An Investigation of the Main Components of Physical and Occupational Therapy and Therapeutic Treatments for Children with Cerebral Palsy

An Honors Thesis (HONR 499)

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Abstract

Physical and occupational therapy are both up-and-coming allied health fields within the medical profession and play an integral role in bettering the quality of lives for all types of conditions and populations. Without these therapeutic disciplines, hope for improvement and for a fulfilling lifestyle for those with disabilities would be lost. However, given the importance of both physical and occupational therapy in the recovery process for many people, it is also vital that parents, families, patients, along with current and aspiring therapists, like myself, understand the background and roles of each therapeutic practice in order to make more educated decisions on treatment. Further, because the condition of cerebral palsy is one of the most commonly treated pediatric issues by both physical and occupational therapists, being more knowledgeable about the definition, treatment options, and prognosis of the condition is quite necessary to give the best of care. As an aspiring pediatric physical therapist, I felt compelled to complete a thesis analyzing the specific components of both physical and occupational therapy, the definition and types of cerebral palsy, some general therapeutic treatment options, and the prognosis for the condition in order to better educate myself and other future therapists, along with the general population and families of disabled children.

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Author's Statement/Introduction

As an aspiring pediatric physical therapist, I felt that it was highly necessary to pour my passion for working with children into this research project. Delving into this subject would not only enable me to become a more well-rounded, understanding, and empathetic future therapist but would also allow parents of disabled children, along with the general public, to gain a better understanding of what the therapists' roles are and what this common condition of cerebral palsy is in actuality. Because I wanted to seek the most current, accurate information available while also maintaining a non-biased view on the subject, I tried my best to consult well-established organizations such as the American Physical Therapy Association (APTA), the American Occupational Therapy Association (AOTA), the Cerebral Palsy Foundation, The Federal Bureau of Labor and Statistics, and other current online magazine publications within the fields of physical and occupational therapy. Even though some of the sources I used were published in the 1990s, the information found in these sources, I felt, were still very pertinent science and diagnosis-related data that fit very well and accurately into my project. I also tried to incorporate a wide variety of sources such as online magazine articles, journal articles, articles from well-established organizations, and other paper sources such as scholarly or research based books about cerebral palsy or therapy techniques and treatment. One change that I had to make as I began the research process was that I had to broaden my research from "cerebral palsy treatments in infants" to "cerebral palsy treatments in children." As I began researching more and began getting deeper into the process, I realized that most of the information available was not infant-specific and had more to do with children of a variety of ages, which prompted me to make the small switch to broaden my project base. Also, one major learning moment during the creation of this thesis was when I realized that my initial plan of researching "physical therapy treatments for cerebral palsy in children" and "occupational therapy treatments for cerebral palsy in children" was not as clear cut as I thought it would be. It turned out that there is much overlap in treatment approaches with physical and occupational therapy, and that all of the treatment options that I had researched were not geared toward one therapeutic discipline more than the other. I was not aware of how much overlap in therapy interventions there is between physical and occupational therapy, despite their own distinct specialty areas and differences. Therefore, because of this learning experience, I instead, discussed six different general treatment options for children with cerebral palsy, and talked about how each treatment option could be completed by either a physical or occupational therapist. I have thoroughly enjoyed completing this thesis, as it has been an once-in-a-lifetime learning experience for me. I hope that with this additional knowledge, I will one day learn to be a more equipped and understanding physical therapist. My biggest hope of all, however, is that the general public and families with disabled children will have an improved knowledge of cerebral palsy and therefore be aware that treatment from physical and occupational therapists is readily available for them.

An Investigation of the Main Components of Physical and Occupational Therapy and Therapeutic Treatments for Children with Cerebral Palsy

Introduction

As Scott Hamilton once said, "The only disability in life is a bad attitude" (BrainyQuote, n.d., para. 1). Through my research about the specific therapeutic disciplines that improve quality of life for those with disabilities (also known as physical and occupational therapy) and after reading patient stories about improvement from therapy, I have found that resiliency along with a strong, intrinsic motivation towards recovery within both the patient and the caregiving therapist(s) is key to true success in improving quality of life. Disabilities do not make any individual less important; rather, they are a part of who that individual is as a person and in turn need to be addressed with the proper care (whether this be physical or occupational therapy or both) to enable these individuals the best chance at living a fulfilling life. Both physical and occupational therapy offer means of improving quality of life; however, as a parent of a child with a disability and/or as the therapist of the disabled child, being more knowledgeable about the differences and similarities and/or overlap in both disciplines is important in making educated decisions regarding treatment needs for the patient. Therefore, because I have a strong passion for working with children in the realm of physical therapy and will hopefully become a future pediatric physical therapist, I feel that it is necessary to gain a better understanding of the differences between physical and occupational therapy, in general. Also, it is important to explore the definition, various treatment options, and prognosis of a condition or disability that many children possess and are born with, which is that of cerebral palsy (Miller & Bachrach, 2006). Although physical therapy and occupational therapy do have differences in their emphasis of skills to treat patients and education required for each therapeutic practice, (physical therapists

focus on improving gross motor skills on the lower extremities, while occupational therapists focus on increasing fine motor skill abilities on the upper extremities) much overlap exists in their treatments. Treatment overlap exists especially in that of the common condition of cerebral palsy in children, which is defined as "a group of conditions characterized by abnormalities of movement and posture…" (Kliegman, Greenbaum & Lye, 2004, p. 545). Further, the general treatments for children with cerebral palsy researched in this thesis, such as constraint-induced movement therapy (CIMT), proprioceptive neuromuscular facilitation (PNF), hippo-therapy, neurodevelopmental treatment (NDT), sensory integration (SI), and hydrotherapy are not meant for either physical or occupational therapy specifically and can be practiced by both therapeutic disciplines (Levitt, 2010; American Hippotherapy Association, n.d.; Le Postollec, 2000; Fleet et al., 2014; Miller & Bachrach, 2006; Dormans & Pellegrino, 1998; University of California, San Diego, 2011; University of St. Catherine, 2014; Scifers, 2004). It was also found that the prognosis for children with cerebral palsy is fairly promising if therapy intervention is started as soon as possible (Dormans & Pellegrino, 1998; Levitt, 2010).

In order to fully understand the similarities and differences in duties and responsibilities for both physical and occupational therapy practice, both types of therapy must be defined and explored individually. Both physical and occupational therapy have the ultimate, common goal of improving the quality of living of patients and therefore bettering the future of many individuals for years to come. However, both professions of the rehabilitation field have many differences, as well, regarding their approaches to certain conditions and different populations of individuals. Because the field of rehabilitation assists such a wide range of populations, and because there are many individuals looking to become professionals within the field, the differences and roles of physical and occupational therapy must be adequately understood and

explored. Understanding the therapies will allow individuals to either fully benefit from the therapy or to act according to the correct set of protocols confined to either physical or occupational therapy. Therefore, beginning with physical therapy, later exploring occupational therapy, and then comparing and contrasting the aspects of each, it is critical to fully comprehend the designated roles of each.

What is Physical Therapy?

