Time and Levels of Assistance	28
Illustrative Example 3: <i>Woy Woy Rehabilitation Unit</i>	31
Therapeutic Walking within Way-Finding	34
Illustrative Example 4: <i>Laban Dance Centre</i>	37
Endnotes	40

CHAPTER 3 - A REHABILITATION CENTRE FOR DARTMOUTH

Dartmouth, Nova Scotia: History of the Site	42
Site Scope	47
Current Facility for Rehabilitation: The Need for Movement	55
Proposed Design + Dynamic Therapy Spaces	59
Second Level: Re-Introduction to Movement	72
Dynamic Therapy Space 1	82
First Level: Challenging the Movement	88
Dynamic Therapy Space 2	91
Dynamic Therapy Space 3	97
Dynamic Therapy Space 4	103
Dynamic Therapy Space 5	105
Ground Floor Level: Integrating the Community	111
Endnotes	116

CONCLUSION	117
List of figures	119
Bibliography	122

INTRODUCTION

Canadian statistics demonstrate that physical disabilities are a common occurrence in the country's population. Mobility issues, physical injuries and movement disorders are becoming increasingly more common in Canada. In 2012, 1 in 10 Canadians aged 15-65 reported having at least one disability that obstructed their everyday activities.¹ In addition, for those over the age of 65, mobility is in the top 3 most prevailing disabilities.² Senior citizens are becoming the fastest-growing age group within Canada indicating the number of disabilities are going to increase in tandem with the onset of this aging population. To match the requirements of the population, there needs to be a focus on designing good rehabilitation centres, as these spaces will be addressing these rising concerns for good physical care.

Physical rehabilitation is the active process by which those disabled by injury or diseases work with specialists towards full recovery – or if a full recovery is not possible, to an optimal physical, mental and social state. Through exercise and physical activity, patients are re-taught basic movement functions until proven fit to cope on their own. The main objective of this therapy is for the patient to eventually be re-integrated into society.³ As such, physical therapy is an important component of one's healing process because the ability to move correlates with one's level of independence. Movement is an integral part of

FIGURE 1 : GRAPH DEPICTING THE PERCENTAGE OF INJURED CANADIANS BY AGE AND SEX IN 2009

FIGURE 2 : GRAPH DEPICTING PERCENTAGE OF INJURIES CAUSED BY FALLS IN CANADA IN 2009

a person's life because it is how we experience the world. It is not, however, always well integrated into the process of healing. As such, the design of transitional care facilities, and their use of traditional care techniques in order to help patients with their physical needs, must be re-evaluated. According to Finnish architect Juhani Pallasmaa, the built environment can sometimes inhibit and, instead of helping with physical healing, interfere and discourage progress. For example, specific rooms are assigned for physical therapy, yet, it is argued that these spaces often do little to promote movement and invigorate the body and mind of physically disabled patients. A solution, however, could be found through architectural design. Pallasmaa writes about the importance of combining all five senses within design and states that our perception is formed through our body interacting with the world.⁴ Pallasmaa describes the importance of movement within our built environments, which allows one to reconnect with oneself and reflect upon the surrounding world. Often, achieving this goal proves to be difficult for those with movement disabilities. Thus, using the connective system of health facilities, such as corridors or stairwells, would allow the therapy to expand throughout the building, resulting in spaces that could provide stimulating, interactive and safe areas for patients to gradually improve their physical health. This thesis will investigate the idea of designing for physical rehabilitation by examining theories of achieving complete well-being through healing spaces. These theories will be used in

conjunction with the gradual process of physical healing through mobility and exercise.

The first chapter of this thesis will discuss the importance of incorporating elements of well-being into our built environment. Well-being is defined as the state of being happy, healthy and prosperous.⁵ In order to design spaces that promote the physical healing process, we must investigate how other areas of one's health can be positively affected. The second chapter of the document will examine traditional care methods and the current ways physical therapy assists patients during rehabilitation. Doing so is important because the design of physical therapy spaces should be influenced by elements of the profession and the activities practised by therapists with their patients. Chapter 2 will also present examples of buildings with similar programs in order to understand how they incorporate elements of well-being and human movement to create engaging spaces. This will illustrate positive and negative design strategies that help inform the rationale behind this thesis and its design proposal.

By studying notions of traditional physical therapy, and incorporating elements that enhance one's state of well-being, this thesis will culminate with a design proposal that provides healing environments to patients with physical and mobility dysfunctions. Located in Dartmouth, Nova Scotia, this project will

be providing a community with a much-needed health centre for patients with mobile dysfunctions. Through the design of a transitional rehabilitation centre, this proposed health centre will demonstrate how the circulatory system of a building can be designed as a therapeutic tool to promote exercise and social interactions for patients.

ENDNOTES

1. Statistics Canada - <http://www.statcan.gc.ca/daily-quotidien/131203/dq131203a-eng.htm>
2. Statistics Canada - <http://www.statcan.gc.ca/daily-quotidien/131203/dq131203a-eng.htm>
3. Gadamer, Hans-Georg. *The Enigma of Health: The Art of Healing in a Scientific Age*. Stanford: Stanford UP, (1996): 73.
4. Ward, Anthony. "Physical And Rehabilitation Medicine In Europe." *Journal of Rehabilitation Medicine*. 38.2, (2006): 85.
5. Pallasmaa, Juhani. *The Eyes of the Skin: Architecture and the Senses*. Chichester: Wiley-Academy, (2005): 44.

THESIS QUESTION

How can design strategies incorporate notions of human movement to become a therapeutic tool, actively assisting in the recovery process of patients with physical and mobile disabilities ?

CHAPTER 1 - THE BODY AND WELL-BEING

THE BODY

Our understanding of the surrounding environment is done entirely through our physical self and its ability to form connections between sensorial experiences and spatial awareness. In other words, our body's sensorial receptors transmit external information through sight, smell, taste, touch and hearing to the brain which creates an understanding of our built conditions. Perception of space, as defined by French philosopher and phenomenologist Maurice Merleau-Ponty, is the human body's proficiency to engage with its surrounding environment:

“Perception involves a lived dynamic between perceptual body and world, such that aspects of the world are known because they immediately evoke in the lived body their experienced qualities.”¹

He firmly believes that the body ‘synchronizes’ with the world's architectural and environmental elements through sensory or motility means. What is important to retain from Merleau-Ponty's work is that perceptual experience is continually shifting via the aspects that we encounter through our lived body. Thus, the mobility of a being should not be solely perceived as visual, but

instead should be understood as a more complex sensory exchange among all senses. This is because the human body is much more than an object in space; the body is a vessel through which our connections to the surrounding world can occur simultaneously.² Thus, translating Merleau-Ponty's phenomenological notions into physical conditions that allow for sensorial and dynamic interactions between body and space through motion are essential within healing environments. This is because patients can begin to retrieve their perception of space, often lost during illness, via the architectural elements they encounter during recovery. With respect to the field of rehabilitation, patients would be able to slowly reclaim their understanding of body-space relationships while they transition back into society. As this thesis will explore, rehabilitation spaces must be redefined to heighten this process of rediscovery because owning a perception of space and comprehending one's position relative to the surroundings is a key element to one's overall well-being and independence.

COMPLETE WELL-BEING

It is important to consider the complete well-being of patients when designing spaces that impact the human recovery process because healing is multidimensional. In other words, healing impacts physical, biological, mental, emotional and societal aspects of a person.³ In fact, the correct definition of health, according to the World Health Organization (WHO) is “a state of complete physical, mental, and social well-being and not merely the absence of disease and infirmity.”⁴ In his book **The Enigma of Health**, German philosopher Hans-George Gadamer describes being ill as “lacking from health,” or missing a component from the entirety of health. He states that illness is associated with a loss of equilibrium between the body and the mind, supporting his theory with a passage written by the Classical Greek philosopher, Plato:

“... the body cannot be treated without at the same time treating the soul. It is further suggested that perhaps even this is not enough, that it is impossible to treat the body without possessing knowledge concerning the whole of being.”⁵

This statement indicates that we must understand ourselves as a whole in order to heal before expecting to be fully “healthy.”⁶ Thus, being healthy includes

balancing the interconnected relationships between the physical body, the mind, and the spirit.⁷ Gadamer also provides his understanding of health as follows :

“Health is not a condition that one introspectively feels in oneself. Rather, it is a condition of being involved, of being in the world, of being together with one’s fellow human beings, of active and rewarding engagement in one’s everyday task.”⁸

Gadamer’s definition places emphasis on the engagement of others in one’s healing process and the importance of being involved within a group or community. To be surrounded by others in times of hardships provides a sense of belonging and compassion to patients. This notion and feeling should be translated into the designs of health environments, including rehabilitation facilities, because it contributes to the gradual re-introduction of patients into society while addressing the essential need of humans to be a part of a whole. Thus, the healing process for patients can be expedited in a positive way. A current issue with past healthcare facilities is that the design does not put enough emphasis on addressing all components of well-being. During several interviews with healthcare professionals, many stated that their health facility did not provide spaces for rest, respite and reflection. These missed

spaces are all critical in the process of healing because they provide areas for mental relaxation and decompression during stressful situations. Their role in providing psychological peace contributes to the design of healing environments, or rather *healing spaces*, in which patients receive all aspects of well-being in order to recover.

QUALITIES OF HEALING PLACES

The process of getting well incorporates multiple factors; it combines physical healing, with mental, spiritual, emotional, and social care, thereby creating a complex system of relationships that all need to be treated.⁹ Considered from this perspective, healing is multidimensional and must be reflected in the spaces that architects design for patients. Especially with respect to physical rehabilitation, the spaces should facilitate how therapist improve the physical problems of patients while having positive effects on patient's emotions. Dr. Esther Sternberg, expert in neural-immune science and author of **Healing Spaces**, states :

“If [architects] could understand how physical surroundings affect emotions and how emotional responses to architecture affect health, then people's health could be taken into account in the design of buildings.”¹⁰

This idea of providing positive physical surroundings that contribute to patient healing is not a new concept. As seen during the Renaissance Era, architecture was meant to emphasize the importance of natural ventilation as it was understood that fresh air enhances one's health.¹¹ Many examples, such as the Villa Eolia, depict how Renaissance architects incorporated these ideas into

FIGURE 3 : VILLA EOLIA

FIGURE 4 : VILLA EOLIA'S WIND TUNNELS

Villa Eolia was constructed in 1560 at Longare di Costozza by Vicentine humanist, Francesco Trento.

It was designed to incorporate wind tunnels which provided fresh air to the inhabitants. Renaissance architects believed natural ventilation was an important component to living a balanced, healthy life, thus these tunnels were essential within living conditions.

their buildings through the use of wind tunnels (See figure 4). The importance of embedding healing qualities within architectural design, however, was lost during the late 20th century. During this period, hospital design placed emphasis on housing advanced medical equipment rather than sustaining patients' emotional well-being. Hospitals were treated as machines aimed to cure the masses of disease and disorders.¹² In spite of this, over the past few decades, there has been a shift in health design. Architects are realizing the importance of creating pleasant environments for both patients and staff that contribute to healing. Health facilities are beginning to lose their "machine-like" vision and instead are being recognized as environments that encompass spaces that work together to address the complete well-being of its patients. According to William M. Gesler, author of **Healing Places**, a healing place is characterized by the combination of various environments, each focusing on different aspects of healing, all contributing to the well being of patients.¹³ He states that "healing and place are inseparable."¹⁴ This is because creating a sense of place - i.e. focusing on the experiential qualities of space - gives patients a sense of belonging, comfort, identity and security within hospitals and clinics.¹⁵

Looking at subtle humanistic elements that enhance a patient's space can make a big difference in the healing process. It is important to do so because it is

elements such as rooms looking onto natural settings, access to the exterior spaces for fresh air, large windows allowing adequate daylight into spaces, etc. that provide comfortable environments for patients and improve their emotional state.

In order to create healing spaces within physical rehabilitation environments, architects must first have a general understanding of physical rehabilitation and the strategic therapies involved. This will allow architects to design appropriate spaces that accommodate the required spatial needs of physical therapists and their patients. Through the theories of creating healing places, architects can implement design decisions that target positive emotional responses.

