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Effectiveness of Dance Movement Therapy on the Quality of Gait and Socialization of Children with Cerebral Palsy

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Effectiveness of Dance Movement Therapy on the Quality of Gait and Socialization of Children with Cerebral Palsy

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ABSTRACT

The purpose of this study was to explore the effectiveness of dance movement therapy (DMT) on the quality of gait and socialization of children with cerebral palsy (CP). Participants (*N*=44) were randomly assigned to the intervention or the control group based on their diagnoses of hemiplegic (*n*=22) or diplegic (*n*=21) CP, with one misdiagnosed. The subjects, aged six to 12 (*M* = 8.4) diagnosed level I or II in the Gross Motor Function Classification System (GMFCS), were from an outpatient rehabilitation center in Istanbul, Turkey. Measures of velocity, stride length and cadence were obtained by a registered physical therapist using Motion Analysis. Measures of social skills and problem behaviors were also obtained by psychologists using the Social Skills Rating Scale (SSRS) before and after intervention. The intervention group (*n*=23) received 45 minutes of dance movement therapy (DMT) and the control group (*n*=21) received art activities (AA). Each group participated in the group setting three times a week for 10 sessions followed by post-tests.

The results for the SSRS test indicated a significant difference increasing in social skills for the DMT group over the AA group. The DMT group also exhibited a significant difference in cadence compared to the control group. The other gait parameters, velocity and stride length, also increased in DMT group. Cohen's *d* test (*d*=0.45 – for stride length, *d*= 0.46 – for velocity) indicated there was a medium effect size. These findings offer evidence that DMT intervention over a brief time was effective in improving socialization and increasing quality of gait for children with CP.

Keywords: aesthetic distance, cerebral palsy, disability, dance movement therapy, gait, music, socialization, rhythmic auditory stimulation, motor dysfunction.

CHAPTER 1

Introduction

Cerebral palsy (CP) affects nearly 17 million people worldwide (Cerebral Palsy Alliance, 2015). CP is an umbrella term covering a group of motor disorders caused by brain damage (Miller & Bacharach, 2006). For individuals with CP, quality of gait reduces selective motor control, impairs balance and also renders muscle tone abnormal (Gage & Schwartz**,** 2009). These symptoms make everyday activities and movements difficult: standing, sitting, walking, eating, and dressing are challenging due to motor dysfunction.

In addition to fine and gross motor difficulties, individuals with CP may also suffer from related difficulties (Cerebral Palsy Alliance, 2015). For instance, speech, hearing and vision are often compromised. As O'Shea (2008) suggested, "Although CP is primarily a disorder of movement, many children with this disorder have other impairments which may affect their quality of life and life expectancy" (p. 37). These various motor impairments and accompanying difficulties diminish their participation in social activities (Van der Heide et al., 2004; Woollacott et al., 2005). Parents are discouraged from enrolling their children with CP in 'normal' activities such as dance, music, art and yoga, which may enhance motor function and socialization (Wiart, Ray, Darrah & Evans, 2010). Other common school experiences may be unavailable to the child with CP. Thus, camping, field trips and social games may pose challenges too great for the average teacher or leader to navigate. Thus motor impairments due to CP diminish and sometimes entirely eliminate many basic and crucial human experiences. The limited ability to move may affect every aspect of a child's life negatively and may impede socio-emotional wellbeing and decrease the quality of their lives (Blacher-Dixon, 1981; Brown & Bergen, 2002; Howard, 1996; McDonald, 1985).

Unfortunately, there is no cure for CP (Damiano, 2006, p. 1537). While physical therapy remains one of the most widely used interventions to help motor impairment (Levitt, 2004; Miller & Bachrach, 2006; Mutch, Alberman, Hagberg, Kodama, & Velickovic, 1992), a review of the literature demonstrated that the research on physical therapy for enhancing quality of gait for children with CP suggested inconclusive evidence (Antilla, 2008; Bartlett & Palisano, 2002; Jeglinski, 2010; Parkes 2004). Bartlett and Palisano (2002) pointed out that "evidence supporting factors predicting motor change for children with cerebral palsy is minimal" (p. 237).

Hence, the purpose of this study was mainly to explore the effectiveness of dance movement therapy (DMT) or the therapeutic use of movement (American Dance Therapy Association, 2013) on the quality of gait of children with CP. In addition, socialization of children with CP participating in DMT was also measured. The research question was: Is DMT an effective intervention to increase quality of gait and can it play a role in effectively socializing children with CP?

This study proceeded under the following assumptions about DMT. DMT provides: (a) an engaging, motivating and playful environment/space; (b) verbal and non-verbal expression of emotion; (c) a safe environment/space; (d) a focus on abilities rather than disabilities; (e) multimodal access to an individual (cognitive, psychosocial, and physical); (f) an increase of mechanical and qualitative aspects of physical function. Studies on DMT and socio-emotional wellbeing in special needs groups suggest that DMT may have positive effects (Allain –Murphy, 1988; Duggan, 1978; Giannone, 1993; Levental, 1982; Levy, 1995; Tortora, 2001, 2013).

These benefits are primarily attributed to participating in an activity that can provide not only an engaging and motivating environment and space but also

opportunities for various means of verbal and nonverbal expression**.** Non-verbal communication cues utilized in DMT, in particular, offer children with CP opportunities to learn and practice social skills and to relate and communicate with others (Chaiklin & Wengrower, 2009). Moreover, in these interactions, since there are no wrong means of communication, the children can express themselves without fear in a nonjudgmental safe space/environment. The holding environment/space may thus provide emotional as well as physical safety. (Chaiklin & Wengrower, 2009; Dannunzio, 2014; McCarthy, 2008; Winnicott, 1965).

To create emotional safety DMT practitioners employ metaphor, themes and symbols to create emotional distance as well as motivate and engage participants (Halprin, 2003; Hinz, 2009; Levy, 1995, Lundy & McGuffin, 2005; Payne, 2016; Samaritter, 2009; Tortora, 2006). Arts therapies including dance movement, drama, music and art are interwoven into the broader therapeutic process. "Aesthetic distance" is the one of the main concepts utilized in arts therapies (see, for example, Deza, 2009; Glass, 2006; Grainger, 2000; Landy, 1983; Levine, 1998; Meldrum, 1999). Arts therapists work in their specialized modalities to help individuals form their own unique creative expressions through movement, storytelling, role, music, and photography.

This allows individuals to express their experiences in a fictional way, providing the opportunity to externalize and objectify these issues without being overwhelmed by them. In many cases, children with CP may not be motivated to follow the literal directions of a physical therapist. However, when working through metaphor, they are often more motivated to extend their physical ability as much as possible. For example, a child is more likely to respond to a prompt stimulating the

imagination, (e.g., “Reach out for the magical balloon”) than a literal prompt (e.g., “Reach out and extend your arms”) (Ellis, 2001; Ferris, 2008; Meekums, 2002).

Additionally, DMT sessions focus mainly on ability rather than disability (Koch, 2006; Levy, 2005; Nemetz, 2006), which is especially significant for children with CP whose daily existence is defined by their disability. Focusing on positive aspects in a safe environment gradually increases the courage and confidence to express with ease while offering the opportunity for increasing communication and socialization skills (Canner, 1980; Csoti, 2001, DeHaas, 2008; Duggan, 1980; Leventhal, 1982; Tortora, 2001).

DMT is believed to be beneficial because it stimulates multimodal domains. Innovations in neuroscience continually offer new directions for treatment and further study, especially in dance movement and music therapy (Berrol, 2006; Jeong, Hong, & Lee, 2005; Karpati, Giacosa1, Foster, Penhune, & Hyde, 2015; Magee & Stewart, 2015). Berrol (1985) pointed out the significance of multimodal treatment for people with injuries affecting the central nervous system. As she affirmed, therapeutic interventions must focus on “accessing all domains of function- cognitive, psychosocial and physical- via the sensory systems” (p. 50). Msall and Park (2008) also emphasized that the most important aims of treatment should be to provide children with an opportunity to reach their fullest potential in all areas, including physical, psychological, cognitive, and social.

DMT can also benefit motor functioning. Duggan (1980) proposed that the goals for children with CP within DMT sessions should include tactile and kinesthetic stimulation with a focus on expanding the movement repertoire through gross and fine motor control exercises. Duggan (1980) also emphasized that “Not only do the sessions promote socialization on a one-to-one basis, but the child’s physical

condition benefits from the contact and movement" (p. 49). Although studies on DMT and neuromuscular development including neurological impairments and related motor dysfunctions are limited, dance has been found to be effective in enhancing the motor functions of individuals who live with neurological impairments such as Parkinson's Disease and Multiple Sclerosis (De Dreu, 2015; Demers & McKinley 2015; Hackney & Earhart, 2007, 2010; Mandelbaum & Lo, 2014; Rabbia, 2010; Salgado, Auxiliadora, & Vasconcelos, 2010; Westbrook & McKibben, 1989; Williamson, 2015).

The use of music or any source of external rhythms may be beneficial during DMT sessions with children suffering from CP. The benefits of rhythm are mainly explored within neurological music therapy. Thaut (2005), a theorist and researcher, defined neurological music therapy (NMT) as "the therapeutic application of music to cognitive, sensory, and motor dysfunctions due to neurologic disease of the human nervous system" (p. 126). Kim, Kwak, Park, and Cho (2012) pointed out that "The repetition of an external timing cue impacts the regulation of the movement pattern. Consequently, the spinal motor system is optimized for the movement pattern following the reticulospinal pathway at the level of the brainstem" (p. 905). Ideally, rehabilitating movements that are biologically rhythmical, like walking, are used in concert with rhythmic auditory stimulation (RAS), a technique widely utilized in NMT (Thaut et al., 2007). RAS is defined as:

> a neurologic technique using the physiological effects of auditory rhythm on the motor system to improve the control of movement in rehabilitation and therapy. RAS is mainly used in gait therapy to aid in the recovery of functional, stable, and adaptive walking patterns in patients with significant

> gait deficits due to stroke, Parkinson's disease, traumatic brain injury, effects of aging, or other causes. (p. 139)

In RAS, a therapist matches the client's cadence with the tempo of selected music. During training, gradual increases in the musical rhythm promote healthy gait patterns. Cadence, stride length, symmetry of stride, and velocity are important parameters. As studies illustrate (Altenmüller; 2015; Ashoori, 2015; Bella, 2015; Galińska, 2015; Hackney, Lee , Battisto, Crosson, & McGregor, 2015; Thaut, 2005), there are promising outcomes for the efficacy of music on movement in the treatment of neurological disorders, including CP. Hence, DMT's positive effects in the emotional and social realm are mirrored in physical improvements and motor functioning. Although the research in this realm is positive, further exploration and research are needed.

To summarize, this study examined the positive effects of DMT on physical qualities and motor functioning as well as emotional and social development. As previously mentioned, the studies in DMT explore the motor functions of individuals who live with neurological impairments are limited. In addition, research on physical therapy (which is the most common treatment option for CP) remains inconclusive as to its effectiveness. This research can contribute to the ongoing evaluation of DMT as an intervention in the treatment not only for socioemotional issues but also motor dysfunctions.

The quantitative aspect of this study may highlight the importance of DMT as a multimodal treatment modality. It is crucial to have quantitative and evidence-based research studies so that the results can be generalized (Cruz & Koch, 2015). Koch (2013) underlined the importance of quantitative study when she stated that "evidence-based research is important in order to ensure that DMT and the therapeutic

use of dance are effective interventions for health-related psychological problems," (p. 3). This study responds to Koch's call for evidence-based research to demonstrate DMT's effectiveness in enhancing overall health. Given the inconsistent success of physical therapy and the promise of dance therapy, investigating the effects of dance therapy on improving quality of gait and socialization of children with CP may contribute to the research literature in the field.

CHAPTER 2

Literature Review

This literature review will focus on studies of cerebral palsy (CP) and dance movement therapy (DMT). The literature review will also present a rationale for applying DMT to enhance quality of gait and socialization in children with CP.

Cerebral Palsy

Definition and Etiology

Internationally, one to two of 1,000 live births produce children diagnosed with cerebral palsy (CP) every year (O'Shea, 2008). In some parts of the world the average prevalence of CP is greater than others. For instance, in Turkey approximately 8/1,000 people suffer from CP (Global HELP Organization, 2013), compared to 3.3/1,000 in the United States (Centers for Disease Control and Prevention, 2012). McIntyre (2011) writes that "Cerebral palsy is the most severe physical disability within the spectrum of developmental delay" (p. 114).