According to the American Physical Therapy Association (APTA) (2011), physical therapists are defined as "health care professionals who maintain, restore, and improve movement, activity, and health enabling an individual to have optimal functioning and quality of life, while ensuring patient safety and applying evidence to provide efficient and effective care" (p. 9). The American Physical Therapy Association's (2015b) vision statement that embodies the purpose of the field is currently "transforming society by optimizing movement to improve the human experience" (para. 10). Therefore, physical therapists exist in order to better the lives of others by putting an emphasis on the enhancement of physical mobility as a whole and therefore the lifestyle as a whole (APTA, 2011). On a side note, it is important to note that APTA (2015b) asserts the terms "physical therapist", "physiotherapist" and "physical therapy" and "physiotherapy" have the same exact meaning (para. 5). Further, APTA (2011) goes on to say that physical therapists "evaluate, diagnose, and manage individuals of all ages who have impairments, activity limitations, and participation restrictions" (p. 9). APTA (2011) shows that physical therapists go about determining a patient-care plan by following the systematic order of "examination, evaluation, diagnosis, prognosis, intervention, and outcome assessment" (p. 10). Physical therapy intervention can occur in many realms, and has a main focus of improving abnormalities of the cardiovascular, pulmonary, integumentary, musculoskeletal, and

neurological systems (APTA, 2011). Physical therapists also have a critically important role in the prevention of symptoms, as APTA (2011) asserts that through early intervention and certain modalities, physical therapists have the ability to prevent the progression of severity of certain conditions in some populations that are deemed "susceptible" or "potentially susceptible" to these conditions (p. 9). According to APTA (2015c), the promotion of overall physical health and prevention of future injuries and inability to ambulate through strengthening and therapeutic exercises is thus another main component of physical therapy practice. Thus, even though diagnosing, and developing plans for strengthening and improvement of motion are part of the physical therapist's main role, prevention of the onset and/or increase in severity of certain conditions proves to be just as important as treating conditions themselves (APTA, 2011).

Further, physical therapists can also provide care in a variety of settings and to a wide variety of populations and age groups as they are in high demand and will continue to be in demand as nearly 800,000 individuals receive physical therapy on a daily basis (APTA, 2015c; APTA, 2015b). APTA (2015c) presents a list of certain areas in which physical therapists can be found in, which include schools, both inpatient and outpatient facilities, acute care, nursing homes, fitness and training locations, research institutes, home health, hospice, and other offices or businesses. In addition, regarding the high demand for physical therapists, the Bureau of Labor Statistics (2015f) estimates that the growth rate of the profession of physical therapy from the years of 2014 to 2024 is at a "much faster than average" (para. 5) rate of 34% growth, as the average growth rate for professions in general is 7% (para. 5). The Bureau of Labor Statistics (2015f) further suggests that physical therapists are going to be in high demand due to the aging "baby boomers" (para. 5) and because of the physical distress caused by the diabetes and obesity epidemic occurring in the United States (para. 5). Lastly, to further illustrate the growing

importance of the field of physical therapy, APTA (2015a) lists on their website that Forbes's magazine (2014 edition) has physical therapy nominated as one of the "top 10" careers that is and will continue to be in highest need, while CNN also stated that physical therapy is one of the "top 10" most rapidly expanding professions in the year of 2012 (para. 12). Therefore, it is purely evident that the field of physical therapy is actively expanding and will continue to do so even more as time goes on. However, because of the quickly growing nature of the field itself, the growth and expansion of physical therapy education is equally as important as their practice.

With respect to the education of board-certified physical therapists, according to the Bureau of Labor Statistics (2015e), in order to become a physical therapist, one must earn a Doctor of Physical Therapy (DPT) degree as well as become board certified. APTA (2011) effectively paints a historical picture of the evolution of physical therapy education by stating that the degree requirement for physical therapists "has evolved from early training programs for reconstruction aides to its current status as the doctor of physical therapy (DPT) degree" (p. 14) over about 100 years or so (p. 14). To further portray this evolvement of the field, APTA (2011) brings in APTA's "Vision 2020" that came out in the year of 2000 and dictates that "by 2020, physical therapy will be provided by physical therapists who are doctors of physical therapy" (p. 15). The Bureau of Labor Statistics (2015e) reports that as of 2015 there were over 200 physical therapy schools that were granted accreditation status by the "Commission on Accreditation in Physical Therapy Education" (also known as CAPTE) (para. 2). According to Commission on Accreditation in Physical Therapy Education (CAPTE) (2015), a physical therapist student must attend a CAPTE-accredited program to be able to take the licensure or board exam to become a licensed physical therapist. Regarding the licensing requirements, The Bureau of Labor Statistics (2015e) also reports that all states in the United States of America dictate physical therapists to

take the licensing exam, which is provided by the "Federation of State Boards of Physical Therapy" (para. 6); in addition, in order to maintain licensure, all physical therapists must engage in a certain amount of continuing education credits every so often as well (para. 6). If the physical therapist desires to advance his or her education even further after obtaining licensure, he or she is able to become officially certified in nearly eight differing disciplines from the "American Board of Physical Therapy Specialties" (The Bureau of Labor Statistics, 2015e, para. 7). However, the achievement of the specialty is not easy (The Bureau of Labor Statistics, 2015e). According to the Bureau of Labor and Statistics (2015e), the therapist must incur over 2,000 hours of experience in the specialty itself or finish a residency that has been granted full accreditation by the American Physical Therapy Association (APTA). Further, most physical therapy programs now last for about three years, need the completion of a bachelor's degree, along with many pre-required course work consisting of physics, anatomy, biology, chemistry, and more (The Bureau of Labor Statistics, 2015e). Additionally, after the completion of a bachelor's degree, a prospective student must apply to physical therapy school via the "Physical Therapist Centralized Application Service" (also known as PTCAS) (The Bureau of Labor Statistics, 2015e, para. 3). Thus, the path to becoming a physical therapist requires much hard work and passion to fuel the individual's desire to continue working towards the goal of being part of a profession that changes people's lives for the better. This evolving path of physical therapist education also reflects the changes and growth of the field of physiotherapy itself over time from its inception a long time ago.

The foundational techniques of physical therapy, such as the use of differing temperatures on the skin to loosen tissue, along with certain massages and various exercise interventions, can be dated back as far as when Hippocrates, or the Greek Father of Medicine,

was actively inventing the world of medicine (APTA, 2011). However, physical therapy did not truly get its initiation into American culture until about the year of 1916, or when polio became very common and muscle research needed to be done in order to find effective interventions for the condition (APTA, 2011). Further, the need for therapy was widened even more extensively when wounded soldiers from World War I needed to be rehabilitated, starting around the year of 1917 (APTA, 2011). The APTA (2011) also explains that as more and more soldiers needed to be rehabilitated to return to war, around 15 or so therapy educational schools were founded in 1917 by the "Army Medical Department/Division of Special Hospitals and Physical Reconstruction" (p. 6) as a way to provide proper rehab for soldiers (p. 6). The beginning of these schooling programs is officially defined as the birth of the profession of physical therapy (APTA, 2011). World War Two in the 1940s also fueled the need for physical therapists, as many soldiers came back to the United States with a variety of serious injuries that needed the assistance of physical therapists (APTA, 2011). In addition, according to APTA (2011), a legislative act called the "Hill Burton Act" (p. 6) was passed through in the year of 1946 which enabled the building of many more hospitals throughout the nation, therefore providing physical therapists with an increased job opportunity (p. 6).

Further, the American Physical Therapy Association was founded also in the 1920s, which responded to the increased demand of physical therapy services from war veterans and from polio victims by expanding the profession through creating more educational programs, especially at already established medical schools and other colleges (APTA, 2011). According to APTA (2011), "by 1950 there were 31 accredited schools, 19 offering bachelor's degree programs and 8 offering post-baccalaureate certification, and the length of the programs increased as a result of developments in rehabilitation and medicine" (p. 6). On the other hand,

the success of the Salk vaccine, created in 1940s, led to the complete obliteration of the polio epidemic around the beginning of the 1960s, further allowing physical therapists to focus their attention on other individuals with other conditions (APTA, 2011). Thus, all because of the Salk vaccine's success, another growth of knowledge and advancement in practice in the profession of physical therapy was able to occur (APTA, 2011).