ENDNOTES

CHAPTER 1

1. Seamon, David. *“Merleau-Ponty, Perception, and Environmental Embodiment: Implications for Architectural and Environmental Studies.”* Intertwinings: Interdisciplinary Encounters with Merleau-Ponty. Albany: State University of New York, (2008): 2.
2. Seamon, 2.
3. Gesler, Wilbert M. *Healing Places*. Lanham, MD: Rowman & Littlefield, 2003. 3.
4. Armstrong, Pat, and Hugh Armstrong. *Wasting Away: The Undermining of Canada’s Health Care System*. Don Mills, Ont.: Oxford UP, (2010): 13.
5. Gadamer, 73.
6. Gadamer, 41.
7. Gesler, 3.
8. Gesler, 3.
9. Gadamer, 70.
10. Sternberg, Esther. *Healing Spaces: The Science of Place and Well-being*. Cambridge, MA: Belknap of Harvard UP, (2009): 7.
11. Kenda, Barbara. *Aeolian Winds and the Spirit in Renaissance Architecture*. Academia Eolia Revisited. London: Routledge, (2006): 2.
12. Sternberg, 4.
13. Gesler, 3.
14. Gesler, 5.
15. Gesler, 6.

CHAPTER 2

PHYSICAL HEALTHCARE AND DESIGN

TRANSITIONAL CARE

As patients move from hospital to home environments, their health is in a state of flux: they are well enough to leave the hospital, yet they are incapable of living without help. This phase requires transitional care. Transitional care is when patients are provided with the necessary treatments and recovery time as they transfer from different environments or levels of health.¹ Typically, transitional care is based on a progressive plan, designed by healthcare practitioners and tailored to a patient's situation. In certain cases, transitional care can encompass rehabilitation, in which recovering patients are treated with the expectation of achieving their optimal potential. The main objective in this case is preparing individuals for an independent life when they return to society. Successful treatments often mean the difference between remaining in a hospital or nursing home or being discharged home.²

Transitional care usually includes numerous services offered by different specialists in various settings to ensure all the patient's needs are met. For example, therapies offered within rehabilitative medicine include psychology,

speech therapy, occupational therapy, recreational therapy and physical therapy (among others). Each branch focuses on an aspect of human health, and ensures that it reaches a satisfying level of recovery before a patient is released. These services are not always located within the same facility or community of practitioners. This is problematic for several reasons: it creates greater chances for poor transfer of information or miscommunication among professionals in regards to a patient's medical history or treatment; there is often complicated medical language and misunderstandings of healthcare which can create confusion and slow down the healing process; the absence of a single-point person leads to issues with the continuity of care; and finally the limited access to essential services creates additional opportunities for patients to injure themselves resulting in re-hospitalization.³ As a possible solution, transitional care services could be designated to a specific area within health facilities in order to ensure clarity while providing the necessary psychological, emotional, social and physical care. This would allow for clearer communication among professionals of different health professions, promptly addressing issues within one environment, and reducing travel distance/cost among services, resulting in better care for patients and smooth delivery of expertise from professionals.

DEFINING THE DIFFERENT TERMS :

TRANSITIONAL CARE :

Provides patients with the necessary treatments and recovery time as they transfer between different environments or levels of health.

(Naylor, Mary, and Stacen A. Keating. "Transitional Care." Journal of Social Work Education. " 44.0 (2008): 65)

REHABILITATION :

An active process by which those disabled by injury or disease achieve full recovery, or, if full recovery is not possible, realize their optimal physical, mental and social potential and are integrated into their most appropriate environment.

(Ward, 85.)

PHYSICAL THERAPY :

Aims to provide the necessary services to individuals in order to develop, restore and maintain maximum movement and capacity throughout their life span.

(Definition provided by World Confederation of Physical Therapy, 2012.)

PHYSICAL THERAPY

A significant aspect of being healthy is one's capacity to move independently within our built environment. Medical professionals prescribe physical therapy in situations where motion and functional abilities of the body have been affected. This is because physical therapy targets affected areas of the body and works to improve its physical state over time through beneficial exercises and stretches. The role of this type of therapy is to provide the necessary services to injured individuals in order to develop and restore maximum movement and capacity.⁴ Objectives of physical therapy exercises aim to improve the strength, endurance, coordination, flexibility and balance of an individual, which are integral aspects to living independently.⁵ In certain situations, therapists will use exercise equipment to enhance a patient's progress which either provides additional support or increases the difficulty of the exercise. In providing equipment support, physiotherapists can increase the difficulty of exercises, gradually develop patients' physical objectives and preventing potential falls. The use of equipment is an important element to this thesis proposal because, as the design will later illustrate, tools are potentially able to be embedded within the design of physical therapy spaces to assist patients' exercises. Therefore, this contributes to an interactive person-to-building session which consequently could enhance patients' physical environment.

FIGURE 5 : DIFFERENT PIECES OF EQUIPMENT THAT ENCOURAGE MOVEMENT USED DURING PHYSICAL THERAPY.

Despite the benefits of equipment that encourage patients to move in order to heal, environments for physical therapy are typically designed as constricting, stale spaces. They have been designed in this way for a long time to contain the equipment within a general venue and allow easy access to resources. Patients are forced to remain within one room of a building, performing exercises that promote mobility, but without actually moving. This is an issue because it diminishes the sensorial experience and limits the redevelopment of one's perception of space. When travelling among rooms, for example, the action offers a change of setting and additional stimulation offers keeps patients interested while practising their physical therapy exercises. By staying within one room, a patient is subjected to one environment that, over time, becomes familiar, dull and disadvantageous to recovery.

Despite the evolving awareness by architects and health practitioners that movement is key to rehabilitation, many rehabilitation facilities are still designed with the physical therapy segregated to an equipment-filled room without offering additional transitional spaces for patients to practise. Examining an illustrative example of Bridgepoint Active Healthcare, a large rehabilitation centre centrally located in Toronto, Canada, will permit a visual understanding of these typical designs.

ILLUSTRATIVE EXAMPLE NO. 1

Bridgepoint Active Healthcare

Architects : Stantec Architecture; KPMB Architects; HDR Architecture; Diamond Schmitt Architects

Location : Toronto, Ontario, Canada

Area : 51,076 square meters

Year : 2013

Bridgepoint is a large rehabilitation facility, specializing in long-term, chronic care designed by a number of architects. In 2013, the original building was destroyed and replaced with a new design.⁶ As a result of this new design, the facility now covers twice the area with four times the volume of the previous rehabilitation centre. With an augmented program, improved quantity and quality of space, as well as a variety of social activity spaces (indoors and outdoors), the new design claims to have a very positive impact on the well-being of patients and staff.⁷ Touring the building with a practising physiotherapist provided insight into the spaces while allowing for critical analysis of the physiotherapy spaces' functionality, qualitative nature, layout, benefits and innovation.

There are 7 inpatient therapy spaces and 1 outpatient therapy space within the building amounting to approximately 1250 square meters.⁸ The design

FIGURE 6: WEST FACADE OF BRIDGEPOINT
(PHOTOGRAPH TAKEN FROM GERRARD STREET.)

FIGURE 7 : BRIDGEPOINT'S LOCATION WITHIN THE CITY

FIGURE 8 + 9 : PHOTOGRAPHS OF A PHYSIOTHERAPY ROOM WITHIN BRIDGEPOINT HEALTHCARE. THE ROOMS ARE BRIGHT AND OWN PANORAMIC VIEWS OF THE DOWNTOWN AREA OF TORONTO. THE SPACES THEMSELVES, HOWEVER, ARE BLAND, DULL AND LACK IN STIMULATION FOR PATIENTS WITH MOBILE DIFFICULTIES.

of Bridgepoint's physiotherapy spaces is a typical example of restricting the activity to one room. Each floor contains one therapy gymnasium located in a corner of the building, which grant panoramic views of the city. The layouts of the gymnasiums vary slightly from one to another, mostly in regards to the specialized equipment used by each unit and are relatively bland with unstimulating materials and harsh florescent lighting. In one physiotherapy room, treadmills and stationary bicycles face the windows looking outwards, while physiotherapy beds line the wall, each divided only by curtains on

ceiling tracks. In some cases, extra equipment is stored in a corner of the room, in place of a designated area. The gyms, used daily by various physiotherapy and occupational therapists with their patients, often become cramped due to overcrowding.

In light of the theories presented in Chapter 1, these physical therapy rooms do not represent complete ideas of healing spaces. Despite the panoramic views to the exterior and adequate daylight, the materials found within the spaces are not comforting and humanistic. Windows cannot open, thus disallowing fresh air into the space, and there are few stimulating elements within the space itself geared towards dynamic interaction between the built environment and patients. In regards to the design of each physiotherapy room, medical professionals were not consulted in their layout and creation, thus resulting in smaller rooms with occasional overcrowding. When this occurs, hallways, exterior spaces and stairwells often become impromptu areas for therapy sessions. With assistance from railings found throughout Bridgepoint, patients are able to navigate and practise certain exercises with their therapists using the built environment.

While the hallways were not specifically designed for physical therapy, this particular solution to a design issue could potentially lead to a new architectural

idea. By addressing circulation spaces such as the hallways and stairwells, patients could use the physiotherapy room for larger equipment, such as treadmills and stationary bikes, while travelling through hallways performing exercises that improve their mobility. In moving through hallway spaces instead of remaining within a room. The rehabilitation facility's surroundings could be designed to expose patients to various stimuli and conditions that help address their physical issues and enhance their physiotherapy session through sensorial experiences. This would allow for opportunities to implement qualities of healing spaces as discussed in Chapter 1. In addition, these circulation spaces could be adapted to have built-in structures such as stairs, ramps and small ledges that encourage physical exercise and stretching, two elements commonly used during physical therapy to improve a patient's physical state. In adopting these structures, patients can dynamically use their built environment for physical activity as a circuit, rather than remaining in a static room, thus encouraging movement and exercise throughout the building's circulation system. Physical exercise provides numerous assets to the human psyche, body and emotional state, which will be discussed in order to understand its beneficial application to our built environments.

FIGURE 10 : VARIETY OF CIRCULATION SPACES
ENCOUNTERED DURING A VISIT TO BRIDGEPOINT
(PHOTOGRAPHS TAKEN BY AUTHOR)

BENEFITS OF EXERCISE

Physical activity has been proven to reduce and even prevent certain debilitating health conditions such as obesity, Type 2 diabetes, cardiovascular disease, chronic pain, osteoporosis, and many more.⁹ As such, physical activity is essential to one's physical, emotional, and mental health. Additionally, the hormones released during exercise have been known to improve one's mood and help in mental illnesses such as anxiety and depression.¹⁰ Despite knowing the benefits and overall positive effects of exercise, the habit of physical activity is typically forgotten or ignored by adults.¹¹ This is because the importance of exercise gets diluted over time in comparison to other priorities such as work and family (for example). The trend of inactivity leads to inactive older adults with increased chances of obesity, cardiovascular health issues and falls. As we age, our physical capacities decline : maximum oxygen intake begins to decrease from 8 to 16% each decade after thirty ; muscle strength declines by 10 to 15% and chances of falling increase substantially.¹² Many studies have demonstrated that regular 30-45 minutes of aerobic exercise decreases the risk of numerous diseases and increases psychological health results.¹³ In 2008, physical activity guidelines created in the United States suggested that any exercise is better than none, with 10 minutes of activity a day being sufficient to provide benefits to one's health. With this in mind, it is important for society's built environments to present opportunity and create conditions that encourage different types and levels of physical activity.

EXERCISE (noun) :

1. Activities requiring physical effort, carried out especially to sustain or improve health and fitness.
2. A task or activity done to practice or test a skill.

EXERCISE (verb) :

To engage in physical activity to sustain or improve health and fitness; take exercise.

(Definitions taken from Merriam-Webster Dictionary)

ILLUSTRATIVE EXAMPLE NO. 2

Groot Klimmendaal

Architects : Architectenbureau Koen van Velsen BV

Location : Arnhem, the Netherlands

Area : 14,000 square meters

Year : 2011

Groot Klimmeendal, designed by Dutch architect Koen van Velsen is a rehabilitation centre located within a small forest outside of Arnhem. The main objectives of this design were to create a building that address patient needs as well as provide a community with various facilities for physical activity. As such, the centre encompasses special program elements, such as a sports / fitness facility, swimming pool, restaurant and theatre, which are shared among the patients, their family members, and members of the local community on a regular basis.¹⁴ This functional program relates to the theories discussed in Chapter 1, specifically referencing the importance and benefits of community engagement during a patient's rehabilitation process. Through the integration of patient and community, patients are given a sense of belonging which lifts their moral and emotional state.