Miller and Bachrach (2006) defined CP as "a collection of motor disorders resulting from damage to the brain that occurs before, during or after birth" (p. 3). While many different factors can contribute to CP's onset (Miller & Bachrach, 2006), the exact nature of the injury that causes CP is not known (Colledge, 1999). Miller and Bachrach (2006) have developed a theory explaining its onset as the result of brain cells damaged by a diminished blood supply and lack of oxygen. More specifically, according to Mutch, Alberman, Hagberg, Kodama, and Velickovic (1992), CP is ''a group of non-progressive but often challenging motor impairment syndromes secondary to lesions or abnormalities of the brain arising in the early stages of development'' (p. 547), that also cause abnormal motor control and muscle tone and often effects quality of gait adversely.

During pregnancy, infections, a damaged placenta, biochemical genetic disorders, chance malformations of the developing brain, and blood type incompatibility all tend to increase risk for CP (Hagberg, 1979; Jones, Morgan, Shelton, & Thorogood, 2007; Lilienfeld & Parkhurst, 1952; Ozcan, 2005; The Ultimate Resource for Everything Cerebral Palsy, 2016). The birth process, premature delivery or abnormal positioning of the child in utero may all contribute to prolonged loss of oxygen and further escalate the risk. However, as Obladen (2011) pointed out, "In more recent times, prematurity, asphyxia, hypoxia, ischemia, traumatic hemorrhage, and inflammation were held responsible (for CP), even though a causal relation with giving birth never has been established and appears unlikely" (p. 8). During early childhood, infections, brain hemorrhages, head injuries, asphyxia and accidents such as poisoning or seizures may also increase the risk of CP (Colledge, 2006). While specialists have shown that some factors seem to correlate with CP onset many facts about its exact cause remain unknown.

Types of Cerebral Palsy

Cerebral palsy (CP) is categorized according to which part of the brain is damaged. Researchers have classified CP four ways: spastic; athetoid (dyskinetic); ataxic; and mixed-type (Centers for Disease Control and Prevention, 2013; Eliasson et al, 2006; Rosenbaum, Panet, Leviton, Goldstain & Bax, 2007; Sankar & Mundkur, 2005). Spastic CP – the most common type of CP – is characterized by muscles that are tight and stiff with limited movement (Cerebral Palsy Alliance, 2013). "Spasticity is a condition in which there is an abnormal increase in muscle tone or stiffness of muscle, which might interfere with movement, speech, or be associated with discomfort or pain" (National Institute of Neurological Disorders and Stroke, 2011, para. 1). Colledge (2006) also points out that "normal muscles work in pairs, when

one group contracts, the other group relaxes to allow free movement in the desired direction. Spastic muscles become active together and block effective movement" (p. 14). Athetoid (dyskinetic) CP results from damage to the basal ganglia in the midbrain. It leads to difficulty in controlling and coordinating movement resulting in involuntary and uncoordinated movement (Cerebral Palsy Alliance, 2013; Eliasson et al, 2006; Miller & Bachrach, 2006; Rosenbaum et al., 2007). The movements may be tremor-like and jerky. Hypotonic CP, on the other hand, is characterized by diminished muscle tone (Levitt, 2004; Miller & Bachrach, 2006). Individuals with Ataxic CP suffer damage to the cerebellum, disturbing their sense of balance, depth perception, and causing difficulty with precise movements. In mixed-type CP, individuals show symptoms characteristic of two or more of the above diagnoses.

CP can also be described depending on the body parts affected (Cerebral Palsy Australia, 2013; Eliasson et al, 2006; Miller & Bachrach, 2006; Msall & Park, 2008). In hemiplegia, impairment manifests on one side of the body. In diplegia, bilateral impairment is evident usually affecting both legs, though the arms and trunk may be also involved. In quadriplegia all four limbs as well as the trunk are affected. In paraplegia only the lower limbs are involved.

Within each classification, researchers also seek to identify the degree of severity, particularly when describing muscle coordination and the body parts involved (Cerebral Palsy Australia, 2013; Eliasson et al, 2006; Miller & Bachrach, 2006; Msall & Park, 2008). "The range of severity may be from total dependency and immobility to abilities of talking, independent self-care, walking, running and other skills, although with some clumsy actions" (Levitt, 2004, p. 1). However, as Miller and Bachrach (2006) claim, "these qualifying words (mild, moderate, and severe) do not have any specific meaning. They are subjective words, and their meaning varies

depending upon the person using them" (p. 6). Researchers and clinicians must, therefore, be able to recognize and acknowledge each individual's needs in order to be able to offer meaningful assistance.

Symptoms and Complications

Quality of gait. Individuals with CP suffer from poor coordination, abnormal balance, and atypical movement patterns caused by interference with messages from the brain that either inappropriately increase or reduce muscle tension (Cerebral Palsy Australia, 2013; Levitt, 2004; Miller & Bachrach, 2006; Msall & Park, 2008; Sankar & Mundkur, 2005). High levels of motor dysfunctions and difficulties with quality of gait, caused by brain damage, are the most common symptoms (Stokes, 1998). Gait is the complex ability not only to maintain the body's center of gravity in a standing position, but also to prepare the body to move, to maintain movement or to stop movement (Cappozzo, Catani, Croce & Vaughan, 1999; Davis & Jeremy, 1999).

According to Gage (2004) "the location and the degree of brain lesion determine the type of tone present, the degree to which selective motor control and balance are impaired, and the extend of growth deformity which results" (p. 65). There are three causes for abnormal gait: reduced selective motor control, impaired balance, and abnormal muscle tone. Reduced selective motor control is defined as the inability to selectively activate specific muscles to make a movement pattern (Gage & Schwartz, 2009). Impaired balance affecting quality of gait is also common for individuals with CP (Clifford & Holder-Powell, 2010; Donker, Ledebt, Roerdink, Savelsbergh, 2008; Eek, Tranberg, & Beckung, 2011; Gage, 2004; Hsue, Miller, & Su, 2009; Woollacott et al., 2005). Kegel (2012) pointed out that "balance or postural stability is a fundamental component of movement, involving the ability to recover from instability and the ability to anticipate as well as to move in ways to avoid

instability" (p. 842). Woollacott et al. (2005) noted that in CP patients "the neuromuscular response characteristics contributing to these balance constraints include a delayed onset of muscle contractions, a disorganized timing of muscle responses, and an increased co-activation of antagonist muscles with agonists" (p. 218). Types of abnormal muscle tone include increased muscle tone (hypertonia) or decreased muscle tone (hypotonia), unstable muscle tone (dystonia) and muscle spasms (Levitt, 2004; Miller & Bachrach, 2006; Rosenbaum, Paneth, & Leviton, 2007). Although existing patterns may differ, there are two common CP-related, abnormal gait patterns: stiff knee gait and crouch gait (Sutherland & Davids, 1993). Stiff knee gait is the most common pattern and can be seen in both hemiplegic and diplegic CP. Individuals who walk with stiff knee gait have insufficient flexion of the knee during the swing phase. A crouch gait pattern consists of excessive hip and knee flexion during gait cycle. It can be seen in individuals with hemiplegia, but more often accompanied with diplegia (Van der Krogt et al., 2010).

Among several physical impairments, balance and quality of gait remain the most significant everyday challenges. They are difficult to stabilize for these children and once compromised, they require more extensive efforts to recover individuals diagnosed with CP.

Emotional and social challenges. Individuals with CP may be below average as to quality of life in terms of socialization and realizing their potential (Miller & Bachrach, 2006; Usuba, 2013). As mentioned in the previous chapter everyday activities are challenging for those with CP because of their motor difficulties, especially quality of gait. These physical challenges may impact them emotionally and socially, noticeably decreasing their quality of life. O'Shea (2008) pointed out that "although CP is primarily a disorder of movement, many children with this disorder

have other impairments which may affect their quality of life and life expectancy" (p. 37). Due to the various motor impairments and other associated difficulties, their participation in play and social activities is diminished (Van der Heide et al., 2004; Woollacott et al., 2005). Miller and Bachrach (2006) emphasized that for children with CP "having access to other children may be limited by the parents' protectiveness, the attitude of other parents toward having their child play with a child who has disability" (p.105). Access to school-based and extracurricular activities are also limited because of physical, psychological and environmental accessibility (McLaren, 2014). As noted above, fewer occasions to participate in group-play and other activities accompany the reduced mobility that children with CP experience (Brown & Bergen, 2002; Damiano, 2006; Hosokawa, Kitahara & Nakamura, 1985; Missiuna & Pollock, 1991).

Often, secondary issues such as decreased motivation, imagination and creativity, socialization and absence of assertiveness emerge. Social and emotional growth and maturity are hindered by the physical constraints of CP (Hosokawa, Kitahara & Nakamura, 1985; McDonald, 1985; Miller & Reid, 2003; Missiuna & Pollock, 1991). The motor impairment caused by CP diminishes and sometimes even eliminates these basic, crucial human experiences for children suffering from the disease. The limited ability to move may affect every aspect of child's life negatively and isolate them (Mulderij, 1997).

Treatment

Damiano (2006) pointed out that there is no cure on the horizon for CP. The current interventions used for gait improvement include serial casting, medication, botulinum toxin injections, orthopedic surgeries and physical therapy. Many other treatments also can be applied to help a child including physical therapy, occupational,

speech and language therapy (Krigger, 2006; Levitt, 2009; Msall & Park, 2008; Rosenbaum, 2003). Msall and Park (2008) emphasized that, "the main goal of any management program is to help the child with CP optimize performance in mobility, functioning in daily activities, educational attainment, and social participation" (p. 811). They also pointed out that the most important goals of treatment should be to provide children with an opportunity to fulfill their fullest potential in all areas, including physical, psychological, cognitive, and social spheres (Krigger, 2006; Levitt, 2009; Msall & Park, 2008; Rosenbaum, 2003).

Physical therapy is the one of the most common current treatments. According to the World Confederation for Physical Therapy (2016) this treatment:

> provides services to individuals and populations to develop, maintain and restore maximum movement and functional ability throughout the lifespan. This includes providing services in circumstances where movement and function are threatened by ageing, injury, pain, diseases, disorders, conditions or environmental factors. Functional movement is central to what it means to be healthy. Physical therapy is concerned with identifying and maximizing quality of life and movement potential within the spheres of promotion, prevention, treatment/intervention, habilitation and rehabilitation. (para. 1)

Levitt (2004) pointed out that the objectives of physical therapy for individuals with CP vary depending on age and the severity of the condition. A variety of techniques are used for enhancing balance, equilibrium, and coordination to improve functional activities (Levitt, 2004; Tirosh & Rabino, 1989). In physical therapy, the treatment focuses on assisting the person with CP to maximize functional control of the body, and to increase gross motor function which will also improve quality of life

(Ketelaar, Vermeer, Hart, van Petegem-van Beek, & Helders, 2001; Levitt, 2004; Tirosh & Rabino, 1989).

Few researchers have studied the effectiveness of physical therapy on the balance and quality of gait of children with CP. One was a study by Shumway-Cook et al. (2003), in which children with CP stood on a platform to experience perturbations. The sudden unexpected outside forces or movements of the platform stimulated unconscious reactions in the children. Sessions of 20-25 minutes per day for five consecutive days were scheduled to see whether there would be improvement in the children's reactive balance. Electromyography was used, before and after training, to record the changes in neuromuscular responses. The center of pressure (COP) was also measured to assess how long it would take to regain balance. The result of this study indicated that there were significant improvements in the children's ability to regain stability even in this short time frame. This study demonstrated that repeated training may improve sequencing and timing in terms of reactive balance. However, some research indicated that such treatments are questionable (Anttila, Autti-Rämö, Suoranta, Mäkelä & Malmivaara, 2008; Bartlett, 2002; Harris & Roxborough, 2005; Jeglinski, 2010; Parkes, 2004). Parkes (2004) pointed out that "the research evidence in support of the effectiveness of physical therapy as provided by trained professionals in relation to children with developmental disabilities is inconclusive" (p. 470). Bartlett (2002) explained that, "evidence supporting factors predicting motor change for children with cerebral palsy is minimal" (p. 237). In addition, several critics indicate that physical therapy has not shown effectiveness for those with CP. According to Jeglinski (2010), the "evidence for the effect of physical therapy on adolescents with cerebral palsy is sparse and therefore there is an urgent need for well-designed physiotherapeutic trials for these people" (p. 773).

Jeglinski's (2010) meta-analysis reviewed 675 articles and engaged Tulder, Furlan, Bombardier, Bouter's (2003) criteria list (see Appendix C) for methodological quality of research. Jeglinski (2010) added the following three more criteria: "(1) validity and reliability of assessments tools (2) existing follow up time that is long enough to see changes (3) the use of relevant statistical methods" (p. 773). Applying all of the above parameters resulted in identifying only 13 studies of the cohort of 675 that met the inclusion criteria. Further, only two out of those 13 studies randomized participants to treatment or control groups in an effort to provide evidence of effectiveness.

