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A STUDY OF NEURO DEVELOPMENTAL TREATMENT APPROACH IN HIGH-RISK INFANT

Dangat pallavi vasant, Dr.pavan Kumar talupuru

DESIGNATION- RESEARCH SCHOLAR SUNRISE UNIVERSITY ALWAR
DESIGNATION- Associate professor SUNRISE UNIVERSITY ALWAR

ABSTRACT

Even in the absence of any medical issues, the risk of poor neurodevelopmental outcomes rises sharply with decreasing gestational age and birth weight. Because to progress in NICU treatment, more high-risk newborns are surviving, but they still face a morbidity in the form of a risk of neuro-developmental delay. Treatment options for high-risk babies that attempt to reduce the likelihood of negative neurodevelopmental outcomes are included under the umbrella term "developmental care interventions" (DCI). Though previous researchers have examined the efficacy of multi-modal sensory stimulation as a physical therapy intervention and component of DCI, the evidence on the effect of DCI is still inconclusive due to controversies in the type, mode, and timing of stimuli presented, given the complexity of sensory interactions and the heterogeneity of interventions. Some scientists even claim that a high-risk infant's growth and development might be harmed by DCI itself if it is not administered correctly. Although the impact of early physical therapy intervention as part of comprehensive DCI has not been examined in the Indian context to far, this study was necessary. This randomized controlled clinical trial (RCCT) seeks to determine the efficacy of early physical therapy intervention in enhancing motor results at four months corrected age among preterm very low birth weight infants at high risk of developing severe neuro-developmental outcomes.

KEYWORDS: Neuro Developmental, Treatment Approach, High-Risk Infant, medical issues, developmental care interventions, physical therapy intervention

INTRODUCTION

Vital indicators of optimal neurodevelopmental outcomes in the new-born period are gestational age and birth weight. Many longitudinal cohort studies have revealed that the lower the gestational age and birth weight, the higher the risk of adverse neurodevelopmental outcomes. This danger is magnified as the mother's age nears term and as the infant's birth weight decreases. In addition to increasing the likelihood of premature delivery and low birth

weight, medical complications related to premature birth might affect other organ systems. In this setting, categorizing new-borns by their gestational age and birth weight is crucial for spotting individuals at risk of having long-term developmental issues.

NEURO DEVELOPMENTAL TREATMENT (NDT)

NDT diagnostic and therapy sessions involve dynamic and reciprocal interactions between the therapist and the child (ndta.org). It is hypothesized that the child's sensorimotor processing, task performance, and skill acquisition would all improve as a result of this therapeutic handling and engagement, allowing him or her to participate in more enriching activities and raising his or her quality of life.

NDT uses afferent input to retrain the patient's internal reference systems, so expanding the patient's range of motion and enhancing his or her ability to use that range of motion efficiently.

The intervention entails the acquisition of functional abilities that involve sensory, perceptual, and adaptive learning. Movement perception is the foundation of learning, hence it is essential that all activities provide some form of sensorimotor experience. Children and adults with neurological conditions (such as cerebral palsy) might benefit from neurodevelopmental treatment, which emphasizes hands-on, client-centered care to enhance gross motor function and increase independence in a variety of settings. It is thought that aberrant movement patterns may be addressed, and normal movement patterns suited to everyday activities can be restored, by stimulating the injured side to promote the right muscle activation. One theory on how this might work reads as follows: "The therapist plans for the necessary preparatory work (such as muscle elongation) to enable the client to perform the task, and will facilitate and guide the movement as needed to decrease or prevent posture and movement behaviors that would interfere with the infant's or child's functional abilities." The therapist's role changes when the newborn or toddler assumes control and learns to anticipate their own postural and motor needs."

During NDT evaluations and therapies, the therapist and child engage in a two-way conversation (ndta.org). It is hoped that the combination of therapeutic handling and engagement would stimulate optimum sensorimotor processing, task performance, and skill

development, allowing the child to participate in enriching activities and enhancing his or her quality of life.

CAUSES OF AUTISM SPECTRUM DISORDER

The diagnostic criteria for Autism Spectrum Disorder (ASD) are based on observable behavioral characteristics, despite the fact that ASD is a complex neurological developmental condition. During Leo Kanner's time, the rate of autism diagnoses has skyrocketed (1943). Earlier estimates put the prevalence of autism at 4–5 per 10,000 children during the Kanner era; the most recent estimate puts it at 1 per 64. (Ratajczak, 2011) Scholars have a significant hurdle when trying to determine what triggers autism. It's a hotly contested topic among parents and professionals in the field of autism. Several experts believe that autism is not an illness with a single etiological factor, but they disagree on what those factors could be. The research shows that autism may be involved in more instances than previously thought, and that the condition manifests differently in various people. Several researchers have shown that infantile brain trauma, anatomical abnormalities, and aberrant brain development may all have a role in the onset of autism spectrum disorder (Holstein S & Rutter M 1997). Autism has complex origins, although most research point to genetics, the environment, and brain inflammation (Preiserowicz, 2015; Ratajczak, 2011).