Koen van Velsen and the users of the building collaborated intensely in order to create a centre that emphasizes positive and stimulating environments

FIGURE 11: VIEW OF THE WEST FACADE

LEVEL 0 : HIGHLIGHTED POOL AND GYMNASIUMS
SPACES

LEVEL 2: HIGHLIGHTED FITNESS GYMNASIUM
SPACES.

for patient well-being. Through the use of transparency, colour, diversity of activities, light, shadow, and nature, patients are exposed to a range of interactive moments that enhance their rehabilitation. One example of the cooperative process among architect and users is the implementation of a shallow wooden staircase which runs the full internal height of the building. This staircase works to “facilitate a direct route among the different floors but also enables a variety of alternative routes roaming the building and thus forms an invitation to undertake physical exercise.”¹⁵ In this sense, the staircase is being used as a tool to promote movement within the building because it encourages users to explore the different connective spaces of the facility. Van Velsen also promotes movement in other ways: by designing voids and light wells to connect the different levels vertically and allowing natural daylight to penetrate into the centre, the architect is creating visual connections among the spaces. This is a good design strategy because it entices users to walk and investigate the entire building, thus enabling users to participate in small physical activities while enjoying their built environment.

The physical therapy gymnasiums are centrally located in the plan and face onto patios, allowing ample daylight into the spaces. Despite these positive qualities, photographs indicate the spaces appear to be quite bland and house a variety of equipment along the walls. This is unfortunate because these

12.

13.

spaces do not reflect the interesting and interactive circulation spaces found throughout Groot Klimmendaal. Instead, the program of the physical therapy rooms is similar to those found at Bridgepoint: the physical treatment is confined to individual rooms, thereby reducing a patient's perception of space and decreasing an aspect of their physical healing as a result. This rehabilitation facility, however, does have the potential to provide excellent opportunities for engaging its users in physical activity and sensorial experiences. For example, by keeping the larger pieces of equipment within the physical therapy rooms, the building's hallways could be modified to accommodate areas for mobility exercises and stretching. These changes would allow patients and visitors to truly experience the facility as they move within the circulation while providing physical benefits. In conclusion, Groot Klimmendaal's circulation spaces depict excellent interactive qualities, yet should expand further on their use as potential spaces for exercise.

IMAGES CAPTURING THE INTERIOR CONDITIONS OF
THE REHABILITATION CENTRE

12. VERTICAL CONNECTIONS BETWEEN FLOORS
DONE VIA LIGHT WELLS, MIRRORS AND WINDOWS.

13. VIEW OF SHALLOW STAIRCASE

14. LARGE WINDOWS BRING LIGHT INTO HALLWAY
SPACES

15. PHYSICAL THERAPY SPACES LOOKING ONTO A
COURTYARD.

THE ASPECT OF TIME AND LEVELS OF ASSISTANCE

It is crucial to address the important relationship among rehabilitation environments, physical therapy, and the aspect of time in regards to healing. Every person heals differently depending on their injury in combination with other external factors. For many, recovery is not about healing completely, but rather about learning to adapt to an illness in order to regain independence and reintegrate into society. Hospital environments, especially rehabilitation centres, must understand the challenging aspect of reintegration and respect the gradual process of recovery. In addition, the therapy prescribed must adjust according to the person. This is because the age of an individual often indicates a certain level of skill, ability, maturity and development. Thus, therapies must be tailored to every person's needs in order for them to improve physically.

As we get older, there is an increasing concern of co-morbidities, weakness, and fragility with respect to the physical body and mind. Healing takes longer due to decreased function of muscle fibres, motor units or neurons within the body.¹⁶ Aging also emphasizes the limits of the human body after years of overuse, neglect and damage. More specifically, the brain and its associated nervous system's activities decrease due to dying brain cells, which causes repercussions to our body's ability to perform certain tasks.¹⁷ Examples of

this include physical pain in joints, thinning muscle tissues, fragility of the skeletal system, hearing loss, visual impairments, slower cognitive skills, and a declining neuromuscular system (resulting in gait disturbances and instability).¹⁸ Conversely, there are ways to decrease, if not eliminate, some of these symptoms by adopting an active lifestyle, exercising to keep the physical body alert while treating the mind. Establishing a gradient of physical therapy exercises, i.e. exercises that increase in difficulty, is useful because it can be applied to physical therapy patients of all ages and levels of function.

This raises a question: how can the built environment contribute to the gradual learning process that physical therapy patients experience over time? If exercise can be brought to the circulation spaces of a building, can we also design elements that allow patients to progressively get better safely? One potential answer to this question is to include smaller variations of architectural components and handrails to provide additional help. As was previously mentioned, built-in structures can offer dynamic settings to inspire physical exercise within rehabilitation centres which could stimulate movement within the circulation spaces. By establishing levels of assistance through paths with walking harnesses, continuous handrails, stairs of different heights, and ample rest stations, patients are provided with support, stability and guidance within the circulation. Through these levels of assistance, objectives appear more

FIGURE 16: HANDRAIL AS AN ASSISTING ELEMENT

realistic and less overwhelming to someone re-learning a basic function.¹⁹ This is essential as it builds a patient's physical confidence and reduces frustration levels during their therapy.

Currently, physiotherapists use smaller versions of spatial structures such as stairs and ramps within physical therapy spaces before requesting patients practise on actual building structures. This is because the spatial structures are effective methods to help patients regain their physical confidence since they are more manageable variations of the real thing (i.e. stairs). These pieces of equipment, however, do not offer patients a full spatial experience because of their static position and size within one space. If architects could establish areas within a rehabilitation facility's circulation that offer a series of dynamic iterations of exercises (resembling a circuit) with safety components, like handrails that encourage forward movement, then, patients could circulate through the hallways of the entire building safely.

FIGURE 17: EXTERIOR STAIR AT BRIDGEPOINT

These stairs are a great example of creating more human scale environments: they reduce the size of the area, making it more compact for the user; they implement additional safety features such as double railings; and they include spaces wide platforms for breaks. All of these help decrease the overwhelming feeling patients may experience during physical therapy.

ILLUSTRATIVE EXAMPLE NO. 3

Woy Woy Rehabilitation Unit*Architects* : Woods Bagot*Location* : New South Wales, Australia*Area* : 2200 square meters*Year* : 2013

The Woy Woy Hospital is a public hospital located on the south-east coast of New South Wales in Australia. The new rehabilitation unit at this hospital, designed by the firm Woods Bagot, specializes in providing interdisciplinary restorative care for a range of injuries, surgeries and illnesses. The facility contains 30 sub-acute inpatient beds, with each room housing one or two beds.²⁰ Staff members work with current inpatient facilities and outpatient support services in order to provide a continuation of care for the patients.

This facility attempts to assist patients in their recovery by implementing gardens and natural elements throughout the design, creating intimate spaces that blend the exterior with the interior. “Home in the Park” is the central theme. The interior spaces use comfortable materials, textures and colours that give the feeling of being in a residential house. Sliding doors and patios provide connections to the outdoor while large windows provide adequate daylight within the interior spaces. This allows patients to enjoy their rehabilitation

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without feeling institutionalized.²² In addition, small therapeutic gardens are incorporated into the design, creating sanctuaries that nurture the patients. Spaces such as these sanctuaries are important because they remove the feeling of being within a hospital, consequently creating comfortable environments that are essential for healing spaces. As written by the architects, “the patient’s healing journey extends into the existing groves of eucalyptus and native grasses.”²¹ This signifies that this centre attempts to remove the stigma of health institutions, generally perceived as negative and daunting spaces by incorporating soothing and calming elements of nature. Thus, through the use of architectural design as well as landscaping, outdoor courtyards and ample daylight, the boundaries between exterior and interior are blurred.

As indicated in plan, the location of the physiotherapy rooms is near the north-west tip of the rehabilitation unit where it appears to be confined to one space. Despite this, the centre possesses an area that highlights the importance of exercise through movement in a gradual method. In the northern part of the rehabilitation’s plan, there is a small walking circuit that sits on the divide between outside and inside, partially covered from the elements.²³ Oriented in such a way to take advantage of Australia’s sun pattern, this small circuit provides patients with a dynamic area to do mobile exercises safely while infusing the space with beneficial qualities, such as exposure to gardens,

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IMAGES CAPTURING THE INTERIOR AND EXTERIOR
CONDITIONS OF THE WOY WOY REHAB. UNIT.

18. EXTERIOR VIEW OF NORTHERN FACADE

19. SOUTHERN FACADE

20. FLOOR PLAN OF THE UNIT (PHYSIO SPACE IN
PURPLE)

21. INTERIOR PHOTOGRAPH OF CONNECTION TO
EXTERIOR

22. VIEW OF THE WALKING CIRCUIT FOR PATIENTS

trees, fresh air, and daylight. The design of the circuit incorporates a series of concrete stairs and ramps of different heights, providing patients with different ground conditions during their exercise. The circuit contains various elements to provide a level of safety for patients such as two handrails for support, a bench for rest, and floor markers to indicate the beginning and end of the circuit for patients with visual difficulties. Wooden shading devices are used to create a warm and pleasant environment for patients as they use the space. The materials were likely chosen to sustain weathering from being outside, yet they provide good support for patients (concrete) while instilling warmth and comfort into the space (wood). In summary, although this circuit is small, it provides a concrete example of applying gradual levels of assistance to create a dynamic space for patients with mobile difficulties.

Note : Photographs of the actual physiotherapy spaces within the Woy Woy Rehabilitation Unit were not found.

THERAPEUTIC WALKING WITHIN WAY-FINDING

In relation to the importance of exercise, walking, especially for older citizens, is known to improve cardiovascular health and muscle strength.²⁴ Furthermore, moderate walking done regularly has been proven to enhance mood, as well as boost the body's immune system.²⁵ As explained by Esther Sternberg in *Healing Spaces*, walking can be meditative: you focus your attention on the rhythm and speed of your breathing during every bodily movement: and it becomes a soothing ritual, "where each step is an effective way to manage stress."²⁶ An example of therapeutic walking includes labyrinths, which involves walking as stress relief within a manicured setting. Once popular in many European gardens, labyrinths are now often included in health care designs. Using many features of Tai-Chi, a system of exercises practised for health and relaxation (see figure 24), labyrinths encourage physiological relaxation through controlled breathing.²⁷ What should be noted from therapeutic walking is that it combines the design of healing spaces with the benefits of physical activity. Natural settings, fresh air and daylight surround the walking path, which creates an environment rich in calming, sensorial elements that permit mental relaxation for those experiencing stressful situations. If applied correctly to the circulation system of a building, this spatial intervention and form of exercise could be used not only by patients, but also by staff members and visitors as a

FIGURE 23: THE CANTEBURY LABYRINTH
KENT, UK.

FIGURE 24: TAI-CHI

TAI - CHI (noun) :

Defined as a system of exercises practiced for health and relaxation.

therapeutic way-finding tool around the facility.

Hospital design is infamously known for its confusing spatial organization, disorienting hallways and poorly-explained layout. Patients and visitors constantly find themselves getting lost when navigating the corridors of hospital facilities. If we are to encourage these environments to be interactive, dynamic and social places, a proper configuration and system must be designed. Way-finding is a technique that uses the physical environment to navigate from one location to another.²⁸ This is because when walking, our brains perceive objects and then place them in sequences, forming a memory of the places we experience as a result.²⁹ Connecting these familiar sights forms a mental map and people become acquainted with the area more easily. One technique use way-finding within a predefine environment, like a rehabilitation centre, to position specific markers or colours on pathways, thereby creating visual markers as memory aids that lead to a specific end or destination. In addition, placing an object entices curiosity of the mind and encourages our bodies to move towards it.³⁰ Using this strategy, spatial organization becomes a discovery, seducing human movement rather than directing it.³¹ If these objects or markers incorporate vegetation, specific materials or other spatial healing components, such as large windows which provide orienting views to the exterior, the way-finding can essentially become a therapeutic tool. These strategies can offer

FIGURE 25: EXAMPLE OF A POTENTIALLY CONFUSING TEXTUAL WAY-FINDING SYSTEM VIA SMALL SIGNS AND TEXT (OTTAWA GENERAL PHYSIOTHERAPY DEPARTMENT)

FIGURE 26: EXAMPLE OF WAY-FINDING SYSTEM USING LOUD GRAPHICS, COLOUR AND MARKINGS (CASSELDEN BASEMENT CYCLING FACILITY, MELBOURNE, AUSTRALIA)

patients and visitors an enjoyable procession through health facilities, making unfamiliar aspects of health centres more comforting.

It is important to note that including elements for those with disabilities is essential because a rehabilitation centre caters to a variety of people, thus it should be inclusive. Visual, spatial, auditory, textural and proprioceptive cues, signals that occur when moving through space³², are various ways to enhance the use of a patient's way-finding abilities. Over time and with practice, repetition and graphic markers, spaces become more familiar and way-finding becomes easier. As explained by John Eberhard in *Brain Landscape*: "motor skills are embedded in procedures which are expressed through performance."³³ This illustrates that the more one practises and repeats a movement, the better it will be expressed over time. For that reason, way-finding can be a playful device that engages users to move and explore their building. This will be further discussed in the following illustrative example.