Anttila, Autti-Rämö, Suoranta, Mäkelä and Malmivaara, (2008) also undertook a systematic review exploring the effectiveness of physical therapy for children with CP. All the randomized controlled trials of physical therapy interventions between 1990 and 2007 were included in this review. They found that "Moderate evidence of ineffectiveness was found of strength training on walking speed and stride length" (p. 8). Therefore, the effectiveness of physical therapy as a therapeutic tool remains inconclusive.

Dance Movement Therapy (DMT)

Definition

Dance has been used for healing purposes since ancient times (Levy, 1995). However, dance/movement therapy, which developed in the 1940s, only became recognized as a profession with the founding of the American Dance Therapy Association (ADTA, 2015) in 1966. The ADTA (2015) defines dance/movement therapy as "the psychotherapeutic use of movement to further the emotional, cognitive, physical and social integration of the individual" (para., 1). The majority of dance movement therapy (DMT) studies address the emotional and social benefits of

this therapy on various populations, such as mental health clients or those with special needs (Allain –Murphy, 1988; Baum, 1995; Capello, 2009; Duggan, 1980; Giannone, 1993; Kierr, 1995; Klainmen, 2009; Lavender, 1995; Leventhal, 1980; Levy 1995; Mala, Karkou, & Meekums, 2012; Robyn, 2014; Rose, 1995; Tortora, 2013).

DMT and Cerebral Palsy

This researcher worked under the assumptions that DMT provides: (a) Engaging, motivating and playful environment/space; (b) Verbal and non-verbal expression; (c) Holding safe environment/space; (d) Focus on abilities rather than disabilities; (e) Multimodal access to an individual (cognitive, psychosocial, physical); and (f) An increase the mechanical and qualitative aspects of physical function. These assumptions are explored and in part supported by literature, as follows.

DMT and Emotional and Social Benefits

Engaging, motivating and playful environment/space. Engaging, motivating and playful environment/space is significant for children with CP. From the moment parents are informed that their children have CP, they begin the searching process to find help and support for their child (Basaran, Karadavut, Uneri, Balbaloglu & Atasoy, 2013). Their journey involves interaction with physical therapists and orthopedists, eye specialists and neurologists, gastrointestinal specialists, speech therapists, and special educators, among others. Creative and playful activities for children where they are engaged and motivated are not often a priority (Howard, 1996; McDonald, 1985; Missiuna, & Pollock, 1991; Rigbyab & Gaikc, 2007). Therefore children with special needs do not participate in these activities with as much intensity as normally developing children (Bult, Verschuren, Jongmans, Lindeman, & Ketelaar, 2011; Imms, Reilly, Carlin, & Dodd, 2008; Palisano, Rosenbaum, Bartlett & Livingston, 2008; Wuang & Su, 2012). However, when they

do participate in DMT sessions, the therapist provides a space where a client/s can develop skills in a playful and engaging manner. As Sacco (1985) pointed out, "DMT sessions for persons who are physically disabled may provide an environment where adaptive skills may be developed in a playful, pleasurable manner" (p. 54). DMT has the capacity to motivate children to join participatory activities.

Verbal and non-verbal expression. Another advantage of DMT is that it invites and promotes self-expression verbally and especially non-verbally. As Levy (2005) pointed out: "Since time immemorial, we have understood that words alone are not enough to express the totality of experience" (p. 1). Disabilities, whether physical, cognitive, or emotional, may cause a great deal of frustration in the lives of those affected. People suffering from these afflictions mostly have difficulty expressing themselves (Breiera, Grayb, Fletcherc, Foormanc, & Klaasd, 2002; Pirilaa, 2007). By enabling creativity and encouraging expressive ability and embodiment, DMT offers many possibilities and options for successful verbal and non-verbal expression of feelings and ideas that all children share including those with special needs including CP (Capello, 2009; Chaiklin & Wengower; Duggan, 1978, 2009; Leventhal, 1982; Levy 1995; Tortora, 2006).

Holding a safe environment. In all arts therapy modalities a holding safe environment is one of the most significant features for achieving therapeutic goals (Austin, 2001; Barcellos, 2006; Choi & Goo, 2012; Jennings, 1993; Jones 2005; Hinz, 2009; Landy, 1994; Levine 1999; Montello 1999; Rubin, 2009). "Holding environment" is a term from Winnicott (1965). During development the mother or care taker provides a holding environment for the child, a psychological space which fosters emotional growth. Likewise, in therapy a therapist provides a holding environment for a client. DMT is no exception to this. Without providing a safe

environment/space it is very difficult to achieve a therapeutic alliance (Chaiklin &Wengrower, 2005, Dannunzio, 2014; McCarthy, 2008). Creative arts therapists use "distancing techniques," also known as projective techniques, for providing "a holding environment/space" to realize the healing potential of the arts. Bullough (1912) was one of the first writers to state in philosophical terms the concept of "distancing" in art. According to him:

> This distance appears to lie between our own self and its affections, using the latter term in its broadest sense as anything which affects our being, bodily or spiritually, e.g., as sensation, perception, emotional state or idea. Usually, though not always, it amounts to the same thing to say that the distance lies between our own self and such objects as are the sources or vehicles of such affections. (p. 91)

Bullough (1912) explained that creating art demands detachment from self to most effectively weave the aesthetic tapestry. One of the early articles about aesthetic distancing in relation to the arts therapies was Landy's discussion in 1983. Landy based his ideas in the research of sociologist Thomas Scheff (1981), who argued that aesthetic distance is the optimal state of balance between affect and cognition, leading to catharsis, which Scheff (1981) characterizes as a balance of distance.

In applying aesthetic distance to work in the arts therapies, practical, personal concerns recede giving one the ability to de-center, i.e., to distance from the demands of everyday reality (Glass, 2006; Halprin, 2003; Hinz, 2009; Johnson, 1999; Knill & Levine; 2005; Landy, 1983; Levine, 1992). In this way clients are able to enter the realm of the imagination, from which they can explore their dilemmas from the distance of the art medium. Arts therapists employ the various mediums of movement, roleplay, art, music, song, photography, and poetry to move their clients into the

imagination (Brook, 2006; Johnson, 1999; Karkou &Sanderson, 2006; Knill & Levine, 2005). Fictional reality flows from these techniques using metaphors and symbols as expressions of the self. Expression in this aesthetically distanced realm helps participants to clarify and resolve areas of emotional and psychological discomfort.

Often in daily life, painful emotions are repressed since they may be overwhelming. However, in the fiction expressed through arts an emotion can be experienced indirectly (Hinz, 2009). According to Hinz (2009) "A symbol can act as a bridge between outer existence and inner meaning; it has the capacity to describe an individual in his (her) entirety, which a cognitive verbal description cannot do" (p. 146). In DMT that experience draws upon visualization, imagery, metaphor and symbol to foster safe expression. DMT especially encourages this expression through movement. Imagery, metaphor and symbols properly applied in DMT stimulate the intended kinesthetic response (Berrol, 2006; Chaiklin & Hilda, 2009; Halprin, 2003; Hinz, 2009; Koch, 2014; Leventhal, 1980; Levi, 1995, 2005; Payne, 2016; Samaritter, 2009; Tortora, 2001, 2006). Therapy may include asking a child to move like a mouse or to reach up to touch the red apples in a tree or to visualize the movement before physically doing it. This stimulates mind and body at the same time and prepares a child for difficult motions not only emotionally but also neurologically (Ellis, 2001; Ferris, 2008; Meekums, 2002).

In addition to using distancing to create a safe space for expression, the therapist may also establish appropriate boundaries and structure that create a beneficial holding environment (Duggan, 1978; Leventhal, 1982; Levi, 1995). A well-marked and clear structure is fundamental in working with individuals with disabilities since they thrive with more "containment" and "holding". As Duggan

(1995) pointed out "it is important for all dance therapists to consider the use of structure in our work. Structure is always present, whether it is obvious as in groups for severely retarded children" (p. 225). She also added that "structure holds" the client providing an environment in which a safe and free response is possible. Structure also "'holds' the movement" (p. 226). In DMT rhythm and music, props and rituals, as well as contracts and rules can act as a container, "the play space within a larger setting which allows for creativity and spontaneity to occur within a set of clearly defined boundaries and rules" (Lewis & Johnson, 2000, p. 454). If play space as a container is well structured, risk taking is easier for the client. In DMT another container is the therapist (Robbins, 1988). According to Robbins (1988), the therapist intentionally becomes an 'empathetic container' to reflect and mirror a client's movements and feelings to support therapeutic risk-taking and enhance growth. Hence in DMT safety is the one of the most important concepts and principles and there are various techniques that enable individuals to be safe in a holding environment (Halprin, 2003; Hinz, 2009; Lundy & McGuffin, 2005; Tortora 2006).

Focus on abilities rather than disabilities. DMT also helps individuals to focus on positive aspects of the self (Koch, 2006; Levy, 2005; Nemetz, 2006). The focus for individuals with disabilities has traditionally been upon limitations and problems (Bly, 1991). Family medical encounters are excellent examples of this. A conventional workup for a child with CP examines the physical being with blood work, scans of many systems and evaluations of movement. Feedback to family includes all the deviations from the norm and usually a dismal prognosis for the long term based on inability or deficits in the systems. Rarely do existing treatment for CP encourage family members (Bairda, McConachieb, Scrutton, 2000; Rosenbaum, 2003; Wanamaker & Glenwick, 1998). The family becomes acclimated to the fact that the

physical impairments may be a lifelong struggle and that potential is based on physical expression alone. Unfortunately, societal messages parallel these same discouraging discourses, which emphasize the child's inabilities more than their abilities (Sacco, 1985). Therefore individuals with special needs spend almost all their lives exposed to the concept of disability. Sacco (1985) explained that,

> It is possible that the individual's interaction with the environment may produce a spiral of failures and negative experiences. A vicious cycle may occur whereby the individual reinforces that he or she no longer has any effect upon the environment, producing an external locus of control and feelings of defeat and incompetency. (p. 50)

This cycle cracks and breaks only when the individual starts to experience positive accomplishment. Tasks which nurture self-sufficiency and competency eventually bring about a change in orientation to affirm self-esteem. DMT can contribute to this affirmation by helping one to explore and discover what is possible. The focus in such a therapeutic setting is upon the healthy aspects of self in a protected environment. Failure is not part of this picture (Hackney & Earhart, 2007, 2010; Hecox, Levine, & Scott, 1975, 1976; Mandelbaum & Lo, 2014; Rabbia, 2010; Salgado et al., 2010) noted that even dance classes for individuals with physical disabilities are beneficial not only in enhancing physical skills, but also in helping to experience new found capabilities. DMT gives occasion for children to express and explore body and mind in a safe holding environment. It enables children to discover their creativity, spontaneity and playfulness. Gradually they start to develop a more positive perception of their body (Chaiklin & Wegrower, 2009). This shift to a healthier perspective fosters the ability to unearth their own coping strategies.

Multimodal access to an individual. Another advantage of DMT is multimodal access. As Kielhofner (1980a) pointed out, "Disability represents a disruption of the total system with biological, psychological, social and cultural components" (p. 737). Therefore, special needs can interrupt the complete system. For example, a child born with CP who had oxygen deprivation during birth may experience neurological damage, which causes movement dysfunction. This physical impairment is accompanied by other challenges. Psychologically, this child may feel different from sibling or peers and even unwanted. Social and spiritual isolation may result, raising existential questions. Berrol and Katz (1985) suggested that for people with central nervous system damage, an effective treatment should include a multimodal approach. This approach allows access to all domains of functioning including the cognitive, psychosocial, and physical via the sensory systems. But when one treats such client populations it is essential to consider this broader spectrum. While trying to enhance motor skills such as balance and coordination, flexibility, strength, and endurance in the biological domain, a therapist also needs to work within the psychological domain to develop a positive body image and to increase self-esteem. The integrative approach of DMT has the power to reach every sphere. It can provide children with CP positive psychological effects while enhancing their motor control and postural stability.

