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“The effects of family-centered physiotherapy on the cognitive and motor performance in premature infants”



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A B S T R A C T

Objective: The aim of this study is to investigate the effects of family centered physiotherapy according to the neurodevelopmental treatment (NDT) principles on mental and motor performance in premature infants.

Methods: A total of 156 infant, $\geq 24/36$ week + 6 days gestational age included in the study. All the infants were diagnosed by a child neurologist and referred to psychology and physiotherapy department for their neurodevelopmental assessment and treatment. Bayley Scale of Infant II (BSI-II) was used for neurodevelopmental assessment and Alberta Infant Motor Scale (AIMS) was used for assessing their motor performance. Seventy-eight of the infants were in the study group and 76 were recruited as age matched controls according to the classification of their gestational age. Family centered physiotherapy according to the neurodevelopmental treatment principles was used as an intervention and all the mothers are trained accordingly.

Results: Cognitive Development Scores and Motor Development Scores of Bayley II were recorded for the 3., 6., 9., and 12 months respectively. Between the 3. and 12. month of gestational age, within-groups measurements in both Cognitive Development Scores ($p < 0.001$) and Motor Development Scores ($p < 0.001$) were significantly increased. However, the improvements in both Cognitive Development Scores ($p = 0.059$) and Motor Development Scores ($p = 0.334$) between the groups was not different.

Conclusion: Family centered physiotherapy with NDT principles may not be enough to improve motor and cognitive performance in preterm infants at the first year of age. For supporting the motor and cognitive development of the preterm infants other intervention modalities also should be considered. **Keywords:** infants; premature; early intervention

1. Introduction

Early physiotherapy rehabilitation programs start from the neonatal period and include interventions up to 24 months. Making use of rapid learning ability originating from brain plasticity, enabling the child for normal functional movements and normal sensory input, and bringing the child to a maximum possible state of physical, cognitive, psychological, and social independence under the given physical, anatomical, and environmental limitations are the aims of the program.

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Continuous improvements in the obstetric and the neonatal health services during the last 50 years have increased preterm birth rates and decreased mortalities thus enabled the survival of many preterm infants (Jarjour, 2015). Consequently, neonatal issues encountered in the preterm infants such as neurodevelopmental problems, neonatal retinopathy, bronchopulmonary dysplasia, respiratory distress syndrome, and hyperbilirubinemia have increased (Bhutani, Wong, & Stevenson, 2016; Gage et al., 2015; Romagnoli, Tesfagabir, Giannantonio, & Papacci, 2011; Sweet et al., 2010; Vohr, 2014).

In the long term, the most common problem encountered in preterm infants is cerebral palsy (CP), which incidence increases by decreasing the gestational age. While the incidence of CP is 0.9–1.43 among term babies, it increases up to 6.1 for births at 32–36 weeks gestation, 43.7 for births at 28–31 weeks gestation, and 55.6–114.6 for births before 28 weeks (Ancel et al., 2006; Kate Himmelmann, Beckung, Hagberg, & Uvebrant, 2006; K Himmelmann, Hagberg, & Uvebrant, 2010; Sigurdardottir, Thorkelsson, Halldorsdottir, Thorarensen, & Vik, 2009). Majority of the preterm infants do not develop CP. However, in addition to CP, a delay in motor development is a frequently encountered problem (Allen, Cristofalo, & Kim, 2011). Significant number of preterm infants may develop delayed motor development, asymmetry, neurological abnormalities such as hypotonia or hypertonia, problems with swallowing, motor planning problems, sensorial processing dysfunctions, functional disorders, academic difficulties, and socio-economic problems (Allen, 2008; Allen et al., 2011; Lau et al., 2003).

Studies have shown that compared with the term infants, preterm infants are more prone to visual and auditory impairments in addition to cognitive problems (Allen, 2008). Among preterm infants, cognitive problems may emerge in the early life, but they may also experience problems in the areas such as language, academic achievement, and social skills later during preschool and school periods or even at adulthood (Allen et al., 2011). Observations of comparatively higher risk for motor and cognitive problems among preterm infants suggest that these infants need early intervention.

There are several studies intending to investigate the effects of physiotherapy rehabilitation and educational approaches on the cognitive and motor development in preterm infants during the early periods of life. In a study done in Avon Premature Infant Project, it is shown that there was no developmental benefit from long term family support after preterm birth (Project, 1998). Nordhov et al. have reported in a study conducted in 2010 that, the Mother-Infant Transaction Program, a parent-focused neurodevelopmental program applied in preterm babies with a history of 2000 g or lower birth weight, lead to improved cognitive outcomes at corrected age of five years (Nordhov et al., 2010). In another study of the same team conducted in 2012, it was reported that, the children included in this program had less behavioral problems at the age of five (Nordhov, Rønning, Ulvund, Dahl, & Kaarensen, 2012). On the other hand, in a review conducted by Spittle et al., they reported that in 3113 preterm infants received early NDT during the first twelve months of life, there was a medium improvement in the cognitive development scores and less improvement in the motor development scores compared with a control group, and this cognitive difference vanished during the school years (M. Spittle, Orton, Anderson, Boyd, & Doyle, 2015).

Physiotherapy and/or educational approaches in the early period of life are implemented usually during the first year after birth, specifically to benefit from the high plasticity in the central nervous system. Via the intensive therapies during this period, normal progress of the motor and cognitive development is aimed, and interventions during this period are beyond therapeutic also for preventive purposes (Blackman, 2002).

Recent studies implementing early physiotherapy programs targeted for preterm infants have increased in the literature (Nordhov et al., 2010; Nordhov et al., 2012; Project, 1998). Studies demonstrating positive effects of physiotherapy and educational approaches in the first years of life however are scarce and it is widely accepted that there is insufficient available evidence.

According to the increase in low gestational birth rates and the lack of reaching and follow up to the early intervention programs at the clinics, family centered physiotherapy programs are more popular in the developing countries. This study was designed to investigate the effects of physiotherapy, implemented at the first years of life, on the cognitive and the motor development in premature infants. This will guide the health care professionals about the treatment of premature infants in the early period of life.

2. Materials and methods

Seventy-eight infants (34 girls, 44 boys) between the ages 24/36 week + 6 days referred from different centers in Ankara and cared at the Gazi University Neonatal Intensive Care Unit were included in the study. The 23 infants (11 girls-47,8%, 12 boys-52,2%) were between 24 and 29 weeks, 31 infants (11 girls-35,5%, 20 boys-64,5%) were between 30 and 34 weeks and 24 infants (12 girls-50%, 12 boys-50%) were between 35 and 36 weeks. The infants having family centered early intervention was study group whereas the 76 infants having no intervention served as age matched controls. Inclusion criteria were as follows: being voluntary, corrected age less than 6 months, and having no history of seizures. Neurological examinations of the infants were carried out by an experienced specialist in pediatric neurology and psychomotor evaluations were done by a specialist psychologist. Neurodevelopmental evaluation was performed in a quiet and silent room using the Bayley Scales of Infant Development (BSID-II). BSID-II was developed by Bayley in 1969 and revised in 1993. It is used in infants and toddlers in 1–42 months of age. Cognitive Development Scale (CDS) was used to measure the information processing, memory, language, social skills, and cognitive strategies and the Motor Development Scale (MDS) was used to evaluate the gross and the fine motor skills (Bayley, 1993).

2.1. Ethical considerations

This study has been approved as a research by the Kecioren Research and Training Hospital Ethical Committee with the number B.10.4.ISM.4.06.68.49/according to the Helsinki Declaration.

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