PROPRIOCEPTION : the sense of the relative position of neighbouring parts of the body and strength of effort being employed in movement. It is caused by *proprioceptors* located in the body's striated muscles and joints.

(Mosby's Medical, Nursing & Allied Health Dictionary, Fourth Edition, Mosby-Year Book 1994, p. 1285)

PROPRIOCEPTIVE CUES : Proprioceptive indicators are used to give spatial awareness to the body. These may include nonvisual cues, allowing one to sense the position of body parts; visual cues, allowing views of body parts; and intersensory, which combines the two.

ILLUSTRATIVE EXAMPLE NO. 4

Laban Dance Centre*Architects* : Herzog de Meuron*Location* : London, England*Area* : 8,203 square meters*Year* : 2000 – 2003

The Trinity Laban Dance Centre is a distinguished dance facility located within an industrial area in south-west London. The building houses many amenities, including several studios, a large theatre, library, cafeteria, administrative offices and production facilities. The main performance theatre is centrally situated within the building with circulation moving around it. The activities are distributed over two open levels, encouraging the intermixing of tasks and creating social interactions.³⁴

This dance facility is associated with its use of human movement within and around the building through landscape and dynamic interior spaces.³⁵ Designed as a public building, the centre incorporates a complex interior of avenues, streets, winding lanes, spiral stairs and courtyards. As part of the way-finding system, these ‘streets’ are differentiated from one another through the use of bright colours, indicating which direction to go depending on the activity. For example, a teal colour on the walls leads users to the dance studios, as

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shown in figure 30. Using transparent and translucent glass allows users to have views to the exterior, while being able to orient themselves within the facility. These materials display the dancers' reflections along the translucent panels in a playfully interactive manner, showcasing some of the activities occurring within the facility to the public. Additionally, the openness of the centre allows for visual and social encounters (seeing where to go), occasional dance practice and an overall feeling of connectedness. This feeling of being connected is important because it creates a community within the building, providing opportunities for users to interact with one another. In the main sloping atrium, two large, black winding staircases anchor the space at either end, creating a gathering space complete with benches and a winding handrail. The use of a wooden, contorting handrail offers an element of continuation throughout the building because it permits one to follow along while walking and a practical entity for dancers to practise. Despite its small size, the significance of the handrail is large because it offers users a journey through the facility's main spaces.

In relation to rehabilitation centres, it is possible to apply way-finding strategies such as colourful orientation walls, orienting views, handrails and open designs to provide a spatial clarity. These methods, however, could be expanded upon significantly in ways to incorporate elements that contribute to healing spaces.

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These elements could include views of natural settings, non-obstructive colours for patients, and continuous handrails of comfortable materials. The use of transparency, reflections and open space could be brought into the context of a rehabilitation centre, yet architects should ensure that spaces do not obstruct a patient's privacy. It can be a vulnerable feeling to practise in a large, open and reflective space, thus, it is important that private areas are designed for certain exercises or tasks. Nevertheless, highlighting moments of activity within a building through translucent panels, is a playful method to encourage human movement. By using translucent panels, the reflections and shadows are less recognizable, and therefore could provide blurred movement for the users within the building. In conclusion, the Laban Dance Centre's use of colour, transparency and openness demonstrate how way-finding can provide a more playful way to move around a rehabilitation facility.

PHOTOGRAPHS OF THE LABAN DANCE CENTRE

28. APPROACHING ENTRY

29. MAIN GATHERING SPACE, WITH ATTENTION TO
DETAILS SUCH AS A DYNAMIC HANDRAIL.

30. INTERIOR PHOTOGRAPH OF A DANCE STUDIO

31. INTERIOR STREET LOOKING ONTO EXTERIOR RAMP.

32. VIEW OF RAMP LEADING TO MAIN GATHERING SPACE.

ENDNOTES

CHAPTER 2

1. Naylor, Mary, and Stacen A. Keating. "Transitional Care." *Journal of Social Work Education*. 44.0 (2008): 65-73.
2. Quinn, Charlene C., et al.. "Short-Stay Nursing Home Rehabilitation Patients: Transitional Care Problems Pose Research Challenges." *Journal of the American Geriatrics Society*. 56.10 (2008): 1940.
3. Keating. 65.
4. Definition provided by World Confederation of Physical Therapy, 2012.
5. Hollmann, et al. "Physical Activity and the Elderly." *European Journal of Cardiovascular Prevention & Rehabilitation*. 14.6 (2007): 730.
6. Cheryl, Atkinson. "Architectural Analysis Report for the POE of Bridgepoint Active Healthcare" (2014): 6.
7. Cheryl, Atkinson. "Architectural Analysis Report for the POE of Bridgepoint Active Healthcare" (2014): 6.
8. Cheryl, Atkinson. "Architectural Analysis Report for the POE of Bridgepoint Active Healthcare" (2014): 106.
9. Kerr, J., D. Rosenberg, and L. Frank. "The Role of the Built Environment in Healthy Aging: Community Design, Physical Activity, and Health among Older Adults." *Journal of Planning Literature* 27.1 (2012): 42.
10. Frontera, Walter R., David M. Slovik, and David M. Dawson. *Exercise in Rehabilitation Medicine*. Champaign, IL: Human Kinetics, (2006): 20.
11. Rosenberg and Frank, 43.
12. Rosenberg and Frank, 44.
13. Quaney, et al. "Aerobic Exercise Improves Cognition and Motor Function Poststroke." *Neurorehabilitation and Neural Repair*. 23.9 (2009): 879. Web.
14. "Rehabilitation Centre Groot Klimmendaal" <http://www.dezeen.com/2011/03/25/rehabilitation-centre-groot-klimmendaal-by-architectenbureau-koen-van-velsen/> (accessed Feb 2015)
15. "Rehabilitation Centre Groot Klimmendaal" <http://www.dezeen.com/2011/03/25/rehabilitation-centre-groot-klimmendaal-by-architectenbureau-koen-van-velsen/> (accessed Feb 2015)
16. Quaney, 881.
17. Hollmann, et al., 732.
18. Lieberman, Daniel. *The Story of the Human Body: Evolution, Health, and Disease*. Knopf Doubleday Publishing Group, (2013): 141.
19. Emily Balcetis (Ted Talk) "Why some people find exercise harder than others."
20. "Design for patient recovery at "homes in the park" < <http://www.woodsagot.com/project/woy-woy-rehabilitation-unit-nsw-australia>> (accessed Dec 2014).

21. “Design for patient recovery at “homes in the park” < <http://www.woodsbagot.com/project/woy-woy-rehabilitation-unit-nsw-australia>> (accessed Dec 2014).
22. “Design for patient recovery at “homes in the park” < <http://www.woodsbagot.com/project/woy-woy-rehabilitation-unit-nsw-australia>> (accessed Dec 2014).
23. “Design for patient recovery at “homes in the park” < <http://www.woodsbagot.com/project/woy-woy-rehabilitation-unit-nsw-australia>> (accessed Dec 2014).
24. Rosenberg and Frank, 44.
25. Sternberg, 121.
26. Sternberg, 120.
27. Sternberg, 119.
28. Eberhard, 55.
29. Sternberg, 138.
30. Sternberg, 153.
31. Zumthor, Peter. *Atmospheres: Architectural Environments, Surrounding Objects*. Basel: Birkhäuser, (2006): 39-41.
32. Sternberg, 138.
33. Eberhard, 124.
34. “Laban Dance Centre” <<https://www.herzogdemeuron.com/index/projects/complete-works/151-175/160-laban-dance-centre.html>> (accessed Dec 2014).
35. Glancey, Jonathan. *Give us a swirl!* The Guardian. London, England. 2011.

CHAPTER 5

A REHABILITATION CENTRE FOR DARTMOUTH

DARTMOUTH, NOVA SCOTIA: HISTORY OF THE SITE

The community of Dartmouth is part of the Halifax Regional Municipality (HRM) and is located on the eastern shore of the Halifax City Harbour. Once an independent city, it is now part of a large metropolitan area that combines suburban, rural and urban elements.¹ With an approximate population of 373,000, the HRM is the largest and most diverse municipality in Nova Scotia and in Atlantic Canada overall.² Currently, the average population of Dartmouth (including Cole Harbour) is around 89,200 and covers an area of approximately 58.57 km².³

Originally a Mi'kmaq First Nation summer fishing and camping destination, present-day Dartmouth was not established until 1750 when English settlers sailed across the harbour from the newly-created city of Halifax to establish Dartmouth in honour of the Earl of Dartmouth, William Legge.⁴ From the time of its establishment up to the 1800s, the area was mostly developed as a small farming and fishing community used by local inhabitants. During the Industrial Revolution from 1760 to 1820, Dartmouth gradually transformed into a light industrial and commercial community through the addition of shops, small

FIGURE 32 : DARTMOUTH, NOVA SCOTIA

factories, an oil refinery and the construction of the Shubenacadie canal system.⁵ Following World War II, the city experienced a substantial period of growth as a result of industry and new employment opportunities.⁶ Since then, road and highway construction have sprawled throughout Dartmouth allowing for easy transit among other regions, such as Bedford, Tantallon and Sackville. The physical connection between Halifax and Dartmouth is an important element in the lives of many Haligonians, as many travel over the harbour either for work, living or social commitments. From 1752 to 1954, the only direct trajectory across the Halifax Harbour was by ferry, still in operation today. In 1955, the Angus L. MacDonald bridge was constructed, facilitating transportation between the two cities. Since this time, Dartmouth has become a successful commercial and industrial area for the Atlantic provinces of Canada while still being a large residential region.⁷

During the 1970s, Dartmouth's landscape was being drastically modified by automobiles. The mass consumption of cars by the middle class transformed the city's planning strategy as cars allowed people to live further out into the periphery areas. This was done due to new road and highway construction allowing the population to build homes further out of Dartmouth's core, while still having quick access to the city's services. In order to provide for these new developments, large shopping malls and commercial complexes

FIGURE 33: DARTMOUTH SKYLINE
 FIGURE 34: MCDONALD BRIDGE BETWEEN
 HALIFAX AND DARTMOUTH
 FIGURE 35: HIGHWAYS CUTTING THROUGH
 DARTMOUTH

were constructed during this period allowing cars to be parked while their owners shopped within the shopping centres. One of these shopping centres was Penhorn Mall, located east of the downtown core. Penhorn Mall was a U-shaped mall located in central Dartmouth and was directly accessible from Portland Street, the main east-west road in Dartmouth. Penhorn Mall was the local community's destination for food (grocery store, Sunday markets, food court), entertainment (movie theatre) and leisure / shopping purposes (Wal-Mart, Sears, and many little boutiques). Many shops migrated, however, when a large shopping district was established in Dartmouth, leaving the mall destitute and empty as a result. After its closure in 2008 and partial demolition ending in 2011,⁸ the site has become a partially-vacant lot except for a small strip mall (7 tenants), a grocery store, a fitness centre, Sears and two large parking lots. Due to the strict commercial zoning regulations of the site, the Penhorn lot is still unoccupied today.

FIGURE 36: CURRENT STATE OF THE PENHORN SITE

FIGURE 37: CURRENT EMPTY LOT ON THE PENHORN SITE

FIGURE 38: FACING EAST

FIGURE 39: FACING WEST

FIGURE 40: FACING NORTH

FIGURE 41: MAIN ENTRY INTO THE SITE

FIGURE 42: SECOND ENTRY

FIGURE 43: VIEW FROM THE HIGHWAY

SITE PHOTOGRAPHS

SITE SCOPE

The large vacant portion of the lot offers many opportunities for architectural interventions. By reusing and rezoning the unused site, the new rehabilitation facility could benefit from being within a mix-used environment and demonstrate how to encourage physical activity to the surrounding communities. This proposal would thus perform two tasks: it would remove an urban eyesore and provide Dartmouth with a new rehabilitation program. The site was chosen because of its size, but more importantly for its location near residents and many amenities that can benefit a patient's process of being reintegrated into society. In being close to a variety of environments, it provides stimulating conditions for patients in recovery, allowing them to eventually readjust and reacquaint themselves to the speed of their daily activities. These surrounding environments include a new green zone for recreational activities and observation; a calm lake with pleasant views and potential trails; as well as a quiet commercial area off the main street that provides grocery stores, pharmacies, restaurants, cafes, and home essential shops. As patients' mobility gradually improves, they will be able to experience and enjoy these areas before being released home. Since the site is situated between two residential neighbourhoods and in proximity to many nursing homes, the new rehabilitation centre will be community-centered, thereby allowing patients to receive the necessary services without having to travel far. This is beneficial

RESIDENTIAL AREAS

COMMERCIAL AREAS

RECREATIONAL AREAS

FIGURE 44: CURRENT ZONING OF THE SURROUNDING AREA

because it provides patients with familiarity and the feeling of remaining within their neighbourhood, adding a sense of comfort to their treatment. By establishing a new rehabilitation facility on the Penhorn lot, patients are able to leave the Dartmouth General Hospital and medical campus for their rehabilitation treatments (see figure 45). This is a positive feature because, by moving away from the medical campus, it removes a stigma of “being ill” and creates a more positive stimulus for patients as they transition from hospital to home.