DMT enhances social skills and social interaction and communication (Allain–Murphy, 1988; Baiori, 2003; Barnet-López et al., 2015; Espenak, 1975; Duggan, 1978; Giannone, 1993; Levental, 1982; Levy 1995; Tortora, 2001, 2006, 2013). Children with CP have been shown to have more difficulty in social skills, to be less accepted by peers, and to display an inability to effectively communicate with others. Early intervention is a crucial element to prevent or alleviate later social problems

such as emotional issues, rejection, and isolation (Csoti, 2001; Missiuna & Pollock, 1991). Baiori (2003) discovered that the use of imitation and attunement was lacking in children with CP. Building upon Baiori's research, one of the main objectives in DMT is to encourage healthy social interaction with others through nonverbal and verbal expression. Social skills developed through constructive social interactions with the other group members using appropriate group dynamics are an integral part of this picture. The sense of play and non-verbal communication cues utilized in DMT offer children who suffer from CP opportunities to learn and practice social skills, to relate and communicate with others. Csoti (2001) points out "body language messages are far more important than the actual words a child uses because most of the message is actually communicated through the body actions and the sound of the voice: only a small percentage is communicated through words alone" (p. 117). Eye contact, gestures, facial expressions, touch, imitation and attunement are the main characteristics which contribute to a social interaction (Baiori, 2003; Tortora, 2006). Espenak (1975), one the of the pioneers in DMT, pointed out that:

> therapy's efforts for reaching and effectively changing the undeveloped self-image of the (disabled) has been a great help in removing some of their social barriers and in overcoming their fear of interpersonal contact by offering them a tool for communication and a physical – emotional program to help them grow as personalities. (p. 3)

In group settings, just being part of a group and working together operates to increase a sense of belonging. Risk taking in such a setting teaches trust in others and creates powerful social and emotional bonds. Each member is acknowledged and their contributions appreciated by every other member (Bräuninger, 2006; Schmais, 1985)

Due to the ongoing focus upon the negative parts of self, individuals with CP have low self-esteem: "Contingent with feelings of low self-esteem are inadequacy, inferiority and lack of self-confidence" (Chaiklin & Wengrower, p. 86). Since there is a safe holding place in DMT that is acknowledged and supported by each group member, the individual is encouraged to try new movement without the fear of judgment or failure. New skills can be introduced and mastered in this structured setting. Confidence and self-esteem flow from these experiences. As Capello (2009) emphasized: "Specific dance activities foster positive self-esteem (such as) 'spotlight dance' and 'change partner dance'. Increased self-esteem is illustrated by brighter affect and smiling, sustained eye contact, as well as a spontaneous applause from group members for each other's accomplishment" (p. 87). Constant comparison to a norm that may not be feasible is absent. Success with these progressive tasks fosters a sense of pride and inevitably contributes to a more positive attitude and nurtures self-esteem.

DMT and Physical Rehabilitation

An increase in the mechanical and qualitative aspects of physical function. DMT's positive effects in the emotional and social realm are mirrored in physical improvements and motor functioning. As discussed in the previous section, children with CP suffer various combinations of motor impairments, including difficulties controlling the muscles, spasticity, poor balance, coordination and gait abnormalities. Duggan (1980) emphasized: "Not only do the sessions promote socialization on a one-to-one basis, but the child's physical condition benefits from the contact and movement" (p. 49). Duggan also stated that one of therapeutic goals in DMT session for children with CP is expanding their movement repertoire.

While the range of studies has grown, there remains a conspicuous gap in the literature about the relationship between dance therapy and neuromuscular development and disease. The limited literature on dance therapy and neuromuscular disease focuses mainly on Parkinson's disease (PD), multiple sclerosis (MS), and stroke. As Erhardt (2009) points out in studies done with older adults with PD, dance has proven to be very effective in improving the motor and mental scores of these patients. Batson (2010) conducted a pilot study on the effectiveness of modern dance with older adults (50-85 years old) with PD. Five males and six females with early-to-middle stage Parkinson's attended a 3-week training that consisted of nine dance classes. The Fullerton Advanced Balance scale was applied to assess and compare balance safety before and after the dance intervention. The results showed statistically significantly improved balance for the group at the .05 level. However there are two issues in terms of the validity and reliability of this study, including not only the small sample size (N=11), but also the lack of a control group.

Salgado, Auxiliadora, and Vasconcelos (2010) used dance as a therapeutic tool for a patient diagnosed with multiple sclerosis (MS) to enhance balance. Dance interventions helped the patient to gain greater postural and balance control demonstrated by positive results in neurological function scales such as the Expanded Disability Status Scale (EDSS), the Scripps Neurological Rating Scale (NRS), and the Minimal Record of Disability (MDS). Salgado et al. pointed out that "dance improved the patient's awareness of her corporeal outline and consequently her balance, making her aware of her body through musical rhythms and melodies, and promoted movement awareness" (p. 60). Sacco (1985) emphasized that "through movement can one come to know one's potential as a physical being. Dance can provide a means for the human system to experience movement and develop motor skills in a manner

which is pleasurable, successful, and satisfying to the individual" (p. 60). Even earlier, Brunnstrom (1965, 1970) noted the benefits of social dance in enhancing neuromuscular facilitation. Brunnstrom (1970) also reported that dance can be especially therapeutic for people with hemiplegia providing them with better control of the weak side.

More recently, Hackney (2007) compared the effectiveness of Argentine tango dancing on balance and gait problems of individuals who lived with and without PD. Nineteen healthy, older adults and 19 with PD attended tango classes for 13 weeks. Both groups showed improvements in certain measures, but the Parkinson's group improved more than the control on all measures of balance, falling, and gait. The results suggest that Argentine tango may be an appropriate, enjoyable, and beneficial activity for all older adults. In addition, Hackney later suggested that, "dance may effectively address motor impairments brought on by aging and illness, as dance requires dynamic balance and adaptability to changing environments" (p. 42). While the study was compelling, its design critically lacked a control group.

Duncan and Earhart (2012) did another study exploring if Argentine tango dancing had been effective in enhancing of physical function of people with Parkinson disease. Sixty-two participants off medication were randomly assigned to either intervention or control group. Intervention group attended the tango classes a twice weekly for a year. They were assessed third, sixth and twelfth months. Assessment measures included the Movement Disorders Society-Unified Parkinson Disease Rating Scale 3 (MDS-UPDRS-3), MDS-UPDRS-1, MDS-UPDRS-2, MiniBESTest balance test; Freezing of Gait Questionnaire (FOG_Q); 6-Minute Walk Test (6MWT) and Nine-Hole Peg Test (9HPT). The result indicated that intervention group (tango

group) improved a lot and had significant differences in most measures, however the control group presented little change on these measures.

Dance and Neuroscience

Recent discoveries and advancements in neuroscience provide valuable knowledge and understanding to the field of psychotherapy and have application in DMT and Music Therapy (MT) (Berol, 2006; Jeong, Hong, & Lee, 2005; Karpati et al., 2015; Magee & Stewart, 2015; Moore, 2013; Thaut et al., 2007). In dance movement therapy, the physical body is one of the crucial foundations, so association between DMT and neuroscience is more natural. The discovery of mirror neurons (MN) was a breakthrough.

MN were discovered while experimenting with monkeys (Rizzolatti, 2004). These special neurons were not only activated when monkeys were performing but also when they were still and observing others performing. Berrol (2006) explained further: "studies are revealing that the identical sets of neurons can be activated in an individual who is simply witnessing another person performing a movement as the one actually engaged in the action or the expression of some emotion or behavior" (p. 302). This indicates that we can feel what others feel by imitating/ mirroring them.

Kattenstroth, Kalisch, Holt, Tegenthoff, and Dinse (2013) did study with healthy older adults (*N*=35). The older adults in intervention group attended a dance class ones a week, during six months. They pointed out "dancing is increasingly used as an intervention because it combines many diverse features making it a promising neuroplasticity-inducing tool" (p. 5). After six months after the post that there was no change in the measures of control group however the ones in dance group increased their "posture and reaction times, but also for cognitive, tactile, motor performance, and subjective well-being" (p. 5).

Other research studies have been done on human beings. Inspired by mirror neurons studies, Winters (2008) gathered 41 participants, four male and 37 female, who were students of creative arts therapies and psychology. In this study, participants were asked to recognize emotions either by observing them from photos or by embodying them, based on the Diagnostic Analysis of Nonverbal Accuracy Test of Posture. Although there were some limitations in this study in terms of gender dominance and participants' profession, the study suggests that whether emotional responses were through observing the photos or through someone's embodiment, the results were essentially the same. The one exception was the feeling of anger. Anger was the feeling most identified when it was embodied. So by simply watching a person crying, one has the same neurological responses as one was crying. This is a very interesting concept as applied in DMT: by observing, one can elicit the same neural activity as performing. Winters added that mirror neurons are especially relevant to DMT since mirroring exercises are one of the main techniques used to help empathic connection. All these developments are so promising since MN are active both when individuals perform an action and when they observe someone else perform the action. This means that the motor planning parts of the brain become active in a child with CP both when the child is doing the movement and when the child is observing another doing the movement.

Rhythmic Auditory Stimulation (RAS)

Recent findings in neurological music therapy (NMT) also suggest the benefits of external rhythm for quality of gait. Thaut (2005), a theorist and researcher, defined neurological music therapy (NMT) as "the therapeutic application of music to cognitive, sensory, and motor dysfunctions due to neurologic disease of the human nervous system" (p. 126). Rehabilitating movements that are naturally rhythmical like

walking are employed in rhythmic auditory stimulation (RAS), a technique widely utilized in NMT (Hesse & Werner, 2003; Thaut et al., 2007). As RAS was defined before, it is "neurologic technique uses the physiological effects of auditory rhythm on the motor system to improve the control of movement in rehabilitation and therapy" (Thaut, 2005, p. 139). In RAS, a therapist matches the client's cadence through the tempo of the music. During training, gradual increases in the rhythm (music) promote healthy gait patterns which include cadence, stride length, symmetry of stride and velocity. Kim, Kwak, Park, and Cho (2012) also point out that "The repetition of an external timing cue impacts the regulation of the movement pattern, consequently, the spinal motor system is optimized for the movement pattern following the reticulospinal pathway at the level of the brainstem" (p. 905). RAS therapies provide promising outcomes for the efficacy of music on movement in the treatment of neurological disorders, including CP.

Music and rhythm are effective in stimulating physical responses by activating motor neurons and training of the timing of muscle activations (Thaut, Kenyon, Schauer, & McIntosh, 1999). Dance movements which are rhythmically structured may also provide an external cue for muscle activation (Thaut, 2005). In 2007, Kwak studied the effectiveness of RAS in gait training of children with CP. Thirty children with CP were divided in three groups; the control group, the therapist-guided training group and the self-guided training group. The control group received traditional gait training, the therapist led group and the self-led – a therapist was an observer group received traditional gait training combined with RAS. For all groups, there was significant difference between the pre and post-test in the in the stride length, gait symmetry and gait velocity.

Conclusion

Movement is critical to many human activities and experiences: play, cognitive and emotional development, and social activity (Cieza & Stucki, 2008). Therefore, motor impairments such as those found in individuals with CP have not only physical but also emotional and social effects that can reduce an individual's quality of life. As previously mentioned there is no remedy for CP "and potential positive effects of most interventions on individuals with CP tend to be modest at best" (Damiano, 2006, p. 1537). As explored in the literature, one of the most widely used interventions for motor impairment caused by CP is physical therapy. Reviewing research on the effectiveness of physical therapy shows that this intervention has inconclusive results.

Although studies on dance and DMT and neuromuscular development including those addressing neurological impairments and related motor dysfunctions are limited, dance has been found to be effective in enhancing the motor functions of individuals who live with neurological impairments across the age range. If the assumptions discussed above have merit, DMT may be considered a valuable therapeutic intervention for physical as well as emotional and social deficits for individuals with CP. DMT may improve not only psychological wellbeing, social skills and quality of life but also quality of gait. Moreover, innovations in neuroscience can provide new directions for treatment and further study. Given the inconclusive success of physical therapy and the promise of DMT, investigating the effects of DMT on improving quality of gait and socialization of children with CP can positively contribute to the field.

CHAPTER 3

Method

Research Question

Is DMT effective for enhancing quality of gait and socialization of children with Cerebral Palsy (CP)?

Study Design

In this study, a quantitative method was applied to explore both the effectiveness of dance movement therapy on enhancing the quality of gait and also socialization of children with CP. The intervention group (*n*=23) received 45 minutes of dance movement therapy. The control group (*n*=21) received other art and free play activities for 45 minutes. Both groups participated in a group setting for 10 sessions three times a week**.** Measures of velocity, stride length and cadence were obtained by a registered physical therapist using Motion Analysis and measures of social skills. Problem behaviors were also obtained by psychologists using the Social Skills Rating Scale (SSRS), before and after intervention.