GENETIC RISK FACTORS OF AUTISM SPECTRUM DISORDER

While several researchers have demonstrated a link between genes and ASD, the precise genetics of the disorder remain unclear. A higher rate of autism has been seen in monozygotic (identical) twins. Research has shown that children of monozygotic twins had a nearly 90% risk of developing autism (Rodiem, 2000). Nonetheless, there is some heritability and genetic diversity is a serious issue since not all genes have a causal agent for ASD. To be more precise, boys are four times more likely than girls to have autism spectrum disorder, as evidenced by the ratio of gender difference count of persons with ASD, which is 1:1. Several factors, including genetic variance, delivery complications, parental age, and the child's surroundings, have a role in autism.

There has been significant debate about whether or not anomalies in chromosomes or a single gene are actually to blame for ASD. In fact, the proper functioning of the brains of children with ASD depends on the presence of numerous of the genes. The prevalence of

genetic disorders in ASD patients, particularly the link between Rett syndrome (40%) and Autism Spectrum Disorder (25%) Scholars are nearly unanimous in their belief that tuberous sclerosis, neurofibromatosis, and the occasional connection of intellectual impairment are the most common manifestations of the single genes syndrome. The cumulative genetic abnormality accounts for 10% of the risk of developing ASD. So, most doctors are familiar with the concept of single-gene disorders (Woodbury, Smith, M., & Scherer, S. W.) (2018).

ENVIRONMENTAL RISK FACTOR OF ASD

The greatest associations between ASD risk and environmental variables are seen in maternal smoking, immunization, thimerosal exposure, and probably maternal age at the time of pregnancy. One of the most important risk factors for ASD is the age of the parents; research shows that the prevalence of ASD rises steadily with each decade that passes. Parents older than 34 years old have their children's risk of acquiring autism spectrum disorder (ASD) increase. In addition, numerous experts have linked an increase in parental age as a risk factor for ASD. Children at high risk for problems with their immune systems and their developing nervous systems typically have fathers who are older than their own. There has been a correlation between the mother's age and the fetus's rate of growth and development. A greater risk of autism spectrum disorder (ASD) is connected with having a mother who is younger than 20 years old.

Pregnancy is a delicate time in a woman's life, and she should be in good physical, mental, and emotional health. When mom isn't healthy, baby is at risk. Traumatic, ischemic, or hypoxic birth conditions having a substantial relationship with ASD risk factors; nevertheless, maternal obesity and diabetes during pregnancy have also been described as risk factors. There was a decreased (but still considerable) risk of ASD with caesarean delivery. Several scholars have also linked parental socioeconomic status to autism, in addition to parental stress, vaccinations, and health issues during the fetal period. Whether or whether autism is linked to childhood vaccinations is a topic of debate among experts. ASD was once thought to be caused by vaccines, most notably the measles, mumps, and rubella (MMR) vaccination; however, further studies disproved this theory. ASD is a complex neurodevelopmental condition that has several causes, both genetic and environmental.

Autism Spectrum Disorder

Symptoms of autism often appear between the ages of two and four. Autism manifests itself in a number of ways, the most obvious of which include an inability to recognize familiar faces or objects, a lack of responsiveness to name calling, a fixation on one or a few objects, and a tendency to spend hours engaged in repetitive activities. Some of their behaviors include being hesitant to make friends, disinterested in engaging in conversation, unable to think beyond the box, and stubborn. Individuals on the autism spectrum may also exhibit varied degrees of intellectual impairment, attention deficit hyperactivity disorder, impulsivity, sedentary behavior, hostility, odd eating habits, and mobility issue.

Because the majority of a child's day is spent either at home or at school, these interventions need to be implemented in both settings. This shows the importance of parents and educators in shaping a child's development. Children on the autism spectrum should be included in mainstream classrooms with children of a similar age. Extreme introverts may have a tough time adjusting to school at first. Yet, they will improve their social abilities via encounters with their classmates. They could be slower to absorb concepts and less likely to engage in academic pursuits than their peers. They need adapted, step-by-step activities tailored to their needs. Nonetheless, it should be noted that they do require supplementary support from parents and educators. In the end, they will turn completely against you if they pick up any bad habits from you. Some autistic kids just don't do well in a traditional school setting. The talents of these children in the arts, music, chess, and technology are widely praised. If evidence of these extracurricular is found, they will be supported.