Finally, with respect to the history of physiotherapy, from the 1950s on to the beginning of the new millennium of 2000, there were a few key events that occurred that in turn led to the further development and advancement in interventions and professionalism within the field (APTA, 2011). APTA (2011) states that during the year of 1955, the "Self-Employed Section" became an aspect of the APTA as a response to the growth in the private sector of therapy, while in 1957 the "Physical Therapy Fund" was created, which allowed for the funding of research and the expansion of physical therapy education (p. 7). Additionally, APTA (2011) explains that close to 45 states in the United States required state licensure in 1959, and the first board licensure exam was created in 1954 by the "Professional Examination Service of the American Public Health Association" (p. 7) and APTA to ensure the proficiency and capabilities of the individual regarding the practices of physical therapy (p. 7). Further, APTA (2011) discusses how constant technological improvements in the field of medicine developed through the next 50 years, while the "Individuals with Disabilities Education Act" (also known as IDEA) (p. 7) was approved through Congress in the year of 1975, which spread the profession of physical therapy into schools for easier access to children who needed the benefits of therapy (p. 7). APTA (2011) also discusses the importance of the beginning of direct access, which basically states that an individual can receive physical therapy without a physician's referral. Now, all 50 states have some sort of form of direct access, but each state has its own regulations within this legislation

(APTA, 2016). Last but not least, the APTA (2011) suggests that as of the year of 1986, "the Federation of the State Boards of Physical Therapy" (p. 7) was created in order to ensure professionalism, credibility, and healthcare knowledge amongst future therapists (p. 7). Therefore, though there are plenty more changes throughout the history of the establishment of the profession, these main events played key roles in the advancement of physical therapy into its current professional status today. The physical therapy profession's counterpart, occupational therapy, also has developed its principles throughout the years and plays a role that is just as important in improving quality of life as physical therapy's role in doing so.

What is Occupational Therapy?

According to the American Occupational Therapy Association (AOTA) (2016), occupational therapists play a key role in "help[ing] people across the lifespan participate in the things they want and need to do through the therapeutic use of everyday activities (occupations)" (para. 2). Further, AOTA (2016) goes on to describe the therapeutic techniques that occupational therapists utilize in practice, which can "include helping children with disabilities to participate fully in school and social situations, helping people recovering from injury to regain skills, and providing supports for older adults experiencing physical and cognitive changes" (para. 2). AOTA (2016) states that occupational therapists usually begin the treatment process with an evaluation of the patient's issues and determination of goals that are set by both the therapist and the patient. The treatment occupational therapists provide consists of therapeutic activities tailored to the patient's goals in working to enhance the ways in which the patient goes about completing their everyday living occupations (AOTA, 2016). Lastly, after a certain amount of therapy sessions, occupational therapists then complete a progress report to see "if goals are being met and/or make changes to the intervention plan" (AOTA, 2016, para. 2). AOTA (2016)

asserts that the role of occupational therapists may also consist of individualized education for the patient and family, a meticulous analysis of the patients' occupational or everyday habitats (such as where he or she works, attends educational affairs, etc.), and suggestions for special "equipment and training in its use" (para. 3). Occupational therapy has a large emphasis on implementing interventions that directly involve the participation and active involvement of the patient, and therefore because the profession centers care on adaptations to the patient's lifestyle, occupational therapy is considered to be "holistic" (AOTA, 2016, para. 3). Thus, because occupational therapists work with patients on a variety of different activities from countless occupations, it would make sense that occupational therapists can be found working in many settings.

In regards to the setting where occupational therapists can be found, along with the projected outlook for the profession itself, these therapists work in a variety of locations, and there is certainly a growing demand for them as well. The Bureau of Labor Statistics (2015d) states that as of 2014, 27% of occupational therapists worked in "local, state, and private hospitals"; 24% worked in the "offices of physical, occupational and speech therapists, and audiologists"; 12% in "elementary and secondary schools; state, local, and private"; 9% in "nursing care facilities"; and 9% in "home healthcare services" (para.1). Thus, it is evident that occupational therapists are in demand in many different places throughout society. In addition, according to The Bureau of Labor Statistics (2015c), the demand for occupational therapists should increase by 27%, which is considered to be "much faster than average" (para. 5) from the ten-year time frame of 2014 to 2024 (para. 5). The Bureau of Labor Statistics (2015c) elaborates on the purpose of this growth by asserting how occupational therapy will have the potential to help "people with various illnesses and disabilities, such as Alzheimer's disease, cerebral palsy,

autism, or the loss of a limb" (para. 5). Further, because of the developing issue of obesity in the United States, occupational therapists will be needed in order to help others therapeutically cope with lasting conditions such as diabetes (The Bureau of Labor Statistics, 2015c). However, The Bureau of Labor Statistics (2015b) assures that the most opportunity will be in "acute" care and "orthopedic settings" due to high populations of elderly people needing care and living assistance (para. 5). Therefore, the apparent growth of occupational therapy as a profession reflects the demand for more therapists, which comes about through extensive education.

When it comes to education, becoming an occupational therapist requires additional education, just as becoming a physical therapist does. As of 2014, the standard degree requirement for an occupational therapist is that of a master's degree from an accredited institution (The Bureau of Labor Statistics, 2015c). Further, AOTA (2015a) states that "The Accreditation Council for Occupational Therapy Education (ACOTE®) has determined that the entry-level-degree requirement for the occupational therapist will remain at both the master's and the doctoral degree" (para. 1). The American Occupational Therapy Association (AOTA) (2015b) issued the goal to transition from the degree requirement of a master's degree to a doctorate's degree by the year of 2025 because of rapid advancements in the medical field and the field of occupational therapy itself. The Bureau of Labor Statistics (2015a) states that occupational therapists must attend an accredited program that is accredited by the "Accreditation Council for Occupational Therapy Education" (para. 6) in order to take the licensing exam (also known as the NBCOT, or the "National Board for Certification in Occupational Therapy" [para. 6]) which provides therapists with the official title "Occupational Therapist, Registered, (OTR)" (para. 7). The Bureau of Labor Statistics (2015a) states on their website that in 2014 there were over 200 accredited occupational therapy programs.

Additionally, the AOTA offers additional areas of certification, such as areas pediatrics (The Bureau of Labor Statistics, 2015a).Thus, the process of becoming an occupational therapist not only requires extensive post-graduate training, but is also similar to the process of becoming a physical therapist. On the other hand, however, before becoming an occupational therapist, it is critical to understand how the field itself started and grew from its historical roots into the field it is today.

The history of occupational therapy's inception is in fact an interesting one, and has similar beginning roots as that of physical therapy. However, according to Missouri College (2014), occupational therapy began during the "Humanist Movement" (para. 2) in the times of the 18th century Europe by a doctor named Philippe Pinel and his counterpart William Tuke when they began to notice how badly psychologically-disturbed patients were being treated at the time, as many of them were simply put into prison for long periods of time (para. 2). Missouri College (2014) states that "Pinel successfully applied this philosophy to the treatment and rehabilitation of many mentally ill patients [through his] defining [of] 'occupation' as a person's attention and energy directed toward a specific goal" (para. 2). To further develop the profession, Missouri College (2014) explains that a woman and so-called "occupational nurse" by the name of Susan Tracey at the turn of the 20th century contributed more meaning to the term "occupational therapy" (which was actually invented by the physician William Rush Dunton) in her studies and practice (para. 4). Missouri College (2014) further tells that together, Tracey, Dunton, and a few other notables collaborated in order to officially create the "National Society for the Promotion of Occupational Therapy" (para. 5) during the early 1900s, an institution that would develop into the American Occupational Therapy Association (AOTA) (para. 5). The profession of occupational therapy then grew even more rapidly once the onset of both World

Wars came into play, therefore allowing for the evolvement of an elite and distinguished profession that would later deal with other cognitive and physical issues besides those associated with being "mentally-ill" (Missouri College, 2014, para. 5).