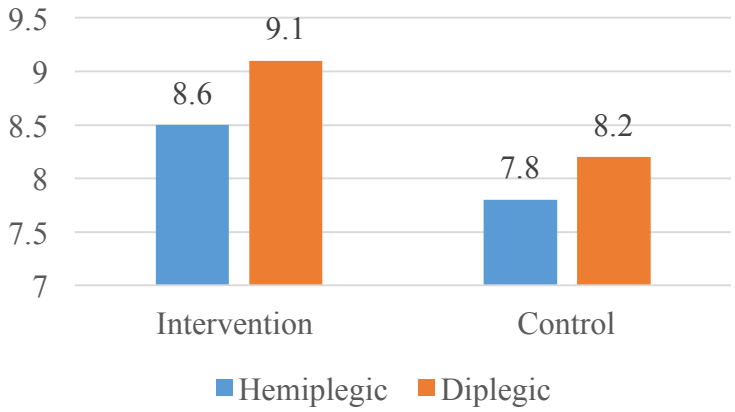
Participants

A sample of children (*N*=44), 24 boys and 20 girls (see Table 1), 21 children with hemiplegic CP, 22 children with diplegic CP, and one child misdiagnosed between ages of six to 12 was selected from an outpatient rehabilitation center in Istanbul, Turkey. All were provided with therapy and rehabilitation including creative arts therapies in addition to physical therapy, special education and speech therapy. The physical therapists and the educators were asked to refer any clients who met the following three criteria:

1. Six to 12 years of age
2. Diagnosis of hemiplegic or diplegic CP
3. Level I or II in the Gross Motor Function Classification System (GMFCS)

Children's ages ranged from six to 12 ($M = 8.4$). Further descriptive statistics of the sample are included in Table 1.

Figure 1. Age in Years for the Sample



In the study, children diagnosed with hemiplegic CP and diplegic CP were placed in separate groups since these two diagnoses affect children's movements in very different ways. As mentioned, in hemiplegia, impairment affects only one side of the body while in diplegia, both legs may be also involved. Therefore, within each diagnosis the level of motor functioning, especially balance and coordination, is variable which affects intervention strategies that can be used.

The Gross Motor Function Classification System (GMFCS) classifies children with CP according to their ability to ambulate (Palisano et. al., 1997). The classifications range from Level I which includes the ability to perform gross motor skills with some limitation in balance, speed, and coordination to Level V in which all areas of motor function are severely affected and a wheelchair is required to ambulate. Children at levels I and II were recruited to participate in this study. At level I, the children can walk indoors and outdoors and can go uphill and downhill. They can go

upstairs and downstairs without assistance. In terms of gross motor skills such as running and jumping, their coordination, balance and speed is limited. At Level II children also walk without help. However, they may have difficulty walking long distances and may need assistance in going up and down the stairs or walking on uneven terrain.

The parents of children eligible for the study were contacted by phone and provided with information about the study. Written information regarding the study was forwarded to parents expressing interest in the study. Written consent for participation in the study was obtained from the parent/guardian. In addition the child gave assent. Both parents and children knew that they could withdraw from participation at any time without penalty

Measures and Data Collection

Gait analysis. Measures of velocity, stride length and cadence were obtained by using the Motion Analysis System. Pre- intervention and post- intervention testing was completed for both groups by registered physical therapists who were supervised by an orthopaedist.

Orthopaedists, physical therapists, and engineers have used Motion Analysis to study human movement for decades. More recently, physiatrists, neurologists, and occupational therapists have adopted the technique as well, using it to assess clients with movement disorders (Mulder, Nienhuis & Pauwels, 1998).

This project employed Orthotrak – a three dimensional analysis developed at the University of Florida and the Miami Children's Hospital (Orthotrak Reference Manual, 2009) to measure the level of quality of gait in children. In this analysis, the physical therapist placed 25 markers on the child's joints after measuring joint angles.

Each child was recorded by eight infrared cameras and two video cameras while walking on a specified platform. All measurements were collected by a physical therapist. Recorded data was transferred to a computer by the researcher. The gait analysis variables most commonly used to describe a gait pattern include: (a) velocity (b) stride length (c) cadence. These measurements are included in this study.

Gait parameters were defined as follows (Nilssen & Helbostad, 2003; Nilssen, Helbostad, Talcott & Toennessen, 2004; Sutherland, 1997): *Velocity*, the product of cadence and step length, is expressed in units of distance per time; *Stride length* is the distance between two successive placements of the same foot (it consists of two step lengths the distance between successive points of initial contact with the same foot); *Cadence* is calculated in steps per minute.

Socialization. In this study, the Social Skills Rating Scale (SSRS) for six to 12-year-olds was used. The scale was developed by Gresham and Elliott (1990) and it has been translated into Turkish by Tekinarslan, Pinar, and Sucuoglu (2012). Validity and reliability studies were conducted based on the data obtained from 562 mothers for norms in the Turkish model. The SRSS has a separate questionnaire for teachers, parents and students which measures social skills, problem behaviours and academic competence. In this study the parent questionnaire was used to measure social skills and problem behaviours. SSRS was provided to a parent/caregiver pre and post intervention to compare the social skills and problem behaviours of the participant.

Format and Procedure

The gait analyses pre-tests were scheduled after all participants were informed about the test and written consent was submitted to the researcher. The SSRS test was also provided to a parent/caregiver before the intervention to document social skills and problem behaviours of the participants at this point in time. After pre-testing,

participants were randomly assigned to the intervention group or the control group according to their diagnosis (hemiplegic or diplegic). The registered dance movement therapist facilitated 10, 45-minute dance movement therapy sessions (*n*=23). The artists and counsellors led 45-minute art and free play activities (AA) with the control group (*n*=21). Each group met for 10 sessions. The same structured theme to achieve therapeutic goals was implemented for every session in both the intervention groups (DMT) and the control groups (AA). Therapeutic goals the 10 themes selected by this researcher for both DMT group and the control group were: "hello," "animals," "friends," "me and others," "emotions," "colors," "elements," "listening," "photographs," "Goodbye." Therapeutic goals and themes were adjusted according to the needs of group participants after the groups started.

Intervention group (DMT). For the DMT group, Marcia Leventhal's (1999) Five Part Session approach for applying the framework to meet therapeutic objectives was used. Leventhal drew upon multiple influences from Gestalt therapy and psychosynthesis. Leventhal's (1999) practice guidelines assume that every human being has a unique essence and that dance can provide direct access to this essence thus enhancing potential. She proposes that the therapist encounters a client "on the developmental level most foreground for the individual at the time of interchange" (Leventhal, 1987, p. 48). This allows the most beneficial flow of rhythm, space and energy.

According to Leventhal (1987, 1980) there are five parts in each session: warm up, release, theme, centering, and closure. These parts comprise the work in each meeting. This approach emphasizes that dance and movement enables one to 'unfold' in a natural way. Simple games using rhythmic movements and imagery are employed in warm up (Leventhal, 1987, 1980). These games explore several movement qualities

such as quick/sustained and strong/light. The second stage aims to relax the body and to allow energy flow, thus decreasing muscular tension. This relaxation has been one of the primary goals in the on-going dance movement interventions. At the third stage, themes should begin to emerge. Movement becomes less structured and spontaneity is encouraged. Participant attention to movement during this time causes ability/disability distinctions to fade. The participants can become less fearful and feel more comfortable and free in their movement during this third stage. The centering stage draws upon grounding exercises which are designed to help children focus their attention on the present moment in order to reconnect to their bodies. Closure endeavours not only to decrease muscle tension but also to increase awareness about the body. A sense of completion and accomplishment will hopefully accompany this stage for each participant.

The DMT sessions were planned to include three sequential segments in each session. Warm-up, theme development and closure were selected. Warm-up exercises consisted of simple body part isolated movement and progressed to movements that required more generalized coordination. During theme development, imagery and rhythmic movements such as strong/light, big/small, hard/soft were designed to enhance the movement repertoire related to a theme chosen. Closure provided an opportunity for relaxing/reducing muscle tension and refocusing heightened awareness. It also enabled the children to have a sense of completion and accomplishment.

In summary, dance movement therapy groups focused each week on enhancing motor control, posture, trunk stability, and coordinating motor movements. In every session different musical pieces were played to inspire participants and

stimulate motor functioning accordingly the themes. The researcher observed the group each sessions to take notes and to evaluate progress.

Session 1. In both first (hemiplegic) and second (diplegic) groups the same session plans were applied. The themes in this first session were “hello” and “me.” There were three main goals in this first session: greeting everyone, acquiring a sense of group and individual emotions and functioning level and setting the group contract. These beginning sessions were also meant to provide the children a sense of safety and trust so that they could build alliances in the group. The session began with children standing in a circle to carry out a simple name and movement exercises. Various greeting exercises followed as children acknowledged each other with eye contact and smiles. Each child was encouraged to dance in his or her own style. Some games followed to emphasize body awareness. They also served to warm up joints and body parts. These tasks were intended to provide an opportunity for verbal and non-verbal expression. Group comparisons delivered the following results: The first group, which was hemiplegic, was 81.8% female and was rather scattered. Almost every group member had a difficult time moving together. However, the second group of diplegic members, which was 91.7% male, exhibited good group cohesion. Although members of this second group did not know each other it seemed as if members were working in a familiar unit. They were able to move with ease and were helpful to each other from this first day. Only one child in this second group remained timid and did not assimilate well into the group.

Session 2. In this session the theme was “animal.” Both groups wanted to start with names and movements. In subsequent sessions, this exercise became an important part of the opening ritual. After each participant choose their favorite animal, they moved as animals with the use of gestures and sounds to explore

different movement qualities which included strong/light, big/small, fast/slow. The objective was to build not only therapeutic alliance with the therapist, but also to foster comfort and confident in moving with each other in the space. Interesting enough, while the children were moving as animals in a forest, the theme of 'home' emerged which resulted in each child creating their own nest. This can be interpreted as their attempt to feel safer in this new space. In both groups all the children seemed extremely engaged. Moreover, everyone in both groups seemed to enjoy an imaginary journey exploring spaces in the room. Various movements, postures, crawling and jumping were encouraged by the therapist as were different paces. This was the first time the group used the whole space. In this session the HG (Hemiplegic Group), participants were more comfortable moving and exploring the space. However they remained scattered about the room. It appeared that this group needed further structure. The DG (Diplegic Group) participants readily embodied animals that moved toward an imaginary forest. Compared with the HG group they were much more supportive and in tune with each other. After this session feedback from the parents indicated that most of the children could not wait to return to the DMT sessions.

Session 3. This session's theme was "friends." It began with routines to warm up joints and body parts. These were followed by mirroring exercises including partner mirror, voice mirror and face mirror. A goal in this session was to encourage roles of leader and follower, talker and listener. In addition, pulling, pushing and moving together were explored. Again motivation was exceptionally high. Although two participants were missing in both groups (HG and DG), group dynamics and energy remained quite positive in HG. The energy seemed to push the children to find new partners and explored body parts and space. Partnering maneuvers such as elbow to elbow and finger to finger were encouraged. Two children, who seemed shy in prior

sessions, looked much more confident and asked to initiate the dance. In the DG, the concept of being leader and follower brought up the dynamic of 'competition'. Group cohesion markedly increased in both groups. At this point, sense of flow and camaraderie was still developing in the HG and not well formed as it was in the DG.

Session 4. In this session the themes were "me" and "other." The major goal was work on personal boundaries. After completing a routine warm up the first exploration was verbal prompting for what is too close/what is too far. Violation of personal space was common in both groups. Games were played to increase awareness of what personal space involves. In addition, directions in the space such as in/out, up/down, side to side were explored. Clapping to the rhythm of music and colorful scarves while dancing were part of this experience.

After the concept of personal space was more understandable, the question was asked in both groups: "What can we do if someone is in our personal space?" It was difficult for both groups to answer this question because of psychological as opposed to logical reasons. There were many answers but the simple answer was: "to say no." Participants worked on how to say no verbally and nonverbally. Although it remains one of the most important skills to internalize for self-protection, it was clear that this was a difficult task for the children. After practicing strategies for saying "no," a Pilates ball was placed in the middle of the circle. Participants were encouraged to touch the ball with an arm and then move away. This session saw HG members forming a closer bond. The HG participants were also calmer and more contained. The use of extra structure and relaxation techniques may have contributed to this development. In DG each participant appeared more confident and free in his or her movements. Even the one boy who was timid at the beginning was participating in almost all activities while siting.

Session 5. The theme of this session was “emotions”. After our opening rituals and warming up exercises, the topic of feelings was introduced. To explore different emotions games and songs were played that were able to call forth a variety of emotions.