As a result of its identification as a mental impairment, autism has been included in the definition of "persons with disabilities" (PWD). Assisting autistic kids legally to enrol in regular schools several grants and scholarships are available via the Department of Education for these students attending public and publicly funded institutions of higher learning. They are also qualified to get grants from municipalities.

GROSS MOTOR SKILLS DEVELOPMENT

In the context of infant development, the phrase "motor skill" refers to any activity that requires the use of the baby's muscles. Gross motor abilities refer to those that need the use of his complete body, not just his hands and feet. They call for the use of powerful muscular

groups in the limbs and core. Crawling, sprinting, skipping, leaping, throwing, climbing, and a host of others are all great illustrations of this. Finally, there are the more delicate movements that need fine motor abilities. The majority of the abilities used on a playground or in a gym are the large muscle groups. Nonetheless, broad motor abilities also encompass fine motions, although those involving larger muscle groups. Some kindergarteners always manage to knock over their chairs while learning. The youngster would have attempted to transfer his or her weight, but would have moved the muscles in his or her legs, hips, or trunk far too much, leading to the inevitable fall. Gross motor abilities are essential for children in pre-school and kindergarten to participate in age-appropriate physical activities such as running, climbing, and throwing. Because of this, they will be able to take part in class activities that call for movement management (sitting still during a lesson or walking in a crowded room).

Muscular fitness is a major contributor to robust motor abilities. Muscles get stronger with regular exercise and practice. If you want to help your child develop his gross motor skills more quickly, you could encourage him to participate in specific gross motor exercises, such as marching in a line. Afterwards, once he has mastered the fundamentals, he can on to the next level. Tell him to march ahead while tapping his knees with his left and right hands. This form of activity immediately encourages bilateral asymmetrical integration and aids in the development of skills that traverse the midline.

ROLE OF PHYSICAL ACTIVITY PARTICIPATION OF CHILDREN WITH ASD

Regardless of gender, age, or ability level, regular involvement in physical activity (PA) is the most important component in ensuring a lifetime of excellent health outcomes. The World Health Organization (WHO) reports that inactivity is the leading cause of preventable death worldwide. The World Health Organization recommends 60 minutes per day of moderate exercise, three times a week, with an emphasis on strengthening the muscles. The population of a country like India, for example, isn't aware of PA and won't have the opportunity to participate. It has been stated that the vast majority of academics have not achieved the level of PA recommended by the WHO. Non-communicable illnesses such as heart disease, stroke, and cardiovascular disease pose serious challenges in India, a country with a poor and moderate income (WHO).

Physical activity (PA) is beneficial for health and fitness since it helps build muscle and improves cardiovascular and muscular fitness, flexibility, endurance, and body composition. Children on the autism spectrum spend less time engaged in physical activity compared to typically developing youngsters. Most parents are informed that children with ASD have a much lower rate of physical activity (PA) engagement. The vast majority of researchers have shown that kids on the spectrum had a greater prevalence of sedentary behaviours and obesity than kids without ASD. Children on the autism spectrum who take part in physical activity (PA) report favourable physiological, cognitive, and emotional outcomes. However, children with autism spectrum disorders (ASD) face significant barriers when it comes to participating in physical activity (PA) due to issues like poor eye-hand coordination, motor coordination, fitness levels, and cognitive perception. Some kids have a hard time staying on their feet during physical exercise, while others may be unable to fully use their muscles, leading to frequent falls.

BARRIERS TO PHYSICAL ACTIVITY IN CHILDREN WITH AUTISM SPECTRUM DISORDER

The high rates of overweight, obesity, and sedentary behavior in persons with ASD can be attributed to a combination of variables, including but not limited to sensory stimulation, social anxiety, physical limitations, and impairments, and so on. Yet, there was a school of thought that posited there were many additional elements at play, including psychopharmacological therapy, heredity, sleep disturbance, and erratic eating patterns. In addition, the severity of Autism and ID may have had a role. Physical exercise, especially its fitness and motor skills components including hand-eye coordination, perceptual problems, and body balance, appears to be significantly impacted in persons with ASD who have a developmental disability. According to reports from educators, parents, and caregivers, many children with ASD struggle with motor coordination and skill development (Provost etal., 2007). Many children with autism spectrum disorder also exhibit additional impairments, including slouched bodies, uncoordinated movements, and diminished strength (Kurtz, 2008). Children with autism spectrum disorder (ASD) may find it difficult to keep up with their typically developing classmates due to issues with body balance and motor coordination. Yet, owing to their lack of social skills, children with ASD have struggled to participate in team sports and other group activities.