FIGURE 45: THESIS SITE IN RELATION TO DARTMOUTH'S MEDICAL CAMPUS
(driving distance and time)

FIGURE 46: PROPOSED ZONING

To maximize the use of the site and benefit from scenic views, the rehabilitation facility will be positioned near the north-east portion of the site. In doing so, it will create two new zones, north of the existing commercial area, that focus on promoting physical activity and health. This site strategy will require a review of the zoning in order to consider a mix-use property for the site, allowing one zone to be a public park, while the other zone houses the new rehabilitation centre and other potential health promotion facilities (see figure 46). The rehabilitation facility's location on the site will be beneficial for the

site's rehabilitation for several reasons: it allows other developments to occur while providing Dartmouth with a large public green space; it will provide private exterior green space for patients' physical therapy sessions; and finally both drivers and pedestrians will have easy accessibility from Portland Street (the main street) to the facility.

In creating these two zones, both residents and users of the rehabilitation centre will have access to a large green space, granting pleasant views instead of a large destitute area to the population. Currently within this residential area of Dartmouth, there are no large public parks or green spaces for leisure walks, activities or rest. Establishing a new public park will hopefully attract positive attention to the posterior end of the site while encouraging community members to use and enjoy a natural setting within their neighbourhood. Additionally, a park could provide patients and therapists of the new rehabilitation centre with natural settings in which they could practise movement exercises. Both the Dartmouth General Hospital and Nova Scotia Rehabilitation Centre do not offer green spaces for their patients and therapists resulting in interior physical therapy sessions only. By providing an accessible park, patients and therapists can practise physical exercises outside, thus giving more interesting and stimulating settings for the therapy. Where privacy is concerned between the neighbourhood residence and the new rehabilitation centre, this park trees

could provide an adequate sound and visual buffer. It is important to grant ample privacy between the residents and users of the rehabilitation centre, despite both being able to use the park, because it allows both sides to use the park freely, without having embarrassing encounters.

The position of the building relative to the park can also create opportunities for interactive exterior spaces for patients and therapists. These exterior [green] spaces can be developed as extensions to the building, which would allow the activities within the facility to transition to the exterior and consequently create dynamic environments around the building. Furthermore, these spaces will allow patients to practise and develop exterior occupational skills (walking on uneven ground, stepping over curbs, etc.) that are essential to living independently. By incorporating concepts previously discussed within these exterior green spaces, such as levels of gradual assistance and sensorial elements that contribute to therapeutic settings, physical therapy exercises could be practised outside, thus granting a change of environment for both patients and therapists.

In regards to site accessibility, the rehabilitation facility's location permits easy access for drivers and pedestrians. There are three access points into the site from Portland Street: two for automobiles while one for public transit

FIGURE 47a: ROAD TYPOLOGY DIAGRAM

(see figure 48). At this scale, it is essential to address car transportation because automobiles are still the main method of transportation, thus should be thoughtfully planned for those trying to travel to the new building. This thesis proposes that new automobile roads carry its passengers directly to the new rehabilitation facility via both existing driveways, forming a loop around the commercial zone (see figure 49). This loop will hopefully integrate the automobile movement of Portland Street into the posterior end of the site and direct people towards the facility (and its parking lot). For pedestrians, sidewalks, walking paths and trails will be implemented in order to connect the building with the park and its surroundings. These elements are essential because they give individuals opportunities to explore the site by foot, thus promoting physical activity at the level of the site.

FIGURE 47b: SITE CIRCULATION DIAGRAM

FIGURE 48: CURRENT MOVEMENT

Current circulation for cars is contained within the south area of the site only. The position of the grocery store and Sears cut off the lot from the rest of the site, thus contributing to its stale nature. The northern part of the site is barren despite random pedestrians travelling the site.

FIGURE 49: PROPOSED MOVEMENT

The new plan keeps the vehicular circulation (and parking) towards the south, adding foot paths and pedestrian routes near the northern section of the site. Rehabilitation includes adding landmarks, gathering spaces and landscaping.

There are many levels of movement occurring throughout this proposal. As identified previously, one level addresses movement at an urban scale, thereby bringing human activity back to a secluded area within the site. This thesis proposal deals with two other levels of movement which will be discussed in greater detail later in the design. Briefly put, the second level of movement addresses how users of the building move among the different spaces and how staff members interact with the various professions in a professional manner. The building's circulation functions as a street, revolving around an open atrium while carrying users from the entry of the building to the different services and ending at the second floor's roof terrace. Additionally, the circulation can function as walking circuits for staff members, patients and visitors, encouraging everyone to participate in low-key physical activity. Finally, the third level of movement addresses how patients move through the physical therapy hallway circuits in order to heal progressively. These particular circuits (entitled dynamic therapy spaces) will be the focus of the design portion of the thesis.

FIGURE 50: SITE CIRCULATION

FIGURE 51: MAIN CIRCULATION

FIGURE 52: THERAPY CIRCULATION

CURRENT FACILITY FOR REHABILITATION : THE NEED FOR MOVEMENT

Dartmouth currently has one main hospital, the Dartmouth General Hospital (Figure 53), which provides acute transitional rehabilitation, as well as outpatient services to the general population. These departments are constantly full with waiting lists for appointments. With the increasing demands for physiotherapy, the Dartmouth General is in need of additional space since its 1970s design is now out of date and creating spatial issues for its services as a result.⁹ Furthermore, many of the Dartmouth General Hospital's beds are occupied by patients who, despite their stable health, require additional physical care in order to be independent.¹⁰ Due to the lack of inpatient physical therapy facilities and increasing patient numbers, healthy patients are kept within the institution, confined to their rooms and beds. This means that patients' recovery is slower since they are not able to receive their physical therapy. Therefore, these patients occupy much-needed bed space, resulting in a shortage of beds, an ever-increasing waiting lists and an inefficient system. What is important to note is that patients that could be treated elsewhere are occupying these beds. As informed by their website, the transitional care unit the Dartmouth General is awaiting placement for 18 patients that are able to reside outside the hospital.¹¹ Providing a new rehabilitation facility that focuses on offering physical therapy services can be beneficial not only for patients, but also for the

FIGURE 53: DARTMOUTH GENERAL HOSPITAL

FIGURE 54: NOVA SCOTIA REHABILITATION CENTRE

There is only one facility in the HRM area providing specialized adult rehabilitation and complex continuing care on an inpatient and outpatient basis. It is part of the Queen Elizabeth II Health Sciences Centre in downtown Halifax.

<http://www.cdha.nshealth.ca/nsrc>

main Capital Health District. Despite the need for a new rehabilitation centre in Dartmouth, the main issues delaying any advancement in the near future relate to provincial political disagreements and lack of funds for a new facility. Currently, the province is focusing their contributions toward renovations for other aspects within existing health facilities, such as providing an additional surgical unit with patient beds for the Dartmouth General.¹²

The population for the proposed transitional rehabilitation facility would be individuals who have been discharged from the hospital setting with stable health, but require additional care for their mobility or physical difficulties. This rehabilitation centre is the link between the hospital and home: it is the final step patients may experience before fully returning to society. Not only does this facility provide individuals with the movement and exercise they need, but it also liberates hospitals beds for those who truly need them.

FIGURE 55: HEALTH CARE FACILITIES WITHIN THE AREA

HOSPITAL
Patients are dependant on caregivers;
Patients' health is not stable;
Mobility is severely limited
(injuries, illness, etc.)
Patient is bedridden
Patient could not support themselves
independently

TRANSITIONAL REHABILITATION
Acts as LINK between hospital and home settings
Patients' health is stable, but requires exercise ;
Injuries have improved but requires gradual movement
Must receive therapy to address mobility concerns

HOME
Individual is fully independent;
Health is completely stable;
Physical issues do not obstruct
living conditions.
Individual is completely mobile

TIME
Designing spaces for gradual
healing and varying abilities

MOVEMENT
Incorporating elements that
allow for movement and exercise

SPACE
Combining the two to create
engaging and interactive conditions

PROPOSED DESIGN + DYNAMIC THERAPY SPACES

This project will help illustrate the practical application of the arguments that this thesis puts forward. By using concepts of healing spaces, new *dynamic therapy spaces* will be designed and presented. It is the hope that these spaces will allow patients to practice physical therapy within the circulation spaces as to receive a more dynamic and spatially perceptive form of treatment.

The program of the building will reflect the required care necessary for complete physical well-being. The facility will accommodate multiple therapeutic professions that interact with one another in order to address patients' physical and psychological needs. These professions include occupational therapy, recreational therapy, physical therapy, acupuncture, chiropractic and massage therapy, as well as social work, psychology and nutrition. Complimenting professions will be grouped together within the building in order to allow for easier communication and interaction among their therapists and staff members. To provide temporary patient living, physical rehabilitation care, and community-integrating activities, the rehabilitation centre will consist of three floors each housing one of these functions. They are grouped as such because the functions reflect a gradual process of recovery: those requiring the most help and physical therapy; those receiving gradual physical therapy

FIGURE 56: PROFESSION RELATIONSHIP
DIAGRAM

to focus on retrieving mobility and physical capacity; and those adapting back to an independent life in their community. The design of each floor will be explained beginning with the function of each floor, the programming, way-finding strategies, and concluding with the dynamic therapy spaces. In order to promote exercise, the organization of the dynamic therapy spaces revolve around the gradual healing process of physical injuries or disabilities and the equipment that patients may use throughout their rehabilitation. Taking inspirational cues from parallel bars, wall bars, stairs, ramps and wobble boards while linking them to their appropriate movement, a sequence of spatial relationships begin to form (see figure 61). Patients begin their rehabilitation journey on the second level and gradually descend to the first level for more practical treatment. Five dynamic therapy spaces will be investigated in sequence.

FIGURE 57: PROGRAMMATIC CONCEPT

DESIGN GUIDELINES FOR TRANSITIONAL REHABILITATION CENTRE

Elements of Well-being Rehabilitation

Natural	Occupational Therapy
Social	Physical Therapy
Spiritual	Recreational Therapy
Psychological	Psychology
Haptic	Nutrition
Architectural	Social Work
	Chiropractics / Acupuncture
	Massage Therapy

QUALITIES OF CIRCULATION SPACES

Beneficial

Strength
Endurance
Balance
Flexibility
Coordination
Rest

Gradual

Levels of difficulty
Accessibility
Privacy
Safety
(physical elements,
materials, etc.)

Therapeutic

Walking Paths
Circuits
Way-finding

Interactive

Between professions
Person to person
Person to building
(materiality, colour, texture,
light, etc.)

FIGURE 58: MASSING STRATEGY

A	ROOF TERRACE
B	PATIENT BEDS
C	PATIENT DINING + AMENITIES
D	PHYSICAL THERAPY
E	ROOF TERRACE
F	BODY-RELATED SERVICES
G	PSYCHOLOGICAL-RELATED SERVICES
H	POOL
I	RECREATIONAL SERVICES
J	CAFETERIA
K	STORES
L	GYMNASIUM

FIGURE 59: PROGRAMMATIC DIAGRAM

FIGURE 60: CIRCUIT DIAGRAM

With regards to movement within, the building's main circulation functions as a street, revolving around an open atrium while carrying users from the entry of the building to the different services and ending at the second floor's roof terrace.

Additionally, the circulation can function as walking circuits for staff members, patients and visitors, encouraging everyone to participate in low-key physical activity.