The goal of this session was to not only acknowledge others’ feelings but also to embody some of the basic emotions such as happiness, sadness, anger, and fear. In this session the therapist also reminded the class that five sessions were completed and five more remained. The some participants expressed a desire for continuing in this group for the whole year like a regular school well beyond the five remaining sessions. Influenced by the theme of this session some were able to express sadness at the idea of ending the group. DG had more ease expressing feelings than HG.

Session 6. “Colors” was the main theme of this session. After warming up exercises group members were asked about the colors in the space. As a group, they were able to point out almost every color in the studio. They were asked their individual preferences about color. In DG this work around color interestingly brought up many feelings. Conflict was a key theme. Three participants expressed dissatisfaction that one member of the group assumed a leadership role too frequently. Jealousy and power issues seem to dominate expression. In response to this conflict the therapist created subgroups, which brought forth much boundary testing. All this was not surprising since this was possibly the first time the children were given the license to express their feelings freely in verbal and non-verbal ways. They were empowered to say no as this boundary testing and opposition to authority dominated the session.

In DG the group’s energy was high but the participants were more collaborative than those in the HG group. They were supportive of each other not only

emotionally but also physically taking initiative to help each other. They did color dancing with scarves and start moving around the room while lying, sitting, crawling, and finally standing. In both groups, there seemed to be a greater comfort level with their own bodies.

Session 7. In this session the focus was on the qualities of "elements." The theme developed in a therapeutic space by using different colored feathers while participants explored, water, earth, air, fire qualities of movement. The red feather especially spoke to both groups: it was related to fire and feelings of anger by the children. Each group wanted to continue angry fire dancing. The participants often experience frustration and anger due to their disabilities and the challenges they face in daily life, however they often lack opportunities to express these emotions. The question of why other children exclude them or make fun of them surfaced. In the second group energy was also very high. They took the elements of dances further by creating a story through movements. There were also strong elements where the "anger" theme was dominant. Heroes, thunderstorms, hurricane explosions were the related themes derived through the improvisations. There was tension here between group leaders and followers. Followers did not want to acknowledge the group leaders' requests. As mentioned above, all this expression is in fact positive; participants have finally found a safe space and a strong voice to vent concerns.

Session 8. The theme was "us" and "listening to each other." In this session the goal was to encourage partnership work in forming mutual dances. After the warm-up rituals were completed further exercises were introduced. One of them was dance and freeze. Initially both groups experienced difficulty in following the directions of the therapist. By lots of repetition they were able to follow the exercise pattern. In this session elastic was used in a circle to fortify the concept of "us."

Participants were asked to find a way to dance with a partner and work on balance. During these three sessions participants took initiative for leading their partner and the group by expressing ideas for activities, initiating play and helping each other.

Session 9. In this session the theme was "photography." After the opening exercises the children were reminded that this was the penultimate session. For the theme development group memories were brought up. Those memories were embodied in movements and still sculptures. During this time a volunteer took photos to symbolize those memories. The participants had many memories to share from group sessions. Both groups expressed regret that the session had to end.

Session 10. As this session began the children were reminded that it was the last day. Some of them expressed sadness. All of them took time to remember the activities, dances, thoughts, and feelings they had shared during the past 10 sessions. For almost all the children, it was difficult to say goodbye. The group gathered also with parents to give them to opportunity to close since they seemed like they were also enjoying to share time and their experiences with each other while waiting for their children. From the perspective the researcher, there was a sense of closure.

Control group. The control group consisted of 21 children: 11 with hemiplegic CP and ten with diplegic CP. An artist and counsellors co-led the 45-minute art activities and free play activities of this group. They met three times per week over the course of three and half weeks (10 sessions). This group was guided in the same themes as the DMT group i.e. "hello," "animals," "friends," "me and others," "emotions," "colors," "elements," "listening," "photographs," "goodbye." In art-making, the children used various art media included drawing, painting, sculpting, collage and mask-making as well as free play. The main therapeutic goals for the control group were the same as those for the intervention group.

Even though this was not the treatment group, the researcher was confident that given the powerful contribution of art to healthy social and emotional engagement, benefits would also be demonstrated in this group. In fact, that was the case. There was extremely positive feedback from children and from their parents. After all children completed ten sessions, the post-tests were applied by a physical therapist to re-measure the participant's velocity, stride length, and cadence. The participants' social skills and problem behaviours were also re-measured.

Data Analysis

The measurements that were collected by the pre-test and post-test administration of the Motion Analyses and the Social Skills Rating Scale (SSRS). The results were analysed using MedCalc Statistical Software to provide descriptive statistics. The pre-test scores were subtracted from the post-test scores. That difference in scores was also analysed using MedCalc Statistical Software to provide descriptive and inferential statistics comparing each group's scores. The statistical analysis was performed using the MedCalc Statistical Software version 12.7.7. The normality of continuous variables was investigated by the Shapiro-Wilk's test. Descriptive statistics were presented using means and standard deviations for normally distributed variables and a median for the non-normally distributed variables. For comparison of two normally distributed groups, the *t*-test was used. Non-parametric statistical methods were used for values with skewed distribution. For comparison of two non-normally distributed groups the Mann Whitney U test was used. For determining the difference between pre- and post-test measures for the study participants, hemiplegic and diplegic, t test was used. This same method was employed to analyze the differences between the group of children receiving dance

movement therapy (intervention group) and those in the art activities (control group). Statistical significance was accepted when the two-sided *p* value was lower than 0.05.

CHAPTER 4

Results

The children in this study were between the ages of six and 12 years, diagnosed with hemiplegic and diplegic CP, and were Level I or II according to the Gross Motor Function Classification System (GMFCS). Their social skills and problem behaviors were evaluated by the administration of SSRS before and after intervention. Data for velocity (distance over time), stride length (the distance covered in a gait cycle), and cadence (steps per minute), were collected by the pre-test and post-test administration of Motion Analysis.

In the intervention group (DMT) ages were not significantly different between the hemiplegic and diplegic groups (p=0.542). This pattern repeated in the control (AA) group where the ages of the children were not different between hemiplegic and diplegic groups (p=0.594) (see Table 1). Between the DMT and AA groups there was also not a significant difference in subjects' age. The mean age of DMT group was 8.9 (1.9); whereas the mean age of AA group was 8.0 (1.6). (Mann Whitney U, p=0.159; see Table 2).

Table 1

Age in Years for the Sample

(Descriptive Statistics for difference between Hemiplegic and Diplegic Groups)

		N	*M±SD*	*Med (min-max)*
Intervention (DMT)	H	10	8.6±1.3	9 (6-10)
	D	12	9.1±2.3	9 (6-12)
	P[1]		**0.542**	
Control (AA)				
	H	11	7.8±1.3	7 (6-10)
	D	10	8.2±1.9	7.5 (6-11)
	P[1]		**0.594**	
Children		43	8.4±1.8	8 (6-12)

[1] *Student t test*

Table 2

Age in Years for the Sample

(Descriptive Statistics for difference between DMT and AA Groups)

	N	*Mean ± SD*
DMT	22	8.9±1.9
AA	21	8±1.6

Mann Whitney U test p=0.159

Social Skills Rating Scale (SSRS)

Social Skills. First, the hemiplegic and diplegic subgroups were compared using the difference scores in both the DMT and AA groups. There was a significant difference in the social skills scores between the H and D groups in the DMT group (p=0.012) (see Table 4) but not in the AA group. In the intervention group (DMT), there were nine girls out of 11 participants in hemiplegic group and 11 boys but only one girl in diplegic group. A similar unevenness of gender within the hemiplegia and diplegia groups was present in the control group as well (see Table 3). Therefore, these difference in social skills (see Table 4) and problem behaviors between the hemi- and diplegia groups are (see Table 6) are confounded with the gender distribution of the subjects.

Table 3

Gender of Subjects

	Boy / Girl	*N*	%
DMT	H	2 / 9	18.2 / 81.8
	D	11 / 1	91.7 / 8.3
AA			
	H	2 / 9	18.2 / 81.8
	D	9 / 1	90 / 10
Subjects		24 / 20	54.5 / 45.5

In total group 54.5 % of patients were male.

Table 4

Pre and Post Scores /Social Skills (Hemiplegic and Diplegic groups)

M(SD)		*N*	Pre-score	Post-score	Difference
DMT	H	10	35.9 (8.8)	59.4 (7.2)	23.5 (7.1)
	D	12	39.5(6.8)	55.3 (6.6)	15.8 (6.3)
	P				**0.012**[1]
AA	H	11	40 (5.5)	40.2 (4.6)	0.2 (1.4)
	D	10	43.4 (5.7)	43.1 (5.5)	-0.3 (1.3)
	P				0.418[1]

[1] *Student t test,*

Table 5

Pre and Post Scores /Social Skills (DMT and AA groups)

M (SD)	Social Skills		
	Pre-score	Post-score	Difference
DMT	37.8 (7.9)	57.3 (7.1)	19.5 (7.6)
AA	41.6 (5.8)	41.6 (5.2)	-0.04 (1.3)
P			**<0.001**

[1] *Student t test,* [2] *Mann Whitney u test*

Student *t*-tests and Mann Whitney *U* tests were also used to analyze the change in social skills scores between the intervention (DMT) and control groups (AA). There was a statistically significant difference (see Table 5). The difference scores in social skills (p=0.001) indicated a greater improvement among children in the DMT group than the children in the control group.

Problem Behavior. The difference between problem behavior scores, in the DMT group between H and D was statistically significant (p=0.003) (see Table 6) but there was no difference within the AA group.

Problem behavior difference scores of children in intervention (DMT) and control group (AA) were compared to note the differences between the DMT and AA group. The change in problem behaviors of children in the DMT and AA groups differed significantly. DMT group had greater change in decreasing problem behavior (p<0.001) (see Table 7).

Table 6

Pre and Post Scores /Problem Behavior (Hemiplegic and Diplegic Groups)

M(SD)		*N*	Pre-score	Post-score	Difference
DMT	H	10	21.8 (5.1)	10 (4.1)	-11.8 (5.8)
	D	12	14.8 (5.4)	10.7 (4.2)	-4.2 (5.1)
	p[1]				**0.003**[1]
AA	H	11	13.8 (4.1)	13.3 (4.0)	-0.5 (0.7)
	D	10	16.3 (5.3)	16.2 (4.7)	-0.1 (1.1)
	p[2]				0.295[2]

[1] *Student t test,* [2] *Wilcoxon Signed Rank Test*

Table 7

Pre and Post Scores / Problem Behavior (DMT and AA Groups)

M (SD)	Pre-score	Post-score	Difference
DMT	18.2 (6.2)	10.3 (4.1)	-7.8 (6.6)
AA	15 (4.5)	14.6 (4.5)	-0.4 (0.9)
p[2]			**<0.001**[2]

[2] *Wilcoxon Signed Rank Test*

Overall there were significant differences between DMT and AA groups not only in increasing social skills but also in decreasing problem behaviors in the DMT group.

Motion/Gait Analyses

In the pre- and post-sessions, participants in both the intervention and control groups had their gate parameters measured by the Motion Analysis System. Data on three gait parameters were collected including: (a) velocity, the distance over time (b) stride length, the distance covered in a gait cycle (right, left, and right), (c) cadence, the number of steps per minute. Since the group scores were non-normally distributed, the A Mann-Whitney *U* Test, which is the non-parametric equivalent of the independent t-test, was used to compare if there were differences between the H group and the D group. An independent-samples t-test was conducted to compare gait analyses results for the DMT intervention groups and the AA control groups. The findings that follow summarize the results of the statistical procedures based on confidence levels set at $p < .05$.

Velocity. In the intervention group (DMT), there was no significant difference in velocity scores (right and left) between the H and D groups (p= 0.085; p= 0.157). This was also the same for the control group (p= 0.842; p= 0.78). Therefore the scores in velocity between the DMT and AA groups were compared. Cohen's *d* test (d=0.46) indicated there was a medium effect size.

Table 8

Pre and Post Scores /Velocity (DMT and AA groups)

M (SD)	VELOCITY					
	Pre-score		Post- score		Difference	
	Right	Left	Right	Left	Right	Left
DMT	86.9 (25.8)	88.1 (26.1)	97.4 (21)	99.1 (22.4)	10.5 (14.8)	11 (15.6)
AA	94.3 (10.0)	95(10.4)	97.9(16.4)	97.4(16.9)	3.7 (17.5)	2.4 (18.1)
p					0.130	0.093

Stride length. Stride length, which was the distance between two successive placements of the same foot, was compared. Right and left stride lengths are normally equal. However the stride length of a person with CP is often smaller than a normal person. Again there was no significant difference between H and D groups, not only within the DMT group (p=0.397 – for right; p= 0. 578 – for left), but also within the AA group (p=0.751 – for right; p= 0. 780 – for left). Therefore, the intervention and control groups were comparable. The mean scores for stride length indicated that there was also not a significant difference in the change scores of participants in the DMT and the AA groups for either right or left foot (see Table 9). Comparing the means between intervention groups (DMT) (M=7.1) and control groups (AA) (M=1.5), there was an increase in stride length. Cohen's d test (d=0.45) indicated there was a medium effect size.