ASD sufferers may have trouble with motor coordination due to underlying biological issues in the brain. Children with autism spectrum disorder (ASD) may have the most difficulty developing social skills, but these skills may be taught via exposure to a variety of situations and environments. In many cases, people with autism spectrum disorder are more likely to experience social withdrawal, emotional distress, and physiological strain as a result of events that are all too familiar to the general population (Goodwin et al., 2006). These circumstances have made it more challenging for children with ASD to participate in sports and other forms of physical exercise, resulting in a decline in overall physical activity. Recent studies, however, has shown that children and adolescents on the autism spectrum do not engage in nearly enough physical exercise to meet CDC's Physical Activity Recommendations.

Premature birth is a significant public health priority in high income countries. However, unavailability of data on preterm births has led to the underrepresentation of this issue especially in low and middle income countries. “Born Too Soon: The Global Action Report on Preterm Birth”, authored by 100 multidisciplinary experts across 11 countries from 50 organisations presented the first ever estimate of the global preterm birth rate in a country wise manner. These estimates revealed that there is an increase in preterm births with reliable time trend data. According to this report, every year approximately 15 million (11.1% of total live births) babies are born preterm which signifies that 1 in every 10 babies is a preterm child.

Preterm infants are those infants which are born before completion of 37 weeks of pregnancy. They have been further categorised into extremely preterm, very preterm and moderate to late preterm. According to World Health Organisation (WHO), extremely preterm infants are born before completion of 28 weeks of pregnancy, very preterm are born between 28 weeks to less than 32 weeks of completion of pregnancy and moderate preterm birth is defined as birth between 32 0/7 – 33 6/7 weeks of gestational age. Late preterm birth is defined as birth between

34 0/7 – 36 6/7 weeks of gestational age. Moderate and late preterm (MLP) births are the fastest growing subset among preterm infants delivered worldwide. They account for about 85% of the total 15 million preterm infants born globally. Studies have reported that in 2007,

10.7% of all the preterm children born in United States were from the category of moderate and late preterm infants.

In India, moderate and late preterm births are the biggest challenge. It has been reported that, India contributes highest share of moderate to late preterm infants to the global statistics which accounts for approximately 3 million births in the MLP category and approximately 80% of the total preterm births in India. Several reasons have been attributed to the global increase in moderate and late preterm births. During the last two decades, increase in labor induction (22.3%), increase in caesarean sections (30.3%), pregnancy related indications such as preterm premature rupture of membranes (PPROM) and neonatal risk factors such as oligohydramnios and intrauterine growth retardation IUGR have been found to be majorly responsible for this steep rise.

Historically, moderate and late preterm (MLP) infants were classified as near term infants. They were treated as term infants because they look equivalent in size and weight of full term infants. However, recently plethora of studies reported that MLP infants are not as mature as term infants. It has been reported, at 34 weeks of gestation, the brain weighs only 65% of the weight at 40 weeks gestation. Significant gyral and sulcal infolding, increase in synaptic density, dendritic arborisation, axonal sprouting, glial cell proliferation and the establishment of neural networks are the most important maturational events that occur during the late preterm period. Along with interruption in “in utero” brain development, preterm infants also experience a lot of environmental stresses in terms of bright lights, loud noises, multiple handling and painful procedures in the Neonatal intensive care unit (NICU). Literature has shown that, the detrimental effect of these environmental stresses on the developing brain of the premature infant further augments the risk of cognitive and neuromotor delays later in life.

CONCLUSION

There are some beneficial benefits on neurodevelopmental outcomes from the developmental care treatments given to high-risk preterm very low-birth-weight infants. The therapies used in developmental care span a wide spectrum of complexity and variety. There is a lack of data about the role and contribution of individual health care disciplines within the context of the multidisciplinary developmental supportive care team. High-risk babies who get physical therapy interventions as part of the developmental care program in the NICU and at home

benefit from early, family-centered (maternally delivered), multi-modal sensory stimulation with assisted movement patterns. Assessing motor performance changes requires the use of psychometrically and clinimetrically sound developmental assessment instruments. The results of this study offer evidence for the effectiveness of early sensory stimulation and goal-oriented facilitation of movement patterns within the context of developmental care treatments for singleton preterm very low birth weight infants at high risk of motor developmental delay. In addition, it substantiates physical therapy's part and/or contribution to the interdisciplinary group providing developmental support.

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