FIGURE 61a: SECTION THROUGH MAIN CIRCULATION SPACES

FIGURE 61b: SECTION THROUGH MAIN CIRCULATION SPACES

FIGURE 61c: SECTION THROUGH MAIN CIRCULATION SPACES

FIGURE 61d: SECTION THROUGH MAIN CIRCULATION SPACES

FIGURE 61e: SECTION THROUGH MAIN CIRCULATION SPACES

EVENT | INJURY

MOVEMENT

EQUIPMENT

SPATIAL TRANSLATION

[Space 1]

[Space 1]

[Space 2]

[Space 3]

[Space 4]

FIGURE 62: DEVELOPMENT OF THE DYNAMIC THERAPY SPACES

SECOND LEVEL: RE-INTRODUCTION TO MOVEMENT

The top floor of the rehabilitation centre will house patients requiring major physical rehabilitation who must remain under the facility's care temporarily until they fully recover (reference figure 64). This level will encompass 20 patient beds, various staff and patient amenities, physical therapy areas, and roof terraces. The layout of the second level has been programmed this way because it allows for patient access to all needed amenities on the same floor. The patient rooms face south-west, north-west and north-east in order to ensure patients can receive views to the new park, Penhorn Lake and the city of Dartmouth. This design decision correlates with concepts of healing spaces as it provides patients with views to natural settings that positively impact one's emotional state during healing. Patient dining, internet cafe, hair salon and other patient amenities are found within the east and south parts of the facility in order to provide ample daylight to the social areas of the floor where patients will gather during the day. Placing these services at a distance from the bedrooms allows patients an opportunity to walk to these destinations, therefore, encouraging small amounts of daily physical activity. Also on this floor are spaces addressing various aspects of a patient's health. These include the psychological, social and spiritual aspects. As explained previously, these rooms are important to include within health facilities because they contribute

to the process of complete well-being during a patient's recovery process. Within the new rehabilitation centre, these spaces include a visiting family lounge connected to a roof terrace which provides both exterior green space and a social interaction space for patients in healing, a spiritual room which provides patients with a space to practise their faith or mental reflection ; and also a patient lounge which provides leisure activities or relaxation among other patients.

A large roof terrace provides patients and staff members therapeutic green space for physical therapy and relaxation (see figure 63). This terrace is directly accessible off the first dynamic therapy space and consists of large gardens, benches and a winding path. This path performs two tasks: first, it allows the physical therapy to flow outside giving patients a change of environment for their exercises; second it provides a relaxing natural environment for those on the top floor. With regards to the terrace's organization, the garden path has been designed loosely based on the concept of labyrinths, as explained in Chapter 2 which provide its users with psychological and physical benefits. Individuals are able to follow the path through the gardens and eventually return to their point of departure, thus permitting a journey of mental relaxation. The experience will offer patients a pleasant natural landscape while contributing positively to one's emotional state through the use of the winding garden path.

FIGURE 63 : SECOND FLOOR ROOF TERRACE

Specific colours, materials and markers will be used as primary tools for indicating spatial direction and orientation throughout the entire building. By using simple, clear but visually stimulating indicators low to the ground, users of the building will be enticed to move towards them and understand which route to take. This relates to the argument of proper way-finding also discussed in Chapter 2. The main circulation path will be a wooden vinyl flooring, fluidly guiding users past the different programs, roof terraces and openings to outside in order to orient users to their surroundings. (reference figure 69). This is important as it clearly indicates to users what is the main path to take and allows them to walk around the level without getting confused. A continuous handrail will follow the main circulation path as a way to ensure safety and gradual assistance for walking within the entirety of the building. When arriving at the dynamic therapy spaces, the flooring will consist of a dark purple, rubber material. This material, typically found in gymnasiums, creates a supportive yet soft texture to the ground that can also sustain a lot of activity from exercises. The colour purple will be consistently used throughout all of the dynamic therapy spaces as to clearly indicate the use of the space.

SECTION THROUGH ALL THE DYNAMIC THERAPY SPACES

FIGURE 65

FIGURE 65a: SECTION THROUGH ALL THE DYNAMIC THERAPY SPACES

FIGURE 65b: SECTION THROUGH ALL THE DYNAMIC THERAPY SPACES

FIGURE 65c: SECTION THROUGH ALL THE DYNAMIC THERAPY SPACES

FIGURE 65d: SECTION THROUGH ALL THE DYNAMIC THERAPY SPACES

FIGURE 65e: SECTION THROUGH ALL THE DYNAMIC THERAPY SPACES

DYNAMIC THERAPY SPACE 1

The first dynamic therapy space's main objective is to gently re-introduce patients to movement and, as such, is intended for those with extreme mobile difficulty. In recognition of these difficulties, this space is conveniently located near the patient rooms which reduces issues with distance and travel while providing them with easy access to physical therapy and the roof terrace (see figure 66).

The first dynamic therapy space focuses on giving patients a zone for walking with adequate assistance while infusing the space with healing qualities such as views to the exterior, natural ventilation, daylight and appropriate materials. In order to allow physical therapy to occur slowly, a walking harness track enables patients to walk throughout the space and circulate across the floor. By incorporating this device into the circulation spaces, patients are able to experience more of the building as they gradually improve their gait, thus granting them a more scenic and sensorial environment than being contained within a room. The track itself is embedded in the ceiling as to make it less obvious to the eye and obstructive to the ceiling's appearance, with only the harness straps being visible as the patients moves (see figure 68). As patients are led through the first dynamic space, they are able to enjoy floor to ceiling views of the roof gardens.

In order to provide levels of assistance and safety for these patients, warm-coloured wooden handrails, parallel bars and seating area are situated at close reach. As patients improve gradually from the harness, they are able to use the parallel bars as a way to strengthen their lower bodies. Each set of parallel bars is 3.5 meters in length and is able to be adjusted both in width and height in order to accommodate every patient (see figure 68). Small wall dividers with pocket benches are in close proximity in case patients require rest during the walking. Towards the end of the hallway, a small circuit of stairs and ramps is used to challenge the patient's lower body strength and coordination (see figure 67). This intervention is intended to prepare patients for their migration to the first floor, where the level of physical therapy exercises is increased.

THERAPY SPACE 1 - SECOND FLOOR

FIGURE 67: INTERIOR ELEVATION A

ADJUSTABLE HEIGHT

ADJUSTABLE WIDTH

THERAPY SPACE 1 - SECOND FLOOR

FIGURE 68: SECTION B

THERAPY SPACE 1 - SECOND FLOOR

FIGURE 69: PERSPECTIVE

FIRST LEVEL: CHALLENGING THE MOVEMENT

As patients improve in their physical health, they will progress to the middle floor (first level) to continue their physical therapy. This is done in order to provide patients with additional space for movement, but also to ensure they are in proximity to the other various professions found on this floor. The first level will be dedicated to patient services with one area for body-related services (physical therapy, occupational therapy, chiropractic, massage therapy and acupuncture) and another for psychological-related services (psychology, social work and nutrition)(see figure 70). This is organized as such to achieve a cohesive way of offering rehabilitation: patients have easier access to services when complimentary professions are located in the same area. Additionally, by situating all healthcare services on one floor, practitioners can deliver patient information more easily among one another.

The main circulation path, mentioned in the previous section, continues throughout the first level. As the wooden path moves down the atrium ramps, it eventually travels around the open atrium space passing through the psychological services before leading into the body-related services. This circulation is crucial within the design because it creates a walking circuit around the building, offering every individual within the facility the

opportunity for some exercise during his or her working day. As the path circulates around the floor, users are presented with different conditions that contribute to the quality of the circulation space and stimulate all five senses: sitting areas for group gatherings, a small coffee bar with benches, planters with aromatic flowers, glimpses into interior activity spaces and views to the exterior keep the main path dynamic and interactive while users walk along. This circuit becomes therapeutic in the way that it offers social opportunities for the health facility members, patients and visitors from the community. As was established in Chapter 1 through the understanding of complete well-being, social spaces for patients are important elements to their healing process because it initiates sentiments of compassion and involvement which lifts their morale. Therefore, this circuit becomes a dynamic social area for the building where every member is allowed to enjoy the designed conditions.

DYNAMIC THERAPY SPACE 2

The second dynamic therapy space (see figure 71) is located within the area of body-related services which faces onto an exterior deck overlooking the new park. This particular space's objective is to increase the difficulties of exercises when patients walk through challenging circuits. The second dynamic therapy space consists of three paths all performing an individual task. The first path consists of the wooden vinyl flooring which allows the main circulation path to continue through this area. The second path moves through a circuit of ramps and stairs, providing patients with a variety of floor conditions and challenging regular walking (see figure 72). This space resembles the Woy Woy Rehabilitation Unit's exterior circuit. The ramps provide smooth transitioning floors that test patients' stability and balance, while the stairs are used in order to develop patient's lower body strength. Railings are found within this circuit to give an extra level of assistance to the movement. The rubber flooring (as seen in the first dynamic therapy space) is applied into this circuit, providing an anti-slip, yet, durable environment for patients as they practise their exercises. The dark purple eventually extends past the circuit and will carry patients through the remaining therapy spaces. The third path within the second dynamic therapy space is composed of wooden benches with railings facing the exterior balcony and public park (see figure 73). This

provides a rest station for the patients to enjoy the north-facing views and regain their physical strength during sessions. In addition to a seating area, small boxes of varying sizes are able to extend from the benches, allowing the patients to step up and down with the help of railings, thus also encouraging more physical activity. The practicality of these “pull-out boxes” was inspired by the physio equipment that therapists currently use during sessions. An important advantage of the dynamic therapy spaces within the rehabilitation centre is their versatility. Both patient and therapist can use these areas for many other exercises other than walking, depending on the issues at hand. Just as therapists must adapt a therapy regime to every patient’s needs, it is also important for the designed spaces to adapt to different exercises.

THERAPY SPACE 2 - FIRST FLOOR

FIGURE 71: PLAN VIEW

THERAPY SPACE 2 - FIRST FLOOR

FIGURE 72: SECTION C

THERAPY SPACE 2 - FIRST FLOOR

FIGURE 73: INTERIOR ELEVATION D

THERAPY SPACE 2 - FIRST FLOOR

FIGURE 74: PERSPECTIVE

DYNAMIC THERAPY SPACE 3

The third dynamic therapy space revolves around the importance of stationary stretching and the versatile ways that wall bars offer physical therapy sessions for strength improvement. This piece of equipment consists of two wood supports at each end with a series of wood or steel bars spanning the width. It can be used for resistance training where a rubber band is wrapped around a bar in order to challenge regular muscle movement and contraction. Wall bars are extremely diverse pieces of equipment as they can be used for both lower and upper body training, stretching, stability, etc. (see figure 75). In order to incorporate the benefits of the wall bar into a dynamic setting, the original shape of the equipment was modified to reflect the organic form of the human spine and replicated within the entire length of the space. This was done to break the straight regularity of the hallway while offering a playful environment for stretching (reference figure 79). As a way to provide seating, folding curved benches are attached to the lower portion of the wall bar structure, allowing patients and therapists moments to sit during the session to regain energy (see figure 78). The entire structure is securely bolted both to the floor slab as well as the wall structure to ensure its stability and structural integrity. The smooth wooden bars provide warmth to the overall space with leather hand-grips adding comfort for patient's exercises. These small

FIGURE 75: VARIOUS USE FOR WALLBAR SYSTEM

details are important to add as they provide humanistic qualities to the spaces, therefore displaying a sense of consideration for the patient's conditions. In addition to the physical benefits, the wall bar space acts as a spatial divider between the dynamic therapy space on one side - where patients and therapists can sit or perform exercises and stretches - and the main circulation path on the other (see figure 77's section). Gaps within the wall bars allow users to maneuver between both areas permitting fluid access from one to the other and creating an active hallway for movement. Two sitting areas are positioned at either end of the hall, allowing patients to move towards a destination for rest. Despite the stationary exercises that take place within this space, the design of the wall bar structure enables movement through its playful design within the hallway, thus giving patients an interactive environment for stretches.

REST STATION

THERAPY SPACE 3 - FIRST FLOOR
FIGURE 77: SECTION AND INTERIOR ELEVATION

THERAPY SPACE 3 - FIRST FLOOR

FIGURE 78: SEATING DETAIL

THERAPY SPACE 3 - FIRST FLOOR

FIGURE 79: PERSPECTIVE

DYNAMIC THERAPY SPACE 4

As patients move through these dynamic environment practising exercises to improve their mobility, it is important to take privacy into consideration. The fourth dynamic therapy spaces are in fact stationary zones that allow therapists to conduct physical therapy with their patients behind translucent panels. Small pods are placed strategically throughout the floor, allowing for moments of stationary exercises between patient and therapist (see figure 80). This offers opportunities for patients who do not feel comfortable practising continually in the openness of the hallways. Every pod is separated from the main circulation by glass translucent dividers, and contain built-in storage compartments to contain smaller equipment for sessions. The dark purple rubber flooring is used within the space to indicate that these are used for physical therapy, regardless of their static nature. The purpose of the translucent dividers is granting a filter of daylight while not clearly exposing the activities within. As such, distorted reflections of human movement will be seen from the opposite side which could act as art work for users passing by using the main circulation path.