Table 9

Pre and Post Scores /Stride Length (DMT and AA groups)

M(SD)	STRIDE LENGTH					
	Pre-score		Post-score		Difference	
	Right	Left	Right	Left	Right	Left
DMT	84 (21.8)	88 (20.3)	91.8 (15.6)	94.4 (17.2)	7.8 (12.2)	6.4 (10.8)
AA	89.1 (11.2)	89 (11.9)	91.9 (10.8)	89.3 (11.1)	2.8 (12.3)	0.3 (13.3)
p^1					0.161[1]	0.258[1]

[1]*Student t test,* [2] *Mann Whitney u test*

Cadence. Cadence rate was calculated by total steps taken per minute. There was no difference between H and D groups in cadence within both the DMT (p=0.053– for right; p= 0.654– for left) and AA groups (p=0.356– for right; p= 0.394 – for left). Between DMT and AA groups there were significant differences. For the DMT group, the mean difference scores for the right and for the left were significantly more increased than for the AA group (see Table 10).

Table 10

Pre and Post Scores / Cadence (DMT and AA groups)

M(SD)	CADENCE					
	Pre- score		Post-score		Difference	
	Right	Left	Right	Left	Right	Left
DMT	118.7 (14.4)	121.3 (13.3)	127.5 (16.1)	126.6 (15.1)	8.4 (11.3)	5.3 (20.7)
AA	128.9 (14.5)	129.2 (14.4)	125.5 (19.9)	125.9 (21.1)	-3.4 (19.6)	-3.4 (19.5)
p[1]					**0.011**[2]	**0.036**[2]

[1]*Student t test,* [2] *Mann Whitney u test*

This shows that the DMT participants experienced a significant increase in cadence compared to the AA group for both right and left feet. Although there were no significant differences in stride length and velocity, the results suggest that DMT had an effect on increasing stride length and velocity. Although not all the motion parameters had statistically significant results, still these results are promising that dance movement therapy can be effective in enhancing quality of gait for children with cerebral palsy.

The purpose of this study was to investigate the effect of DMT on quality of gait and social skills in children with hemiplegic and diplegic CP. The results of this study demonstrated the positive effects of DMT on the gait parameter of cadence but velocity and stride length of children with CP. The study also illustrated that DMT had positive effects on socialization for these children. The results will be discussed further in next chapter.

CHAPTER 5

Discussion

The present study sought to examine if children with cerebral palsy (CP) enhanced their quality of gait and socialization through dance movement therapy (DMT). This chapter will expound on the statistical data reported in the results section in relation to the research questions, the literature review and the researcher's assumptions. Clinical implications for the field, limitations of the study, recommendations for future research and conclusion will also be presented.

Discussion of the Research Questions

The first research question was: Is DMT effective for enhancing quality of gait of children with Cerebral Palsy (CP)? The literature reviewed in Chapter 2 defined Cerebral Palsy (CP) as an umbrella term covering a group of motor disorders caused by brain damage (Mutch et al., 1992; Miller & Bachrach, 2006). In summary, these children have high levels of motor dysfunctions and difficulties with quality of gait (Stokes, 1998). Among this population, three main issues result in abnormal gait: reduced selective motor control, impaired balance and abnormal muscle tone (Gage and Schwartz, 2009) (Clifford & Holder-Powell, 2010; Donker et al., 2008; Eek et al., 2011; Hsue et al., 2009; Woollacott et al., 2005). Unfortunately, there is no remedy for these motor problems (Damiano, 2006). Physical therapy remains one of the most widely used interventions to help motor impairment. However, the literature review has demonstrated that the research on physical therapy provides inconclusive results (Anttila et al., 2008; Bartlett, 2002; Jeglinski, 2010; Parkes, 2004; Harris & Roxborough, 2005).

Dance has been used for healing purposes since ancient times (Levy, 1995). Although the studies on dance movement therapy (DMT) and neurological

impairments are limited, dance has been found to be effective in enhancing the motor functions of individuals who have Parkinson Disease (PD) and Multiple Sclerosis (MS) (De Dreu, 2015; Demers & McKinley 2015; Hackney & Earhart, 2007, 2010, 2012; Kattenstroth, Kalisch, Holt, Tegenthoff, & Dinse, 2013; Mandelbaum & Lo, 2014; Rabbia, 2010; Salgado et al., 2010; Westbrook & Helen, 1989; Williamson, 2015). Since CP also involves neurological impairments, this research proposed that that DMT would bring about these same effects for children with CP because of the researcher's assumptions summarized above.

One of the researcher's assumptions was that DMT would provide an increase in the mechanical and qualitative aspects of physical function. The quantitative results indicated that dance movement did influence walking gait for the children with CP. As indicated previously, the gait parameters tested were velocity, stride length and cadence. For velocity and stride length, *t* tests revealed that the differences from the pre- to the post-tests were not statistically significant due to sample size. Cohen's d measure of effect size (d=0.45– for stride length, d=0.46– for velocity) indicated there was a medium effect size.

For cadence, *t* tests revealed that the differences from the pre- to the post-tests were statistically significant (p= 0.011 – right; p=0.036 – left). As discussed in the literature review, there are many research articles about how music and external rhythm provide external cues for gait (Hesse & Werner, 2003; Thaut et al., 2007). Cadence is one the rhythmic pattern of gait. Thus, it is not surprising that the children in the DMT group demonstrated improved cadence. In RAS, a therapist matches the client's cadence through the tempo of the music (Thaut, 2005). In doing this, the rhythm of the music promotes healthy gait patterns. As Gaston (1968) stated, rhythm

is not only an energizer but also an organizer. Therefore, that motivation and positive anticipation predominated.

Even though subjects in the DMT group did not know each other before therapy began, bonding occurred quickly. Despite some background competition, relationships that formed within the therapy group began to blossom into friendships even outside of the study group. Initially, some participants had difficulty standing in a circle without support. It was surprising as they were classified as level one and two according to the GMFCS, and should have had this skill. As therapy progressed, however, these same children began running in the studio. This development indicated that they were performing during the initial evaluation at far less than their potential. A safe encouraging environment and support from group members allowed them to take risks that enhanced their development. As Bly (1991) pointed out, the focus of individuals with disabilities has traditionally been upon limitations and problems. However, DMT can offer an alternative by helping one discover abilities and explore what is possible. As an example, one boy was extremely shy and timid. At the beginning, he would sit at the corner and just watch the rest of the group. As the sessions progressed, he started participating in most of the activities while staying in this same spot. Group encouragement came in the form of encouragement to join more fully. While respecting his initial hesitancy to become actively involved, the group applauded his decision to engage more fully and encouraged him as he did. This incidence also demonstrated that DMT is accessible for everybody even if it takes some time to achieve a higher standard of socialization. The positive attitude of the group contributed to the collective enhancement of motor skills.

In general, motivating children through creative and playful activities is not often a priority in therapy. By allowing creativity, encouraging expressive ability and

embodiment, DMT offers many possibilities for successful verbal and non-verbal expression BY children, including those with CP (Chaiklin & Wengrower, 2009; Capello, 2009; Duggan, 1978; Leventhal, 1982; Levy 1995; Tortora, 2001, 2006, 2013). In addition, DMT provides a safe nonjudgmental environment (Chaiklin & Wengrower, 2005, Dannunzio, 2014; McCarthy, 2008). By using symbols and imagination children feel less threatened by a reality that often involves overwhelming feelings of fear and anxiety. For instance, when working with "elements," it was easier for children to express anger when they engaged in play, embodying fire (Berrol, 2006; Chaiklin & Hilda, 2009; Halprin, 2003; Hinz, 2009; Koch, 2014; Leventhal, 1980; Levi, 1995, 2005; Payne, 2016; Samaritter, 2009; Tortora, 2001, 2006, 2013). According to Hinz (2009) a symbol connects external reality and inner meaning. In such a nonjudgmental setting the children can begin to realize their potential.

Overall, DMT improved an aspect of gait performance of children with CP with motor dysfunctions.

Social Skills Rating System (SSRS)

The second research question was: Is DMT effective for enhancing socialization of children with Cerebral Palsy (CP)? Due to motor impairments and secondary difficulties, individuals with CP generally do not have chances to join social activities as often as their peers without special needs (Van Der Heide et al., 2004; Woollacott et al., 2005). Social and emotional growth and maturity are delayed by the physical limitations of CP (Miller & Reid, 2003; Missiuna & Pollock, 1991). Miller and Bachrach (2006) emphasized that for children with CP "having access to other children may be limited by the parents' protectiveness, the attitude of other parents toward having their child play with a child who has disability" (p. 105).

Moreover, according to a study done by McDermott et al. (1996) “Parent-reported behavior problems were five times more likely in children with cerebral palsy (25.5%) compared with children having no known health problem (5.4%)” (p. 447). Main problem behaviors were related to “anxiety, being headstrong, hyperactivity, having peer group conflict and being dependent” (p. 456).

Overall, children with CP have been shown to have more difficulty in social skills, to be less accepted by peers, and to display an inability to effectively communicate with others. Early interventions are important to prevent later social problems such as emotional issues, rejection, and isolation (Csoti, 2001; Missiuna & Pollock, 1991).

According to literature, DMT has the capacity to motivate children to join participatory activities. Building upon Baiori’s (2003) research, one of the main objectives in DMT is to encourage healthy social interaction with others through nonverbal and verbal expression. Studies on dance/movement therapy (DMT) and socio-emotional wellbeing in such special needs groups as CP populations suggest DMT has positive effects (Allain –Murphy, 1988; Baiori, 2003; Barnet-López et al., 2015; Duggan, 1978; Espenak, 1975; Giannone, 1993; Levental, 1982; Levy 1995; Tortora, 2001, 2006, 2013).

This study’s results parallel the previously published research and literature. The social skill scores of children in both DMT groups (hemiplegic and diplegic) met the statistically significant level from pre to post measurement (p=0.012). Social skill scores of children in art activities (control group) groups did not differ in statistical significance from pre to post measurement (p=0.418). According to data, DMT had a positive effect on social skills of children with CP. In addition the measurements of problem behavior scores of children in both DMT (hemiplegic and diplegic) groups

differed in a statistically significant manner from pre to post measurement ($p = 0.001$). DMT had a positive effect on decreasing problem behaviors of children with CP.

DMT enhanced social skills, social interaction and communication by providing sense of belonging. Safety in group settings, membership in the group alone encourages social interactions and working together operates to increase a sense of belonging. Risk taking in such a setting teaches trust in others and creates powerful social and emotional bonds.

Using metaphor was important to dance movement therapy because it has the ability to hold many layers of meaning (Meekums, 2002). It allows for expression of emotions in ways that may be otherwise inexpressible.

Csoti (2001) points out "body language messages are far more important than the actual words a child uses because most of the message is actually communicated through the body actions and the sound of the voice: only a small percentage is communicated through words alone" (p. 117). Eye contact, gestures, facial expressions, touch, imitation and attunement are the main characteristics which contribute to a social interaction (Baiori, 2003; Espenak, 1975; Tortora, 2006).

In addition to the SSRS results, anecdotal comments from parents of children in the DMT groups who had noticeable improvement were noted. Those comments included:

1. "She does not hit her sister anymore."
2. "My child was never able to go the bathroom alone before after coming here she was able to go to bathroom by herself…even at night."
3. "He seems calmer since he started dancing."

4. “It was almost impossible to take her to get a haircut. She would scream, cry and even start hitting people who were trying to hold her. After your sessions, she was so cooperative. It was extremely shocking for all of us.”

5. “He was always shy. After your group he started turning on radio and dancing in front of us even when there are other cousins at home.”

6. “His teacher said he has been behaving better since last week.”

7. “He can’t wait to come here.”

8. “She says she has so many good friends here, she never had a friend before.”

9. “For the first time he went to a store to get bread for us. We are really proud of him.”

Therefore the data indicating that DMT is effective on increasing social skills and decreasing problem behavior is not surprising.