A Brief Comparison of Physical and Occupational Therapy

Since an in-depth exploration of the occupations of both physical and occupational therapy (such as definitions of both, job outlook for both, educational requirements for both, and history of each rehabilitative technique's development) have been discussed, it is now critical to solidify the differences and similarities between both physical and occupational therapy in order to be a more well-rounded lay person and/or healthcare professional. According to St. Catherine University (2014):

> A physical therapist…treats the patient's actual impairment, while an occupational therapist…treats that impairment in action. The PT… tries to improve the impairment itself by increasing mobility, aligning bones and joints or lessening pain. The OT…helps the patient complete necessary everyday tasks with the impairment... (para. 2).

Further, the Greater Baltimore Medical Center (n.d.) explains that "physical therapists focus on the large motor groups that contribute to walking, reaching, standing, and physical activities. They work on strength, balance, range of motion and swelling as well as pain to encourage independence" (para. 2). The Greater Baltimore Medical Center (n.d.) also goes on to describe occupational therapy by stating:

> Occupational therapists help individuals achieve independence and improve one's ability to perform daily activities and self-care. For example, OT's may help a patient learn to

> dress themselves, brush their teeth or comb their hair after a stroke or illness that has severely weakened their arms (para. 1).

Additionally, Mike Le Postollec (2000) wrote an article from *ADVANCE* (a healthcare magazine) stating that "traditionally, OTs focus on ADLs and fine motor skills while PTs work on gross motor tasks and ambulation…" (para. 9). However, Le Postollec (2000) also writes that there are many similarities between both physical therapy and occupational therapy, while the differences between stem from variations "in approach and a few specific specialty areas" (para. 9). Therefore, Le Postollec (2000) argues that depending upon the severity of the patient's condition, the differing knowledge in specific therapeutic techniques between physical and occupational therapists are often utilized together to assist the patient in recovery even further, which is a concept termed "co-treatment" (para. 5) where both physical and therapists work together in treating the same individual (para. 5). Le Postellec (2000) goes on to discuss how patients with higher needs for intensive therapy, such as those with cerebral palsy, or those who have suffered a massive stroke, often benefit largely from both physical and occupational therapy as both practices have similar yet slightly different goals that improve the patient's condition in a more effective manner. Thus, both physical and occupational therapy have slight differences regarding exact treatment emphases and education; however, the skillset that each occupation utilizes can often complement and enhance the effectiveness of the other when practiced together as co-treatments for certain conditions such as cerebral palsy (Le Postollec, 2000).

Tying it Together: Physical Therapy, Occupational Therapy, and Cerebral Palsy in Children

As this exploration of the realms of practice within physical and occupational therapy continues to progress further on into development, the study of the implementation of these rehabilitative services continues to become more condensed as the focus of the proceeding section of this analysis will be upon children (any child from infancy to eighteen years of age) with cerebral palsy. To start off with a simple and condensed definition of the condition itself, according to Miller and Bachrach's (2006) *Cerebral Palsy: A Complete Guide for Caregiving, 2nd Edition*:

> Cerebral palsy is a collection of motor disorders resulting from damage to the brain that occurs before, during, or after birth. The damage to the child's brain affects the motor system, and as a result the child has poor coordination, poor balance, or abnormal movement patterns—or a combination of these characteristics (p. 3).

Because cerebral palsy is, in fact, one of the most common birth defects among children (five out of around 2,000 children are born with cerebral palsy), along with my strong interest in becoming a pediatric physical therapist in the future, I feel that studying treatment of cerebral palsy will hopefully enable me to become more a knowledgeable, understanding, and empathetic physical therapist in the future (Miller & Bachrach, 2006). Additionally, learning how both physical and occupational therapy can assist a child with a specific condition will allow for a better understanding of not only the specifications of cerebral palsy itself but also for a reinforcement of the differences in physical and occupational therapy. Therefore, before delving into the intricacies of the condition itself, it is important to be familiar with the certain clinical

aspects therapists must keep in mind when dealing with children who have cerebral palsy and their families before actual treatment can begin.

Clinical Considerations

According to Sophie Levitt's (2010) *Treatment of Cerebral Palsy and Motor Delay*, parental and therapist participation and active engagement in the affected child's rehabilitation process throughout life, also called a "person-centered" and "collaborative learning approach", is most effective in not only decreasing stress in parents but also in developing trust between the parents and therapist, which in turn allows for positive therapy outcomes in general (p. 15). Levitt (2010) asserts that the team effort of the therapist along with the parents when it comes to setting goals for the affected child results in more productive yet supportive relations between therapists and families, which then leads to "more motivation as parents and child respond positively to a therapist who appreciates their desires and their ideas for solving some of their own problems" (p. 15). Therapists all are very aware of their role in working closely with the families of the affected children, and understand the overall importance of developing a solid relationship with the family as part of their profession (Levitt, 2010). Therefore, Levitt (2010) argues that with this "collaborate learning approach"(p. 15), not only do therapists need to be aware of varying cultural customs of families, but also that they are required to offer both the patient and family the following:

> Opportunities to discover what they want to achieve; opportunities to clarify what is needed for these achievements; opportunities to recognize what they already know and can do; opportunities to find out what they still need to learn and do; participation in the

> selection and use of methods; and participation in the evaluation of progress (Levitt, 2010, p. 17).

Levitt (2010) goes on to support these foundational considerations by asserting that providing parents with these options for involvement puts them more at ease and "builds their confidence" (p. 17) as well as the opportunity for therapists and families to brainstorm and compromise ideas that both parties find effective in treating the child (p. 17). Thus, making sure to integrate parents equally and encouraging their participation in the child's therapy process is key to promoting trust development with families and ensuring the possibility of greater success in therapy for children (Levitt, 2010). Further, Levitt (2010) also affirms the effectiveness of parental engagement when by emphasizing the fact that parents learn to think more "realistically" (p. 33) about both their child's diagnosis and prognosis when they actively engage in their child's therapy (p. 33). Now that a brief overview of a successful clinical approach for family and patient care for children of cerebral palsy has been discussed, it is important to continue the detailed exploration of a cerebral palsy diagnosis.

