



## Motor Sensory Physiotherapy Intervention in Premature Infants in Neonatal Intensive Care Unit (NICU)



George Tsigaras <sup>a</sup>, Alexandra Xristara-Papadopoulou <sup>b</sup>, Athina Georgiadou <sup>c</sup>, Anna Chalkia <sup>d</sup>, Efthymia Vargiami <sup>e</sup>, Kallistratos A. Ilias <sup>f</sup>

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### Corresponding Author <sup>a</sup>



### Abstract

**Purpose:** The purpose of this study is to explore the importance of implementing a customized motor sensory physiotherapy program by recording data about the total days spent and weight gain of preterm infants in the Neonatal Intensive Care Unit. **Methods:** Randomized clinical trial of a sample of thirty (30) preterm infants split into two 15-member groups, one intervention group, and one control group. An adapted program of motor sensory physiotherapy techniques, while in NICU, was implemented to the intervention group while nothing was implemented to the control group. Both groups met the same entry criteria. The same protocol of motor sensory physiotherapy was applied in the intervention group during the whole period of the study. **Results:** Data show that customized motor sensory physiotherapy while in NICU improves weight gain and reduces total days of stay. **Discussion:** Even though adapted motor sensory physiotherapy intervention has a positive impact on the development and outcome of preterm infants in NICU, more research is required on the physiotherapy techniques by studying a larger sample size in NICU.

### Keywords

*endometrial development;  
motor sensory development;  
motor sensory intervention;  
neonatal intensive care unit;  
preterm;*

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- <sup>a</sup> Neonatal Intensive Care Unit, Ippokrateio General Hospital, Thessaloniki, Greece  
<sup>b</sup> International Hellenic University of Thessaloniki, Thessaloniki, Greece  
<sup>c</sup> Neonatal Intensive Care Unit, Ippokrateio General Hospital, Thessaloniki, Greece  
<sup>d</sup> International Hellenic University of Thessaloniki, Thessaloniki, Greece  
<sup>e</sup> Neonatal Intensive Care Unit, Ippokrateio General Hospital, Thessaloniki, Greece  
<sup>f</sup> International Hellenic University of Thessaloniki, Thessaloniki, Greece

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## 1 Introduction

According to bibliographical references motor sensory physiotherapy intervention is based on neuroplasticity and on the principles that govern it in those critical periods of neurodevelopment. The various mechanisms of neuronal plasticity are important factors that contribute to the brain's ability to acquire new information, to change in response to external stimulation, and to recover from injury (Johnston, 2009). Recording and understanding of risk factors, through early intervention programs, may provide the basis for the therapeutic intervention and development of guidelines.

Randomized clinical trial of a sample of thirty premature infants who were randomly separated into two 15-member groups, the intervention group and the control group. We implemented an adapted program of motor sensory physiotherapy techniques in one of the groups (intervention group), while in the control group, no such intervention was implemented. The two groups met the same entry criteria. The techniques we chose were Adapted Positive Touch Stimulation, Customized Positioning and Position Changing, Adapted Motor Sensory Positive Stimulation, Visual-hearing Positive Stimulation, and Massage. The data were analyzed by comparing the two groups for weight gain and days spent in NICU.

Our results show increased weight gain and fewer days in NICU in the intervention group compared to the results of the control group. In conclusion, adapted motor sensory physiotherapy intervention seems to improve weight gain and reduce the stay in NICU.

## 2 Materials and Methods

We created a Randomized Clinical Trial of adapted motor sensory physiotherapy intervention which took place in Ippokrateio General Hospital of Thessaloniki Neonatal Intensive Care Unit in 2017. Ethical approval was given by the Bioethics Committee of Alexander Technological Educational Institute of Thessaloniki. Approval was given by the scientific department of Ippokrateio Hospital. Parents were informed and parental permission was given for the intervention in NICU, without changing our methods after the beginning of the trial.

The sample size of the trial was thirty premature infants (n=30). Randomly separated into two 15-member groups the Intervention group and the Control group. Adapted motor sensory physiotherapy intervention was applied in the intervention group, in comparison with the control group which did not receive motor sensory physical therapy intervention. We set selection criteria as follows: Age 25w-37w, Birth weight 700gr-2500gr, and clinical stability.