Clinical Implications

There has been a general lack of evidence in the literature regarding DMT and motor functioning especially quality of gait in children with CP. The literature about DMT and motor functioning is also limited. In this sense, this present study will make an important contribution to the body of literature by exploring DMT in relation to motor functioning and socialization. This study revealed important findings relevant to dance movement therapists working with children with diplegic and hemiplegic CP.

The current study may raise clinician’s awareness in the field regarding the use of a multimodal approach with this population. Berrol and Katz (1985) suggest that for people with central nervous system damage, effective treatment should include a multimodal approach. This approach allows access to all domains of functioning including the cognitive, psychosocial, and physical via the sensory systems. This

study showed that DMT increased the participants' velocity and stride length. Cadence was increased significantly.

It can be generalized that DMT may benefit other neurological disorders such as MS or stroke that effect motor functioning. Overall, important findings to be considered when implementing treatment are:

1. The use of DMT can be an effective tool for cadence in children with CP.
2. The use of DMT can be also effective in enhancing social skills and decreasing problem behaviors.

Limitations of the Current Study

Limitations of the current study include the large number of participants in each group, individual differences, sex dominance in groups, the length of sessions, the lack of a longitudinal study, timing surrounding the post tests, and confounding variables.

The large number of participants in each group made it difficult for the group leader to lead the groups. In the art activities control group the number was not so problematic as participants were sitting the majority of the time while making art projects. However in the DMT groups, the children were in movement for most of the session. Although there were volunteers to help in the DMT groups, for the dance movement therapist, reaching every child and focusing the group was difficult. From this experience it appears that an ideal number of participants should be a maximum of six with one or more therapists. While having more dance therapists working in smaller groups would be more efficient it has to be considered that creative arts therapy is an emerging field in Turkey. Currently there is only one trained registered dance movement therapist in Turkey. The study obliged the researcher to work within this reality. Secondly, although having the same diagnoses of hemiplegic and diplegic

and GMFCS level 1 and 2, there were imbalances in the groups, which might be related to the variability of cognitive, physical, and sensory processing abilities, as well as the socio-educational background of the families.

Another limitation was in the number and gender distribution of the subjects. There were nine girls out of 11 participants in the hemiplegic group and 11 boys and only one girl in the diplegic group. Group dynamics were adversely affected by this limitation. . In the diplegic group (n_{girls}=9), the group dynamic was influenced by competition and jealousy so that it was difficult to build group cohesion and a sense of trust. Probably this impeded subjects from taking risks not only emotionally and socially, but also physically. In the diplegic group, where the group cohesion was stronger than in the hemiplegic one, the reality of having 11 boys caused a competitive dynamic and led to difficulties in expressing vulnerability.

Furthermore, it was difficult to provide a safe holding environment as there was a large number of participants in each group with only one dance therapist in addition to volunteers.

Another constraint is the short duration of the therapy and the lack of follow up. As discussed in the literature review, children with CP must rely on their damaged motor pathways, and DMT helps to develop new motor pathways. Time is a critical element in establishing those new connections. For this study it was assumed that 10 sessions of DMT for CP patients would be insufficient to regulate a new gait pattern. In further research, the intervention should last at least 10 weeks. It would be important to evaluate if the improvements are sustained over time with follow up at six months and at 12 months after intervention.

A final limitation of the current study was the timing of the post-test. Motion analysis equipment was able to test only six children per day. Some children

completed the post-tests one day after completing all the intervention sessions; some a week later. Therefore, test reliability was confounded.

Despite the limitations enumerated, the present study suggests that dance movement therapy can serve as a valuable evidence-based rehabilitation resource for children with CP.

Recommendations for Further Research

Future studies should extend the length of time and number of sessions. There were 10 sessions in the current study. That might not be sufficient to tap a child's full potential. In addition to extending the time/frequency of intervention future research should also include a longitudinal examination to identify the effects of DMT on quality of gait. This would enable a more accurate assessment of the relationships that impact quality of gait. Future research should also identify a more homogenous group and work with a smaller number of children in each group. Increasing the number of dance therapists working with each group would also be beneficial. Although the sample size was sufficient, a larger sample size would ensure the accuracy and enable capturing the relationship among variables that this study identified. Lastly, researchers should take into consideration using self-assessment tools for children to evaluate their own progress. This would provide deeper understanding about the effectiveness of DMT.

Conclusion

The purpose of this study was to investigate the effect of DMT on quality of gait and social skills in children with hemiplegic and diplegic CP. This preliminary study indicated that DMT had not only positive effects on the socialization but also on the gait parameters of children with hemiplegic and diplegic CP. The current study is among one of the first to examine the use of dance movement therapy (DMT) for

quality of gait with children with CP. The study illustrates that DMT was associated with a change gait parameters in children with CP. The current study may raise the awareness of clinicians in the field regarding the use of a multimodal approach that includes DMT with this population.

Overall the quantitative data suggests that the intervention provided positive changes in cadence. Although the results were not statistically significant, the DMT group members had greater mean scores in velocity and stride length than the AA control group members. SSRS tests also showed differences between the DMT treatment and AA control groups in increasing social skills and decreasing problem behaviors. The promising outcome of the present study highlights the effects of DMT on walking gait for neurologic disorders. The results of validity and reliability analyses suggest that dance movement therapy may serve as an evidence-based rehabilitation resource for children with CP. The evidence gives credence to the clinical observations made throughout work with children with CP. It is time for DMT scholars and practitioners to devote more attention to evidence-based research in order to enhance its professional status within the medical and psychotherapeutic establishment. It is also a favorable time in the early development of expressive therapies in Turkey to model a practitioner/researcher approach that enhances the professional status of DMT. As it has been seen from the research results, DMT offers potential in favorably impacting the lives of children with CP and related disorders. With additional research that potential can be further realized.

APPENDIX A

INFORMED PARENT/GUARDIAN CONSENT FORM: STUDY OF DANCE/MOVEMENT THERAPY IN COMPARISON TO ART ACTIVITY

Principal Investigator: Ayse Nilgun Turkcan **Co-researcher:** Dr. Robyn Cruz, Ph.D., BC-DMT, LPC

Your child is being asked to volunteer in this study to assist in my research project on the experience of dance movement therapy in comparison to art activities. The intent of this project is to explore the effectiveness of dance movement therapy on enhancing the quality of gait of children with cerebral palsy in addition to socialization.

Your child's participation will entail attending a dance/movement therapy session or an art activity three times per week over a four week period. The sessions will be 45 minutes in length and take place in Metin Sabanci Rehabilitation Center. Measures of gait characteristics will be obtained by motion analyses before and after the 10 sessions intervention (pre and post-tests). His/her process and the test results will be kept confidential. This research project is anticipated to be completed by November 2015.

I, _____, consent to my child's participation in this research project.

I understand that:

- He/she is volunteering to participate in either a dance therapy session or an art activity approximately 45 minutes in length.
- His/her identity will be protected.
- His process notes and the tests results will be kept confidential and used anonymously only for the purposes of supervision, presentation, and/or publication.
- This study will not necessarily provide any benefits to him/her. However, he/she may experience increased quality of gait, social skills and self-esteem.
- The process notes and the test results will be kept in the investigator's possession for possible future use. However, this information will not be used in any future study without my written consent.
- The therapist is ethically bound to report, to the appropriate party, any criminal intent or potential harm to self.
- I may choose to withdraw my child from the study at any time with no negative consequences. My child may also choose to withdraw from this study at any time with no negative consequences.
- If my child is randomly assigned to the art activity, he/she will be given the opportunity to participate in the dance/movement therapy sessions after the completion of the project.
- My decision whether or not to have my child participate will not affect our current or future relations with TSCV Center. My decision whether or not to have my child participate will also not affect my child's treatment at TSCV.

Confidentiality, Privacy and Anonymity:

He/she has the right to remain anonymous. If he/she elects to remain anonymous, the records will remain private and confidential ***to the extent allowed by law****. Pseudonym identifiers rather than his/her name will be used on study records. His/her name and other facts that might identify him/her will not appear when this study is presented or its results are published.*

If for some reason he/she does not wish to remain anonymous, you may specifically authorize the use of material that would identify him/her as a subject in the experiment. You can contact my advisor Dr. Robyn Cruz at rcruz@lesley.edu with any additional questions.

You will be given a copy of this consent form to keep.

a) **Investigator's Signature**:

_____ _____

_____

Date Investigator's Signature

Print Name

b) **Signature of Parent/Guardian**:

I am 18 years of age or older. The nature and purpose of this pilot project has been satisfactorily explained to me and I agree to have my child participant in the study as described above. I understand that I am free to withdraw my child from this study at any time if I so choose, my child may also discontinue participation at any time, and the investigator will gladly answer any questions that arise during the course of the research.

_____

Date Parent/Guardian's Signature Print Name

There is a Standing Committee for Human Subjects in Research at Lesley University to which complaints or problems concerning any research project may, and should, be reported if they arise. Contact the either of the co-chairs, Terrence Keeney, tkeeney@lesley.edu or Robyn Cruz, rcruz@lesley.edu at Lesley University, 29 Everett Street, Cambridge Massachusetts, 02138.

Thanks for your participation!

APPENDIX B

CHILD INFORMED ASSENT FORM:

STUDY OF DANCE/MOVEMENT THERAPY IN COMPARISON TO ART ACTIVITY

Principal Investigator: Ayse Nilgun Turkcan, **Co-researcher:** Dr. Robyn Cruz, Ph.D., BC-DMT, LPC

I am being asked to volunteer in this study to assist in the principal investigator's research project on the experience of dance / movement therapy in comparison to an art activity experienced. The intent of this project is to compare the effectiveness of dance movement therapy on enhancing quality of gait in addition to socialization.

I will be attending either dance movement or art activity three times per week in four weeks period. The sessions will be 45 minutes in length and take place in TSCV Center. Measures of gait characteristics will be obtained before and the after 10 sessions intervention (pretest and posttest) by motion analyses. My process and the test results will be kept confidential.

This research project is anticipated to be finished by approximately November 2015.

I, _____, agree to my participation in this research project.

.

I understand that:

- I am volunteering to participate in either dance therapy session or art activity approximately 45 minutes in length.
- My identity will be protected.
- My process notes and the tests results will be kept confidential and used anonymously only for purposes of supervision, presentation, and/or publication.
- This study will not necessarily provide any benefits to me. However, I may experience increased quality of gait, and social skills and self-esteem.
- The process notes and the test results will be kept in the investigator's possession for possible future use. However, this information will not be used in any future study without my written consent.
- The therapist is ethically bound to report, to the appropriate party, any criminal intent or potential harm to self.
- I may choose to withdraw from the study at any time with no negative consequences.
- If I am randomly assigned to the art activities, I will be given the opportunity to participate in either the dance/movement therapy or the physical therapy sessions after the completion of the project.
- My decision whether or not to participate will not affect my current or future relations with TSCV Center. My decision whether or not to participate will also not affect my treatment at TSCV Center.

Confidentiality, Privacy and Anonymity:

I have the right to remain anonymous. If I elect to remain anonymous, the records will remain private and confidential ***to the extent allowed by law****. Pseudonym identifiers rather than my name will be used on study records. My name and other facts that might identify me will not appear when this study is presented or its results are published.*

If for some reason I do not wish to remain anonymous, my parent/guardian may specifically authorize the use of material that would identify me as a subject in the experiment.

You will be given a copy of this assent form to keep.

a) **Investigator's Signature**:

_____ _____

_____

Date Investigator's Signature

Print Name

b) **Signature of Participant**:

The nature and purpose of this research has been satisfactorily explained to me and I agree to participant in the study as described above. I understand that I am free to withdraw from this study at any time if I so choose.

_____ _____ _____

Date Participant's Signature Print Name

There is a Standing Committee for Human Subjects in Research at Lesley University to which complaints or problems concerning any research project may, and should, be reported if they arise. Contact the either of the co-chairs, Terrence Keeney, tkeeney@lesley.edu or Robyn Cruz, rcruz@lesley.edu at Lesley University, 29 Everett Street, Cambridge Massachusetts, 02138.

Thanks for your participation!

APPENDIX C

TULDER ET AL.'S (2003) CRITERIA LIST

1. Was the method of randomization adequate?

2. Was the treatment allocation concealed?

3. Were the groups similar at baseline regarding the most important prognostic indicators?

4. Was the patient blinded to the intervention?

5. Was the care provider blinded to the intervention?

6. Was the outcome assessor blinded to the intervention?

7. Were co-interventions avoided or similar?

8. Was the compliance acceptable in all groups?

9. Was the withdrawal/drop-out rate described & acceptable?

10. Was the timing of outcome assessment in all groups similar?

11. Did the analysis include an intention-to-treat analysis?

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