An Introduction to Cerebral Palsy (Definition, Causes, Additional Considerations)

To reiterate the exact definition of the condition of cerebral palsy, Levitt (2010) explains the diagnosis of cerebral palsy as "the commonly used name for a group of conditions characterized by motor dysfunction due to non-progressive brain damage early in life" (p. 1). The condition is also known as one of the most prevalent conditions known to be responsible for "childhood disability" (Levitt, 2010, p. 1). According to the Cerebral Palsy Foundation (n.d.-a), the diagnosis for the condition usually occurs in the first twenty four months of the infant's time on Earth. There are many levels of functionality with cerebral palsy, as some people affected are

able to speak and ambulate well, while others may be completely reliant upon family members or an outside caregiver for their whole lifespan (Levitt, 2010). Due to the brain damage seen at birth, children with cerebral palsy experience an extent of lack of ability to control physical aspects such as "postural control, balance, and movement" (Levitt, 2010, p. 1). Levitt (2010) shows that depending upon the type of cerebral palsy the patient possesses, he or she may experience certain physical and neurological defects, such as high or low muscle tone ("hypertonicity" or "hypotonicity"), as well as "abnormal patterns of muscle activation…, absent or poor isolated movements…,abnormal postures and problems with manipulation…[and] musculoskeletal problems" (p. 1). Levitt (2010) also adds that "there are biomechanical difficulties resulting from both the neuromuscular dysfunction and musculoskeletal problems, which add to this complex picture" (p. 1). Levitt (2010) assures that even though the actual disturbances to the brain in infancy never worsen, "musculoskeletal problems may increase in late childhood and adolescence, needing physiotherapy input to minimize this" (p. 1). Further, not all children with cerebral palsy experience additional handicaps, but some may have other language, vision, and/or auditory issues depending upon the extent of how much the brain was affected at birth (Levitt, 2010). However, Levitt (2010) makes the important point that often times "normal intelligence [is] camouflaged by severe physical disability" (p. 2), while other misbehaviors stem from the child's frustrations in his or her inability to participate in certain activities due to their physical limitations (p. 2). Dormans and Pellegrino (1998) further reiterate the lack of causation between cerebral palsy and cognitive impairments in their work titled *Caring for Children With Cerebral Palsy* by explaining "although cerebral palsy is commonly associated with mental retardation, mental retardation is not part of the diagnosis of cerebral palsy" (p. 34).Therefore, it seems that there is a wide range of symptoms and areas affected

depending upon the toll the brain has taken during its damage at birth; however, in order to be able to have a certain idea of what the prognosis may be, being aware of how the abnormalities occurred or what caused them in the first place is crucial (Levitt, 2010).

To begin with, Levitt (2010) informs readers that babies born prematurely automatically have an increased probability of developing neurological issues. In their educational book titled *Pediatric Strategies in Pediatric Diagnosis and Therapy*, Kliegman, Greenbaum, and Lye (2004) address the probable causes of cerebral palsy, such as "prenatal factors such as congenital infections or malformations, perinatal factors such as hypoxia or intraventricular hemorrhage, or postnatal factors such as central nervous system (CNS) infection, trauma, or hypoxia" (p. 545). Further, Kliegman et al. (2004) presents other factors that have been found to be contributing elements towards cerebral palsy development in infants, which include "amnionitis…and maternal clotting disorders" (p. 545) present in gestation (p. 545). Before more research was completed, Kliegman et al. (2004) states that medical practitioners used to think that "difficult labor and delivery" (p. 545) was mainly responsible for the onset of the condition; it is now known, however, that problems during the pregnancy itself are usually the main contributing factors to brain defects and cerebral palsy (p. 545). Another important note that Levitt (2010) makes in her work is that the child's development may also have been stunted somewhat due to constant separation from parents because of health related issues following birth. Levitt (2010) also states that when treating a patient with cerebral palsy, the therapist must keep these six elements about the patient's condition in mind:

> (1) Retardation in the development of new skills expected at the child's chronological age; (2) persistence of infantile behavior in all functions, including infantile reflex reactions; (3) slow rate of progress from one developmental stage to the next; (4) a

> smaller variety of skills that in the able-bodied child; (5) variations in the normal sequence of skills; (6) abnormal and unusual performance of skills (p. 3).

Thus, after consulting some outside research, it is now known that there are a few leading causes of cerebral palsy that may or may not be preventable as well as considerations therapists must be aware of when taking a child with cerebral palsy onto their caseload(s). Further, now that the causes of the condition are somewhat understood, the individual types of the condition can be examined in detail, as cerebral palsy can be described in a couple of different ways (Levitt, 2010).

Types of Cerebral Palsy

Cerebral palsy can be identified as "tetraplegia or quadriplegia", "diplegia", or "hemiplegia" (Levitt, 2010, p. 5). All of these phrases are commonly utilized to describe what area of the body that has been affected by the cerebral palsy condition (Levitt, 2010). Levitt (2010) explains that "quadriplegia" (p. 5) translates to the effect of arms, legs, and whole body being affected, even though at times one side (either right or left) is influenced even more severely by the condition (p. 5). Levitt (2010) defines "diplegia" as when the legs are distraught more so than the arms, while "hemiplegia" is when only "limbs and body on one side are affected" (p. 5). However, it is important to note that these identifiers are not obsolete and at times lack accuracy because the child's physical status has the capability to evolve as he or she grows older (Levitt, 2010). Another set of identification commonly used to distinguish between the types of cerebral palsy include "spastic types", "athetoid (dyskinetic) types", and "ataxic types" (Levitt, 2010, p. 5).

According to the Cerebral Palsy Foundation (n.d.-b), "spastic" cerebral palsy is considered to be the most frequently occurring of all types, and is characterized by tight muscles and "…movements [that] may appear stiff or awkward" (para. 3). Levitt (2010) describes the muscles appearing as "spastic" or "stiff" and counteract a stretch very rapidly, which is termed "hypertonus" (p. 6). However, Levitt (2010) explains that hypertonus in spastic cerebral palsy could be either "spastic" or "rigid" (p. 6). Levitt (2010) explains that "spasticity" only resists movement at a certain spot during a specific motion and only impacts particular groups of muscular tissue, while "rigidity" challenges a pattern of motion throughout the whole course of motion while also influencing the whole musculoskeletal system instead of only certain muscles (p. 6). Levitt (2010) argues that children with this specific type of cerebral palsy develop irregular body positioning, which as a result, most "spastic" (p. 7) cerebral palsy cases present with an inability to hold the head and trunk erect while limbs are incredibly stiff (p. 7). In addition, Levitt (2010) also notes that the degree of spasticity a child displays may change periodically depending upon his or her moods, shifts in physical "positioning" (p. 7) of the child's body in space, and the speed in which the child moves his or her body, as increased stiffness occurs with rapid motion (p. 7). Lastly, the child with spastic cerebral palsy may be able to attempt to move his or her limbs, but not without expending a large amount of energy (Levitt, 2010). Continuing off of this claim, Levitt (2010) decrees that "spasticity does not necessarily mean paralysis" (p. 7). Children who are diagnosed with the spastic type of this condition also can present with a varying degrees of cognitive abilities, sensory sensitivity, inability to understand where the body is in space, and breathing and feeding issues (Levitt, 2010, p. 8).

On the other hand, the Cerebral Palsy Foundation (n.d.-b) discusses how "athetoid" cerebral palsy often presents with "slow and uncontrollable writhing or jerky movements of the

hands, feet, arms, or legs" that are out of the child's control (para. 4). Regarding movement patterns, Levitt (2010) affirms that these movements may be exaggerated or encouraged when the child becomes overly zealous and/or unsure about something, while "tackling a mental problem" (p. 8) also causes an amplification of these random movements as well (p. 8). Levitt (2010) also points out that irregular sitting or standing positions (such as irregular curvatures in the spine) develop in order to "compensate for instability" (p. 8) from the child's constant motion (p. 8). Because there is so much constant and random movement that these children cannot control, initiating any type of mobility independently may be difficult and "un-coordinated" (Levitt, 2010, p. 9). Levitt (2010) goes on to demonstrate that these children can experience either high or low muscle tone, while an "arousal of emotions" (p. 9) further intensifies the degree of tone the child possesses, while the muscular system tends to relax more when the child engages in sleep (p. 9). Also, according to Levitt (2010), a common characteristic seen with children who have this type of cerebral palsy is the "athetoid dance", which is when these children cannot weight-bear "on their feet and continually withdraw their feet either upwards, or upwards and outwards" (p. 9). This dance, Levitt (2010) stresses, is caused by a disconnect "between grasp and withdrawal reflexes" (p. 9). Levitt (2010) also continues her discussion of "athetoid" (p. 9) cerebral palsy by saying how many individuals with this type of cerebral palsy also have sharp cognitive abilities and a great sense of individuality but do have issues with processing certain sounds and communicating at times (p. 9). Levitt (2010) goes on to admit that independence with respect to activities like eating may be impaired because of a lack of effective use of the arms.