THERAPY SPACE 4 - FIRST FLOOR

FIGURE 80: PLAN VIEW

DYNAMIC THERAPY SPACE 5

The final dynamic therapy space is an important area for physical recovery as it focuses on improving one's proprioceptors and perceptual awareness. As explained in Chapter 2, proprioception is the ability to sense how one's limbs are positioned in space in relation to the whole body.¹³ Many neurological diseases that lead to movement disorders can disrupt one's proprioception receptors causing instability, confusion and gait problems. Perceptual awareness, as referenced in Chapter 1, is the proficiency to engage with one's surrounding environment.¹⁴ The fifth dynamic therapy space is designed around exercises and equipment to improve these aspects of one's physical health. Proprioceptive exercises used by physical therapists tend to focus on adjusting the body's balance ability and developing their spatial-awareness skills. Such exercises may include the use of wobble boards, trampolines or foam wedges that create uneven walking conditions. In order to define a zone for these specific tasks, the fifth dynamic space is lower than the main circulation path, thus delimiting where these workouts can occur (see figure 81). Despite being highlighted by the dark purple flooring and lower setting, a small wall with reflecting glazing panels provides an added layer of privacy to the area (see figure 82). Additionally, these reflective surfaces are used within the dynamic space, acting as mirrors for body orientation during the

physical therapy. Having the reflective quality is essential for patients because it displays how their body reacts to the challenging equipment and assists them in posture corrections. Within this marked zone, there are two main areas: one is for the use of proprioceptive equipment; the second area consists of a long shallow trampoline embedded in the floor (see figure 83). Parallel bars line the trampoline to assist patients while they walk which also adds a level of safety during this task. By integrating this fifth dynamic therapy space within the circulation system of the rehabilitation facility, it combines regular walking with proprioceptive exercises to create a challenging, yet, more-interactive connection between the facility and patients. The benefit of this combination is that it improves a patient's perceptual and spatial awareness by the addition of human movement, which consequently activates the body's sensorial receptors. Therefore, multiple areas of one's physical health are being addressed and improved over time.

THERAPY SPACE 5 - FIRST FLOOR

FIGURE 82: INTERIOR ELEVATION G

THERAPY SPACE 5 - FIRST FLOOR

FIGURE 83: SECTION H

THERAPY SPACE 5 - FIRST FLOOR

FIGURE 84: PERSPECTIVE

GROUND LEVEL : INTEGRATING THE COMMUNITY

The ground floor will contain a variety of programs that benefit patients' health near the end of their rehabilitation. On this floor, patients are offered environments that prepare them for group activity settings or exercise sessions that can be done once they leave the rehabilitation centre. The main intent for this floor is to integrate the community with the programmed activities in order to create a comfortable transition for patients as they return to an independent life. By situating specific programmed activities on the ground floor, community members will be able to use the facility's spaces while interacting with the rehabilitation centre on a regular basis, creating an amiable relationship between the building and its surroundings. These spaces include the cafeteria, gymnasium, pool, and stores comprised of a pharmacy, supplement store, prosthetic-fittings spaces and fitness-equipment store (reference figure 85). Their placement within the building's design is based upon the specific needs that each space requires in terms of daylight, natural ventilation, views or exterior access. Recreational therapy services will also be situated on the ground floor because it is important for this profession to have exterior access in order to coordinate group-exercise sessions, sporting events and other outdoor activities.

The ground floor's organization and circulation revolves around an open atrium space that acts as a large social area for the building. The main entrance to the building is located on the South facade which is directly accessible from the parking lot. Visitors are guided into the building by wooden floors that continue through the building as the main way-finding system. A large circulation ramp cuts through the atrium, exposing the vertical movement of the facility's members as they circulate the building. The gymnasium, pool, cafeteria, and recreational therapy department are located around the atrium's edges, which create opportunities for brief social interactions among patients and community members before or after their activity session. By containing the more public therapy programs on the ground floor, it provides patients with social activity while still maintaining adequate privacy by not overexposing them to the public. Designing the facility in this way ensures patients do not have to mingle with community members if they are not yet comfortable.

The exterior green space immediately surrounding the facility will be landscaped to accommodate outside therapy sessions. Exits on the West and North facades of the building give staff, visitors and patients direct access to the green spaces from the building. Therapists and patients will be able to walk around using asphalt trails while benefitting from fresh air and a change of environment. Additionally, benches throughout the landscape will allow both

patients to rest during their walks, and members of the community to enjoy the area while visiting the centre. By adapting the landscape for physical therapy benefits and multi-use activities, members of the rehabilitation consequently transform the green spaces into another “room” for the facility, thus providing the centre with a natural space essential for healing. In creating a strong connection between the building’s interior activities and exterior green spaces, both patients and the rehabilitation centre are grounded within the community.

SITE PLAN
FIGURE 85

ENDNOTES

CHAPTER 3

1. “A Newcomer’s Guide” http://www.halifax.ca/newcomers/Documents/NewcomersGuide_July2011.pdf (viewed on November 17, 2014)
2. “A Newcomer’s Guide” http://www.halifax.ca/newcomers/Documents/NewcomersGuide_July2011.pdf (viewed on November 17, 2014)
3. “Dartmouth” <http://www.thecanadianencyclopedia.ca/en/article/dartmouth/> (viewed on November 17, 2014)
4. “Historic Dartmouth: A Walking Tour” http://downtowndartmouth.ca/images/uploads/DDBC_Final_LowRes_Revised.pdf (viewed on November 17, 2014)
5. “Historic Dartmouth: A Walking Tour” http://downtowndartmouth.ca/images/uploads/DDBC_Final_LowRes_Revised.pdf (viewed on November 17, 2014)
6. “Historic Dartmouth: A Walking Tour” http://downtowndartmouth.ca/images/uploads/DDBC_Final_LowRes_Revised.pdf (viewed on November 17, 2014)
7. “Dartmouth” <http://www.thecanadianencyclopedia.ca/en/article/dartmouth/> (viewed on November 17, 2014)
8. “City planners see big future for Penhorn Mall site” <http://thechronicleherald.ca/business/35214-city-planners-see-big-future-penhorn-mall-site> (viewed on November 5, 2014).
9. “Dartmouth General gets \$7M to move ahead with expansion” <http://www.cbc.ca/news/canada/nova-scotia/dartmouth-general-gets-7m-to-move-ahead-with-expansion-1.2642960>
10. “Preparing for renovations at Dartmouth General Hospital” <http://www.cdha.nshealth.ca/media-centre/news/preparing-renovations-dartmouth-general-hospital>
11. “Preparing for renovations at Dartmouth General Hospital” <http://www.cdha.nshealth.ca/media-centre/news/preparing-renovations-dartmouth-general-hospital>
12. “Dartmouth General gets \$7M to move ahead with expansion” <http://www.cbc.ca/news/canada/nova-scotia/dartmouth-general-gets-7m-to-move-ahead-with-expansion-1.2642960>
13. Sternberg, 138.
14. Seamon, 2.

CHAPTER 4 : CONCLUSION

Physical rehabilitation is a fundamental form of care for disabled individuals because it enables them to regain independence through relearning basic functions. As previously stated through statistics, the number of disabilities is going to increase in tandem with the country's aging population, which indicates the need for good rehabilitation facilities. As such, it is essential that architectural design addresses how these environments can have a positive impact on patients' recovery. This proposal began by examining the relationship between the body and architecture in order to comprehend how movement heightens patients' sensorial experience within health environments. By applying theories of healing spaces to health facilities, patients are provided with comfortable and soothing environments which directly impact their emotional state. By adding human movement within these spaces, patients' further increase their sensorial experience while improving physical issues, resulting in more health benefits. Therefore, in order to create good rehabilitation centres, architects must reflect these theories into their designs.

While the current practice of physical therapy is typically done in static environments, its application to the circulation spaces of a building offers beneficial qualities to patients and therapists. As shown through the illustrative

examples, rehabilitation facilities are beginning to recognize the importance of encouraging physical activity through design. In doing so, these environments promote the positive effects of exercise on patients' overall health and consequently encourage them to participate in this active healing process. By removing the walls surrounding physical therapy and moving the practice to the hallways, patients and staff members will participate in more invigorating sessions as they experience the entirety of their facility through movement.

The design of the dynamic therapy spaces enables patients to circulate from one space to the next as a circuit, progressively improving their physical conditions. By placing them within the circulation spaces, patients are able to physically engage with their built environment through movement and receive the beneficial exercise physical therapy provides. More importantly, patients are able to gauge their improvement in relation to their spatial position. In other words, patients are able to visualize their progress based on their ability to complete the circuits. This is hard to accomplish when physical therapy is practiced continuously in one space. Therefore, incorporating dynamic spaces within the hallways of rehabilitation facilities will not only promote exercise, but, it will also intensify the way patients view, interact and experience their built environments during physical recovery.

LIST OF FIGURES

[INTRODUCTION]

Figure 1: modified graph from *Activity-limiting Injuries, 2009* - <http://www.statcan.gc.ca/pub/82-625-x/2010002/article/11272-eng.htm>. (accessed March 2015)

Figure 2: modified graph, *Activity-limiting Injuries, 2009* - <http://www.statcan.gc.ca/pub/82-625-x/2010002/article/11272-eng.htm>. (accessed March 2015)

[CHAPTER 1]

Figure 3: Photograph, Villa Eolia. Kenda, Barbara. *Aeolian Winds and the Spirit in Renaissance Architecture*. Academia Eolia Revisited. London: Routledge, 2006, 5.

Figure 4: Photograph, Villa Eolia wind tunnels. Kenda, Barbara. *Aeolian Winds and the Spirit in Renaissance Architecture*. Academia Eolia Revisited. London: Routledge, 2006, 7.

[CHAPTER 2]

Figure 5: Photograph, Various Equipment. <<http://www.clinton-ind.com/products/physical-therapy-equipment>> (accessed Dec 2014).

Figure 6: Photograph, Bridgepoint Active Healthcare, taken by O. Ferguson-Losier, 2014.

Figure 7: Map, Bridgepoint's Location, Cheryl Atkinson's report *Architectural Analysis Report for the POE of Bridgepoint Active Healthcare*, 2014. 20.

Figure 8+9: Photographs, Bridgepoint's physiotherapy rooms, taken by O. Ferguson-Losier, 2014.

Figure 10: Photographs, Bridgepoint's circulation spaces, taken by O. Ferguson-Losier, 2014

Figure 11: Photograph + floor plans, Groot Klimmendaal, < <http://www.archdaily.com/126290/rehabilitation-centre-groot-klimmendaal-koen-van-velsen/>> (accessed March 2015).

Figures 12: Photographs, Groot Klimmendaal Interior, <http://www.dearchitect.nl/binaries/content/gallery/architect/projecten/2010/09/Arnhem+Koen+van+Velsen+Revalidatiecentrum+Groot+Klimmendaal/interieur/klimmendaal022.JPG/klimmendaal022.JPG/architectimage%3Aextralargethumbnail>, <http://www.dearchitect.nl/projecten/2010/09/Arnhem+Koen+van+Velsen+Revalidatiecentrum+Groot+Klimmendaal/> (accessed Jan 2015).

Figures 13: Photographs, Groot Klimmendaal Interior, <http://www.dearchitect.nl/projecten/2010/09/Arnhem+Koen+van+Velsen+Revalidatiecentrum+Groot+Klimmendaal/> (accessed Jan 2015)

Figures 14: Photographs, Groot Klimmendaal Interior,

<http://www.dearchitect.nl/projecten/2010/09/Arnhem+Koen+van+Velsen+Revalidatiecentrum+Groot+Klimmendaal/> (accessed Jan 2015)

Figures 15: Photographs, Groot Klimmendaal Interior, <http://www.dearchitect.nl/projecten/2010/09/Arnhem+Koen+van+Velsen+Revalidatiecentrum+Groot+Klimmendaal/> (accessed Jan 2015)

Figure 16: Modified handrail drawing - google images <www.asiwallprotection.com/files/1653804/page/handrail.jpg>

Figure 17: Photograph, Bridgepoint exterior staircase, taken by O. Ferguson-Losier, 2014

Figure 18: Photograph, Woy Woy North Facade, <<http://www.archdaily.com/551038/woy-woy-rehabilitation-unit-woods-bagot/>> (accessed Dec 2014).

Figure 19: Photograph, Woy Woy North entry, <<http://www.archdaily.com/551038/woy-woy-rehabilitation-unit-woods-bagot/>> (accessed Dec 2014).