According to the Cerebral Palsy Foundation (n.d.-b), the last and most "rare" type of cerebral palsy is "ataxic" cerebral palsy (para. 5). The Cerebral Palsy Foundation (n.d.-b) further

describes this specific diagnosis with characteristics such as "poor coordination", as well as an "unsteady walk with a wide-based gait" (para. 5). The main issues resulting from this specific type of cerebral palsy are basically instabilities within the "head, trunk, shoulder and pelvic girdles" (Levitt, 2010, p. 9). Levitt (2010) importantly notes that the arms are often recruited for quick "balance-saving reflexes" (p. 10) due to insecurities in balance (p. 10). Also, planned motion is possible for these children but occurs in a very random and clumsy fashion, while most of these ataxic children experience very low muscle tone with "poor muscle power" (Levitt, 2010, p. 10). Levitt (2010) describes these children's joints as highly "flexible" as well, while some children may additionally present with a "nystagmus" (p. 10). According to the American Optometric Association (n.d.), a "nystagmus" is defined as random, involuntary eye movement that can have detrimental effects upon an individual's "balance and coordination" (para. 1). Last but not least, these children may have intelligence deficits that may stem from problems with "vision and perception" (Levitt, 2010, p. 10). Therefore, understanding and being knowledgeable about the specific characteristics of each type of cerebral palsy is vital to being a well-rounded health care professional or parent of a child with cerebral palsy. Putting the specifics aside, however, being aware of some of the general issues that cerebral palsy presents with as a whole is just as equally as important.

Common Traits in all Forms of Cerebral Palsy

According to Levitt (2010), there are certain physical characteristics that pertain to all types of cerebral palsy. Levitt (2010) emphasizes that deficiencies in the normal progression of "motor development" are seen in all cases of cerebral palsy (p. 10). Levitt (2010) notably explains that the lack of or disrupted "development" of certain "postural balance mechanisms significantly disrupts the motor development… [as] postural mechanisms are an intrinsic part of

motor skills" (p. 10). Another characteristic of all types of cerebral palsy is a certain degree of "weakness of neck, trunk, shoulder and pelvic muscles, which are not activated by undeveloped postural mechanisms" (Levitt, 2010, p. 10). In addition, Levitt (2010) continues the discussion of commonalities with all types of cerebral palsies by discussing how all children with cerebral palsy experience some sort of irregularity within their "infantile" reflexes (p. 10). Levitt (2010) makes the further comment that these "infantile reflexes… are present in the normal newborn and…become integrated or disappear as the baby matures" (p. 10), while children with cerebral palsy maintain these reflexes for a much longer period of time because they do not get properly assimilated into the child's brain (p. 10). Levitt (2010) also asserts that due to the impairment in the natural progression of the proper body positioning discussed in the first part of this paragraph, children with cerebral palsy must compensate for this deficiency by continuously utilizing their "infantile reflexes" such as "automatic stepping", "feeding reflexes", "plantar grasp reflexes", etc. because these reflexes are the only physical capabilities these children possess that enable them to carry on in their daily lives (p. 10). However Levitt (2010) does clarify that reflexes are not always the cause of neuromuscular and/or communication impairments seen with cerebral palsy, and therefore the therapist (a physical therapist, occupational therapist, or speech therapist) should assess the overall abilities of the child as the primary step. Levitt (2010) strongly believes that "only when abnormality [in the child's physical and cognitive abilities] has been detected, to then consider whether *one* of the reasons for this abnormality seems to be a pathological or primitive reflex" (p. 11). Thus, the only way to rectify any issues pertaining to the prolonged presence of reflexes can only be solved by the therapist first focusing on extensive treatment and hopeful improvement of the patient's overall physical abilities and limitations (Levitt, 2010). Lastly, other coexisting and common symptoms all

children with cerebral palsy may experience include "sleep problems, fatigue, feeding problems and poor nutrition, decreased bone density, musculoskeletal pain or pain from severe gastroesophageal reflux, and are less fit than able-bodied children" (Levitt, 2010, p. 11). Therefore, it is evident that there are most certainly common symptoms experienced by all children with cerebral palsy. The good news is, however, there are certain symptoms that can be improved by interventions that are physical and/or occupational therapy related.

Physical and Occupational Therapy Interventions: Similar, but Different

When it comes to discussing physical and occupational therapy treatment options for children with cerebral palsy, it is imperative to understand that although physical and occupational therapy do have their differences in target treatment areas, both disciplines often times focus on improving similar aspects. Both physical and occupational therapy play equally important roles when it comes to "help[ing] the child develop motor skills…[while both also have a focus in] seating arrangements, early intervention therapy, and developmental testing" (Miller & Bachrach, 2006, p. 450). Miller and Bachrach (2006) do distinguish the two therapeutic practices by stating how "physical therapists…focus mainly on gross motor or large muscle activities involving the legs, such as walking, bracing, using crutches, and rehabilitation after surgery" (p. 450). On the other hand, regarding the main role of the occupational therapist towards the improvement in quality of life of the child with cerebral palsy, Miller and Bachrach (2006) suggest that the main functions occupational therapists emphasize with patients is "fine motor activities involving the upper extremities" as well as other actions such as "feeding, writing, and using scissors" (p. 450). Further, Rodger and Ziviani (2006) emphasize how pediatric occupational therapists also focus primarily on the child's cognitive "growth and development" (p. 136) and how the status of this component affects his or her ability to perform

in his or her usual activities in daily life (p. 136). Now that the principle differences between physical and occupational therapy have been directly stated, it is vital to reinforce the fact that many of the treatments for cerebral palsy are not specific towards physical or occupational therapy and are utilized in both therapeutic practices, as Le Postollec (2000) writes that "there are areas of overlap between PT and OT…and [they] mainly differ in approach and a few specific specialty areas" (para. 9). Le Postollec (2000) also notes that a physical therapist by the name of Sandy Smith reiterates the point of how physical and occupational therapists often times have similar goals by stating:

> 'It's too simple to say that OTs work on upper extremities and PTs work on lower extremities… Even though the patient's condition affects a specific muscle group or joint, they could benefit from receiving interventions from both disciplines because if the patient doesn't have enough trunk strength or the ability to weight bear through the upper extremity, they won't be able to transfer [from different locations], walk or do other things that PTs work on' (para. 9).

Therefore, it is critical to remember the congruency between physical and occupational therapy goals and to keep the overlap of these two disciplines in mind as most of the treatment options explored within this analysis could be utilized within the practices of either physical or occupational therapy.

General Therapeutic Treatments for Children with Cerebral Palsy

With respect to creating treatment plans for children with cerebral palsy, Levitt (2010) lays out four fundamental goals or aspects that all therapists must strive towards when treating a child with cerebral palsy:

- Develop postural mechanisms
- Correct abnormal postures and movements as much as possible in the context of standing and stepping
- Assess and select appropriate designs and sizes of standing equipment, orthoses and walking aids according to the individual
- Bone density problems need early use of appropriate standing and walking frames (p. 199).

Further, Dormans and Pellegrino (1998) also state that interventions for children with cerebral palsy must also be selected based upon "the child's cognitive abilities and motivation; the resources of the child's family; the goals of the child and his or her family; and other medical issues, such as seizures and sensory impairments" (p. 298-299). However, due to time and length restrictions, only general types of therapeutic interventions will be explored for this analysis. Keeping these therapeutic goals in mind, however, one type of treatment that therapists utilize in treating children with cerebral palsy is that of "constraint-induced movement therapy" (also abbreviated as CIMT) (Levitt, 2010, p. 240).

According to Levitt (2010), CIMT is used primarily for children with the "hemiplegia" form of cerebral palsy, and is based off of the assumption that the "affected arm and hand" are unable to be used effectively in the child's daily life due to "lack of experience and practice" with respect to their movement (p. 240). The basis of this type of intervention is that restraint of the normal arm allows for the weakened limb or arm to practice completing certain actions and thus helps to develop and improve "perceptual-motor function and motor learning… [in the affected] arm and hand" (Levitt, 2010, p. 240). Splints are used at times for a couple of hours

daily to restrain the normal side and to therefore encourage the child to use the impaired limb (Levitt, 2010). Also, Levitt (2010) provides another way to prompt use of the "hemiplegic" limb(s) (p. 241), which is for the therapist to maintain a gentle yet restricting grasp of the normal arm and give the child specific objects to use for play with the deformed limb (p. 241). Levitt (2010) does report that there is strong evidence that restraint of the normal side "activates motor planning in the hemiplegic side" (p. 241). On the other hand, with respect to the question of whether physical or occupational therapists utilized CIMT, according to Fleet et al. (2014) both physical and occupational therapists utilize this type of intervention as it has shown to greatly improve strength in the "upper extremities" (para. 3). Thus, it is quite possible that occupational therapists may utilize this technique as well, because not only do occupational therapists emphasize strengthening the upper extremities, but they also do use immobilizing techniques for upper limbs which is one aspect of treatment that the CIMT technique calls for (Miller and Bachrach, 2006; Levitt, 2010).

Another type of intervention for children with cerebral palsy is that of "proprioceptive neuromuscular facilitations" (also known as "PNF") (Levitt, 2010, p. 37). Levitt (2010) explains that a neurophysiologist by the name of Herman Kabat, along with two other individuals Margaret Knott as well as Dorothy Voss, Kabat "developed [this] system of movement facilitation techniques and methods for the decrease of hypertonus, for strengthening, coordination and improving joint range" (p. 37). The PNF technique requires the usage of certain motion sequences which include putting extremities into "flexion or extension; abduction or adduction; [and/or] internal or external rotation" (Levitt, 2010, p. 37). Further, Levitt (2010) states that PNF techniques also incorporate "sensory stimuli" (p. 37) such as "touch and pressure, traction and compression, stretch or limb elongation and the proprioceptive effect of muscles

contracting against resistance" in order to prompt the intended limbs toward a specific motion (p. 37-38). Levitt (2010) also notes that the amount of "sensory" (p. 37) input gradually lessens in intensity as the specified motion becomes easier for the patient (p. 37). Levitt (2010) lists "irradiation" (p. 38) as another type of PNF strategy that could be implemented (p. 38). This type of PNF technique is defined by Levitt (2010) as the transfer of movement "from one muscle group to another" (p. 38) through putting an overload of movement on one limb that in turn causes the movement to occur in a different limb (p. 38). Another one of these special techniques that Levitt (2010) describes is "repeated contractions" which is when one specific type of movement is completed many times in a row by "using any joint as a pivot" (p. 38). Lastly, Dormans and Pellegrino (1998) describe yet another type of PNF technique, which is that of "contract-relax and hold-relax" therapies in which help to lower hypertonus within "spastic muscle groups" (p. 299). Therefore, the main purpose of PNF is to promote movement through use of repetition of certain movements and through the implementation of various types of stimuli (Dormans & Pellegrino, 1998). These PNF techniques can be modified in order to make them more enjoyable and tolerable for children as well (Dormans & Pellegrino, 1998). Also, it is important to note that even though Levitt (2010) states that PNF techniques are usually used within the adult population, Scifers (2004) wrote in an *ADVANCE* article that these types of therapeutic techniques are appropriate for and benefit all age groups. Lastly, it is important to note that the PNF technique is one that is incorporated into both physical and occupational therapy practices, as Attari et al. (n.d.) states that PNF stretching assists in improving "functional mobility" (slide 8) as well as "activities of daily living" (slide 8), which according to the University of California San Diego (2011) are components that both physical and occupational therapists work together to improve.

An additional therapeutic modality for children with cerebral palsy includes that of horse-back riding, also known as hippo-therapy (Miller & Bachrach, 2006). Miller and Bachrach (2006) attest to the claim that riding on horseback provides multiple benefits for children with cerebral palsy, as not only does this activity promote "balance and relaxation of spastic muscles" but also the positioning of the child's body on the horse itself also assists in "stretching hip adductors and improves pelvic tilt and trunk positioning" (p. 451). This improvement in posture also results in a quick overall improvement in joint and muscle mobility, which allows for more work to be done effectively when the riding session is complete (Miller & Bachrach, 2006). Another added benefit to the implementation of horses into the therapeutic session is that most children truly have fun while doing so, which results in greater motivation in the therapy sessions (Miller & Bachrach, 2006). Further, the American Hippo-therapy Association (n.d.) also states that "the variability of the horse's movement, the rhythm, dimensionality, regularity, and the ability of the therapist to modify these movement qualities, is where the horse, as a tool, supersedes the others" (para. 6). Regarding which disciplines implement hippo-therapy into treatment interventions, according to the American Hippo-therapy Association (n.d.), this technique is utilized by physical, occupational, and even speech therapists because of its ability to "to address impairments, functional limitations, and disabilities in patients with neuromusculoskeletal dysfunction" (para. 1).

Another type of therapeutic approach that Levitt (2010) says is commonly incorporated by both occupational therapists and physical therapists is the "Neurodevelopmental treatment", also known as "NDT" or the "Bobath Approach" (p. 39). This approach was developed by Karl and Berta Bobath, a "neuropsychiatrist" and a "physiotherapist", and was constructed upon "the premise that the fundamental difficulty in cerebral palsy is lack of inhibition of reflex patterns of

posture and movement" which in turn results in irregularities in body position and tonicity (Levitt, 2010, p. 39). Levitt (2010) states that one of the main goals of the approach is to "prepare" a child with cerebral palsy for any type of bodily motion through lowering muscles tightness via "stretching, handling and positioning by the therapist" (p. 39). Another key component to NDT that Levitt (2010) points out is "sensorimotor experience" which can be defined as the "'breakdown' of the movement abnormalities" (p. 39). This in turn, according to Levitt (2010), supposedly provides the patient with "the sensation of more normal tone and movements" (p. 40) through manual, tactile manipulation from the clinician, which in return the child should regain the ability to initiate more standard, usual movements (p. 40). Levitt (2010) explains that this is a concept called "'feedback'" (p. 40). Therapists also aim at lowering hypertonicity at certain areas of the body, which are commonly at the "head and neck, shoulder and pelvic girdles" (Levitt, 2010, p. 40). Levitt (2010) also stresses the importance of the child's caregivers continuing the NDT therapeutic techniques at home in order for them to be fully effective. On one last note, according to the Kennedy Krieger Institute (2012), this NDT approach is considered a "hands-on treatment approach used by physical therapists, occupational therapists, and speech-language pathologists" and is currently used to improve patients' ability to "control movement as a result of neurological challenges, such as cerebral palsy, stroke, and head injury" (para. 1).