Figure 20: Photograph, Woy Woy Rehabilitation floor plan, <<http://www.archdaily.com/551038/woy-woy-rehabilitation-unit-woods-bagot/>> (accessed Dec 2014).

Figure 21: Photograph, Woy Woy interior view, <<http://www.archdaily.com/551038/woy-woy-rehabilitation-unit-woods-bagot/>>

rehabilitation-unit-woods-bagot/> (accessed Dec 2014).

Figure 22: Photograph, Woy Woy Rehabilitation walking circuit, <<http://www.archdaily.com/551038/woy-woy-rehabilitation-unit-woods-bagot/>> (accessed Dec 2014).

Figure 23: Photograph, the Canterbury Labyrinth in Kent, UK, <http://www.labyrinthbuilders.co.uk/our_portfolio/canterbury_labyrinth.html> (accessed Dec 2014).

Figure 24: Photograph, Tai-Chi, <<http://www.lifehack.org/>> (accessed Feb 2015).

Figure 25: Photograph, way-finding system in Ottawa General Hospital taken by O. Ferguson-Losier, 2014.

Figure 26: Photograph, Casselden Basement Cycling Facility, Melbourne, Australia <<http://www.theloop.com.au/Mize/project/77925>> (accessed March 2015)

Figure 27: Photograph, Laban Dance Centre exterior facade, <<http://ad009cdnb.archdaily.net/wp-content/uploads/2011/07/1309967596-courteys-of-flickr-cc-license-1000x750.jpg>> (accessed Dec 2014).

Figure 28: Photograph, Laban Dance Centre, main atrium space, <http://www.auro.com.hk/wir_ueber_uns/referenzobjekte/weltweit/bilder_referenzen_welt_grossbritannien/grossbritannien_laban_center_2.jpg> (accessed Jan 2015).

Figure 29: Photograph, Laban Dance Centre studio,

<https://c2.staticflickr.com/6/5130/5275214268_41f1827000_z.jpg> (accessed March 2015).

Figure 30: Photograph, Laban Dance Centre hallway, <<http://detail-online.com/inspiration/labancentre-in->> (accessed Dec 2014).

Figure 31: Photograph, Laban Dance Centre, main atrium space, <<https://doyouspeakarchitecture.files.wordpress.com/2009/02/labancentreinterior.jpg>> (accessed Dec 2014).

[CHAPTER 3]

Figure 32: Base map from google maps "Dartmouth, Nova Scotia"

Figure 33: Photograph, Dartmouth Skyline <<http://segaert.zenfolio.com/img/s8/v10/p794441489-5.jpg>> (accessed Nov 2014).

Figure 34: Photograph, McDonald Bridge <<http://www.ns.dailybusinessbuzz.ca/Provincial-News/2011-01-27/article-2176471/NS%3A-Halifax-bridge-tolls-going-up-to-one-dollar/1>> (accessed March 2015).

Figure 35: Photograph, Dartmouth's highway circulation <screen shot from google maps>

Figure 36: Photograph, Penhorn Plaza, taken by O. Ferguson-Losier, 2014

Figure 37: Photograph, Penhorn lot, taken by O. Ferguson-Losier, 2014

Figure 38: Photograph, Penhorn lot, taken by O. Ferguson-Losier, 2014

Figure 39: Photograph, Penhorn lot, taken by O. Ferguson-Losier, 2014

Figure 40: Photograph, Penhorn lot, taken by O. Ferguson-Losier, 2014

Figure 41: Photograph, Penhorn lot, taken by O. Ferguson-Losier, 2014

Figure 42: Photograph, Penhorn lot, taken by O. Ferguson-Losier, 2014

Figure 43: Photograph, Penhorn lot from highway 107, taken by O. Ferguson-Losier, 2014

Figure 44: Base map taken from Bing.com, modified by O. Ferguson-Losier

Figure 45: Base map taken from Google Maps, modified by O. Ferguson-Losier

Figure 46: Base map taken from Google Maps, modified by O. Ferguson-Losier

Figure 47A + 47B: Base map taken from Google Maps, modified by O. Ferguson-Losier

Figure 48: Base map taken from Google Maps, modified by O. Ferguson-Losier

Figure 49: Base map taken from Google Maps, modified by O. Ferguson-Losier

Figure 50: Sketch by O. Ferguson-Losier, 2014

Figure 51: Sketch by O. Ferguson-Losier, 2014

Figure 52: Sketch by O. Ferguson-Losier, 2014

Figure 53: Photograph, Dartmouth General <<http://www.cbc.ca/gfx/images/news/photos/2012/04/04/hins-dartmouth-general-6col.jpg>> (accessed Nov 2014)

Figure 54: Photograph, Nova Scotia Rehabilitation Centre, <http://www.cdha.nshealth.ca/system/files/imagecache/colorbox_large/Rehab_Photo9_0.JPG> (accessed Sept, 2014)

Figure 55: Base image taken from Bing.com, modified by O. Ferguson-Losier

Figure 56: Sketch by O. Ferguson-Losier

Figure 57: Programmatic Concept by O. Ferguson-Losier

Figure 58: Massing strategy by O. Ferguson-Losier

Figure 59: Programmatic Diagram by O. Ferguson-Losier

Figure 60: Circuit Diagram by O. Ferguson-Losier

Figure 61a-e: Section through main circulation spaces by O. Ferguson-Losier

Figure 62: Development sketches dynamic therapy spaces by O. Ferguson-Losier

Figure 63: Second floor roof terrace plan by O. Ferguson-Losier

Figure 64: Second floor plan by O. Ferguson-Losier

Figure 65a-e: Section through entire dynamic therapy spaces by O. Ferguson-Losier

Figure 66: Dynamic therapy space 1, floor plan by O. Ferguson-Losier

Figure 67: Dynamic therapy space 1, interior elevation A by O. Ferguson-Losier

Figure 68: Dynamic therapy space 1, section B by O. Ferguson-Losier

Figure 69: Dynamic therapy space 1, perspective render by O. Ferguson-Losier

Figure 70: First floor plan by O. Ferguson-Losier

Figure 71: Dynamic therapy space 2, floor plan by O. Ferguson-Losier

Figure 72: Dynamic therapy space 2, section C by O. Ferguson-Losier

Figure 73: Dynamic therapy space 2, interior elevation D by O. Ferguson-Losier

Figure 74: Dynamic therapy space 2, perspective render by O. Ferguson-Losier

Figure 75: Dynamic therapy space 3, various use for wall bar system by O. Ferguson-Losier

Figure 76: Dynamic therapy space 3, floor plan by O. Ferguson-Losier

Figure 77: Dynamic therapy space 3, section F + interior elevation E by O. Ferguson-Losier

Figure 78: Dynamic therapy space 3, seating detail by O. Ferguson-Losier

Figure 79: Dynamic therapy space 3, perspective render by O. Ferguson-Losier

Figure 80: Dynamic therapy space 4, floor plan by O. Ferguson-Losier

Figure 81: Dynamic therapy space 5, floor plan by O. Ferguson-Losier

Figure 82: Dynamic therapy space 5, interior elevation G by O. Ferguson-Losier

Figure 83: Dynamic therapy space 5, section H by O. Ferguson-Losier

Figure 84: Dynamic therapy space 5, perspective render by O. Ferguson-Losier

Figure 85: Site plan by O. Ferguson-Losier

Figure 86: Ground floor plan by O. Ferguson-Losier

BIBLIOGRAPHY

[BOOKS]

Gadamer, Hans-Georg. *The Enigma of Health: The Art of Healing in a Scientific Age*. Stanford: Stanford UP, 1996.

Seamon, David. "Merleau-Ponty, Perception, and Environmental Embodiment: Implications for Architectural and Environmental Studies." *Intertwinings: Interdisciplinary Encounters with Merleau-Ponty*. Albany: State University of New York, 2008.

Dodds, George, Robert Tavernor, and Joseph Rykwert. *Body and Building: Essays on the Changing Relation of Body and Architecture*. Cambridge, MA: MIT, 2002.

Mason, Duncan. "Exercise in Rehabilitation" *Tidy's Physiotherapy*. Edinburgh: Churchill Livingstone/Elsevier, 2008. 272-303.

Gesler, Wilbert M. *Healing Places*. Lanham, MD: Rowman & Littlefield, 2003.

Sternberg, Esther M. *Healing Spaces: The Science of Place and Well-being*. Cambridge, MA: Belknap of Harvard UP, 2009.

Sternberg, Esther M. *The Balance Within: The Science Connecting Health and Emotions*. New York: W.H. Freeman, 2000.

Arnheim, Rudolf. *The Dynamics of Architectural Form*. Berkeley: University of California, 1977.

Pallasmaa, Juhani. *The Eyes of the Skin: Architecture and the Senses*. Chichester: Wiley-Academy, 2005.

Zumthor, Peter. *Atmospheres: Architectural Environments, Surrounding Objects*. Basel: Birkhäuser, 2006.

Zardini, Mirko, Giovanna Borasi, and Margaret Campbell. *Imperfect Health: The Medicalization of Architecture*. Montréal: Canadian Centre for Architecture, 2012.

Lieberman, Daniel. *The Story of the Human Body: Evolution, Health, and Disease*. Knopf Doubleday Publishing Group, 2013.

Eberhard, John P. *Brain Landscape the Coexistence of Neuroscience and Architecture*. Oxford: Oxford UP, 2009.

Frontera, Walter R., David M. Slovik, and David M. Dawson. *Exercise in Rehabilitation Medicine*. Champaign, IL: Human Kinetics, 2006.

Armstrong, Pat, and Hugh Armstrong. *Wasting Away: The Undermining of Canada's Health Care System*. Don Mills, Ont.: Oxford UP, 2010.

Kenda, Barbara. *Aeolian Winds and the Spirit in Renaissance Architecture*. Academia Eolia Revisited. London: Routledge, 2006.

[ARTICLES]

Kerr, J., D. Rosenberg, and L. Frank. "*The Role of the Built Environment in Healthy Aging: Community Design, Physical Activity, and Health among Older Adults.*" *Journal of Planning Literature* 27.1 (2012): 43-60.

Hale, Jonathan. "*Critical phenomenology: architecture and embodiment*" *Architecture and Ideas*. (2013): 18-37

Cheryl, Atkinson. "*Architectural Analysis Report for the POE of Bridgepoint Active Healthcare*" June 16, 2014.

Rastall, Maggie, et al. "*An Investigation into Younger and Older Adults' Memory for Physiotherapy Exercises.*" *Physiotherapy* 85.3 (1999): 122-28.

Fornara, Ferdinando, Marino Bonaiuto, and Mirilia Bonnes. "*Perceived Hospital Environment Quality Indicators: A Study of Orthopaedic Units.*" *Journal of Environmental Psychology* 26.4 (2006): 321-34.

Morris, Meg E. "*Movement Disorders in People with Parkinson Disease : A Model for Physical Therapy.*" *Physical Therapy Journal* 80 (2000): 578-597.

Rand, Scott E. et al. "*The Physical Therapy Prescription.*" *American Family Physicians*. Volume 76. (2007): 11.

Zimring, Craig, et al., "*Influences of Building Design and Site Design on Physical Activity : Research and Intervention Opportunities.*" *American Journal of Preventative Medicine*. Volume 28, Issue 2, Supplement 2. (2005): 186–193.

Ward, Anthony. "*Physical And Rehabilitation Medicine In Europe.*" *Journal of Rehabilitation Medicine* 38.2. (2006): 81-86.

Foque, Richard, and Martine Lammineur. "*Designing for Patients: A Strategy for Introducing Human Scale in Hospital Design.*" *Design Studies*. 16.1 (1995): 29-49.

Naylor, Mary, and Stacen A. Keating. "*Transitional Care.*" *Journal of Social Work Education*. 44.0 (2008): 65-73. Web

Quinn, Charlene C., et al. "*Short-Stay Nursing Home Rehabilitation Patients: Transitional Care Problems Pose Research Challenges.*" *Journal of the American Geriatrics Society*. 56.10 (2008): 1940-945.

Hollmann, Wildor, Heiko K. Strüder, Christos V.m. Tagarakis, and Gerard King. "*Physical Activity and the Elderly.*" *European Journal of Cardiovascular Prevention & Rehabilitation*. 14.6 (2007): 730-39.

Quaney, B. M., L. A. Boyd, J. M. McDowd, L. H. Zahner, Jianghua He, M. S. Mayo, and R. F. Macko. "*Aerobic Exercise Improves Cognition and Motor Function Poststroke.*" *Neurorehabilitation and Neural Repair*. 23.9 (2009): 879-85.