Additionally, Levitt (2010) discusses how a woman by the name of Jane Ayres and Fisher et al. created another therapeutic modality titled "sensory integration" (p. 42) which enables children to be exposed to different types of stimuli or sensory items and uses them to in turn create a certain intended physical motion (p. 42). A lot of children with the condition of cerebral palsy, Levitt (2010) explains, have no issues ingesting certain stimuli, but their

"interpretation" and what they do with this input requires outside attention because these children most often do possess some sort of "perceptual or sensory processing difficulties" even though these children do not experience an actual "loss of sensation" all together (p. 42). Thus, in order to offer improvement, "stimulation of all the senses (touch, proprioceptive, vestibular visual and auditory) is provided in learning motor control with active motor function" (Levitt, 2010, p. 42). However, even though some of these activities can be fun for the kids, Levitt (2010) expresses that one must take caution when dealing with sensory information, as some children may overreact to the stimulus and therefore develop a very high degree of tonicity or tightness in the muscles, as well as they may become frightened. Lastly, Levitt (2010) also explains that this approach may be utilized by occupational therapists when treating "children with clumsy motor skills or developmental incoordination syndrome or perceptual-motor disorders" and "has been used in other conditions as well as in cerebral palsy" (p. 42). Both physical and occupational therapists may use this approach as Levitt (2010) states as physical and occupational therapies "may overlap..." for this treatment; on the other hand though, "specialized occupational therapy attends to specific difficulties of sensory integration or perception" which is a main emphasis of this treatment technique (p. 42).

One last, but not least, intervention for children with cerebral palsy is that of doing therapeutic exercises in the pool, also known as "hydrotherapy" (Levitt, 2010, p. 45). The main components of hydrotherapy include "strengthening and passive range of motion and stretching" (Levitt, 2010, p. 45). Levitt (2010) strongly argues that even though special equipment may be needed for the child to enter into water, "postural control" and "balance" is greatly improved while the joints of the body do not take nearly as much body weight due to the water's "buoyancy" (p. 46). Also, because working in the water is not only more fun for the children but

it also promotes muscular strength and social interaction with others present in the water, both physical and occupational therapy could benefit from implementing hydrotherapy into practice (Levitt, 2010; Rodger & Ziviani, 2006). However, since it has now been established that children with cerebral palsy have many different treatment options and benefit from outside treatment from both physical and occupational therapists, it is also important to understand the progression of the condition and whether beginning therapy earlier improves the prognosis of the child's cerebral palsy.

The condition of cerebral palsy, according to Levitt (2010), is not considered to be a progressive disease, as the brain damage stays as equally as impaired as it was when the damage first occurred. However, as the child continues to grow, it is known that the "motor dysfunction [seen with cerebral palsy] changes with both growth and a child's development" (Levitt, 2010, p. 1). Thus, even though the damage to the brain does not worsen over time, the way in which the child's muscles move vary over the child's lifespan (Levitt, 2010). Kliegman et al. (2004) supports this claim by saying an infant with cerebral palsy may present with very low muscle tone during his or her "first six months of life and then develop spasticity" (p. 545). Kliegman et al. (2004) goes on to say that the "dyskinesia (dystonia and athetosis) and ataxia may not develop until the child is 18 months old" (p. 545). Levitt (2010) reports that the benefits of physical therapy "positively contributes to body function" however, and that physical therapy may be necessary as the child gets older due to possible arising issues and changes within the "musculoskeletal" system (p. 1). With respect to life expectancy rates, Dormans and Pellegrino (1998) state that patients with cerebral palsy are able to sustain life into "adulthood [and] their projected life expectancy is somewhat less than that of the typical population" (p. 26). Dormans and Pellegrino (1998) additionally assert that depending upon the specific kind of cerebral palsy

the child has, the prognosis is different because longevity is directly related to the extent of other health issues involved. Shorter life spans are often seen with children who have cerebral palsy and have coexisting "respiratory, gastrointestinal, and nutritional issues" (Dormans & Pellegrino, 1998, p. 26). Levitt (2010) also argues that several studies have shown walking is possible to attain between the ages of three to nine years of age, and after around the age of ten the ability to learn to walk or to continue doing so was not guaranteed.

Thus, given the prognosis, Levitt (2010) asserts that because at times a cerebral palsy diagnosis develops over a certain amount of time and is not detected right off the bat, it may be difficult to start therapy right away. However, Levitt (2010) strongly agrees that "the earlier the treatment is started, the more opportunity is given for whatever potential there may be for developing any normal abilities and for developing any normal abilities and for decreasing the abnormal movement patterns and postural difficulties" (p. 4). The physical therapist will observe the infant while playing with him or her to look for any abnormalities, as "any immobility threatens musculoskeletal growth and development which can lead to deformities" (Levitt, 2010, p. 4). Levitt (2010) explains that involving the infant with physical therapy as early as possible will lessen the chances of developing abnormalities. In addition, Levitt (2010) does also suggest that getting the infant engaged in therapy sooner than later enables the baby a greater chance at semi-normal development by encouraging "interaction with his [or her] mother and father" and by "providing an increase in a baby's sensory-motor and everyday experiences" (p. 4). This in turn, from Levitt (2010)'s research, enables the infant to learn and "communicate the information he [or she] gains" (p. 4). Even though Levitt (2010) points out that some infants may grow out of some "abnormalities…without intervention", when in doubt, it is still recommended to start

therapy as early as possible in order to make sure that "potentials for improvement" will not disappear (p. 5).

In conclusion, although physical and occupational therapy do have their specific differences in practice, overlap in treatment goals occurs more often than is thought, especially when it comes to treating children with cerebral palsy, defined by Kliegman et al. (2004) as a "non-progressive" (p. 545) neurological condition with four different sub-types (p. 545). In addition, it is also evident that not one general treatment discussed in this thesis (which includes CIMT, PNF techniques, hippo-therapy, NDT techniques, sensory integration, and hydrotherapy) is geared specifically for physical therapy or occupational therapy; rather the treatments can be utilized by both therapeutic practices (Levitt, 2010; American Hippotherapy Association, n.d.; Le Postollec, 2000; Fleet et al., 2014; Miller & Bachrach, 2006; Dormans & Pellegrino, 1998; University of California, San Diego, 2011; University of St. Catherine, 2014; Scifers, 2004). Lastly, children with cerebral palsy have a fair chance at living long lives depending upon the extent of their coexisting health conditions, while prognosis and chance at improvement increases drastically when therapy intervention is started as soon as possible (Dormans & Pellegrino, 1998; Levitt, 2010). Thus, I hope that with this research and these findings, parents of children with disabilities along with aspiring pediatric therapists, such as myself, can be more aware and educated about this common condition of cerebral palsy. In turn this will enable them to make more informed decisions about their healthcare in order to provide them with the best opportunities to be functional in society. Even though diagnosis of such a condition may be disheartening and the therapy process may be difficult for both the child and the parents, being more educated about the therapeutic process as a whole will ensure them a more satisfying experience. Further, maintaining a positive attitude with motivation in the heart will allow for

progress to be made without emotional setbacks. Theodore Roosevelt reinforces this point completely with his famous quote: "Nothing in the world is worth having or worth doing unless it means effort, pain, difficulty…I have never in my life envied a human being who led an easy life. I have envied a great many people who led difficult lives and led them well" ("Quotes About Easy", n.d.).

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