We set exclusion criteria as follows: Positive toxicological results, mother's history of using drugs during pregnancy, congenital anomalies requiring surgical intervention, meningitis, intracranial bleeding III or larger, chromosomal abnormalities, history of epileptic seizures, very poor prognosis for survival. The two groups met the same entry criteria, and the intervention group followed the same protocol of adapted motor sensory physiotherapy intervention throughout the trial.

100% of the sample belongs in the category of premature infants (25-37 weeks gestation). Homogeneity is recorded between the two groups with 53% belonging to the category SGA and 47% belonging to the category

AGA. The data collection was done through recording of the clinic printed forms (medical files) and manual recording of the observation of the infant's daily adapted motor sensory physiotherapy intervention.

*Data collected were analyzed.*

The comparison between the two groups of parameters of weight gain in grams during the intervention period (Weight Gain), and the total NICU stay in days (Stay Duration) taken from the medical history files by the medical staff.

The duration period of the intervention was set to 4 weeks with the abstention of the intervention 2 days per week, totaling twenty (20) days of intervention. The duration of each intervention session was set to a maximum of 30 minutes and a minimum of 20 minutes. The duration of each technique was set to 5 minutes maximum with amendments of the program depending on the responsiveness and adaptation to the program of each infant in each technique, choosing after the first 20 minutes the techniques that each infant responded better to. Intervention time was adapted to the infant's condition depending on the response observed. Intervention stopped when the heart rate indication from the oximeter was more than 180 beats per minute for over 1 minute (monitor max180bpm/max1min) and the blood oxygen level was less than 90 spO<sub>2</sub>.

The techniques used were chosen based on bibliographical references of their positive outcomes (Javier et al., 2012; Byrne & Garber, 2013; Spittle et al., 2007; Lewis & Feiring, 2014; Byrne & Garber, 2013; Piek, 2002; Byrne & Campbell, 2013; Bonnier, 2008; Morgan et al., 2013; Sweeney et al., 2009; Sweeney et al., 2010; Als et al., 2004; Field, 2017; Ohlsson & Jacobs, 2013; Cameron et al., 2005; Girolami & Campbell, 1994; Rustam et al., 2016) and are as follow: Positive touch stimulation (Als et al., 2004; Ohlsson & Jacobs, 2013; Feldman et al., 2014), Positioning and Position changing (Field, 2017; Sweeney et al., 2010; Byrne, E., & Garber, 2013; Vaivre-Douret & Golse, 2007; Ferrari et al., 2007; Prins et al., 2010), Motor sensory positive stimulation (Field, 2017; Field et al., 2010; Byrne & Campbell, 2013; Bhat et al., 2005; Bhat & Galloway, 2006; Bhat et al., 2007; Hadders-Algra, 2001; Massaro et al., 2009), Visual-hearing positive stimuli (Byrne & Campbell, 2013; Field, 2017; van Hof et al., 2006; Niemi, 2017; Alvarez et al., 2017), and Massage (Niemi, 2017; Alvarez et al., 2017; Jain et al., 2006; Procianoy et al., 2010; Lin et al., 2015; Massaro et al., 2009; Hernandez-Reif et al., 2007; Lahat et al., 2007; Moyer-Mileur et al., 2013; Yates et al., 2014; Saeadi et al., 2015; Wang et al., 2013; Smith et al., 2013; Smith et al., 2013; Cabral et al., 2016; Dirix et al., 2009). The intervention protocol that was analyzed focuses in the implementation of adapted appropriate techniques that offer a feeling of absolute protection (simulation of endometrial experience), in controlling of external stimulation, in recording vital sign data evaluated and recorded by the physiotherapist via recording tools and medical monitor observation, and in data collection from the medical history files. In each physiotherapy session, personalized (touch-proprioceptive-motor sensory-visual hearing-vestibular) stimulation is applied depending on the needs and the signs of undesirable effects of each infant. We are obligated to change our approach if the response of the infant is not the one expected. It is imperative to modify our techniques according to the clinical response of the infant (Fox et al., 2010; Malina, 2004; Hadders-Algra, 2000; Cabral et al., 2016; Moyer-Mileur et al., 2013; Bonnier, 2008; Meena et al., 2012; Alvarado-Guerrero et al., 2011; Chorna et al., 2014; Brauer et al., 2016; Fox et al., 2010; Spittle et al., 2007). All the numerical data were analyzed with SPSS-24 and shown as Excel graphs.

### 3 Results and Discussions

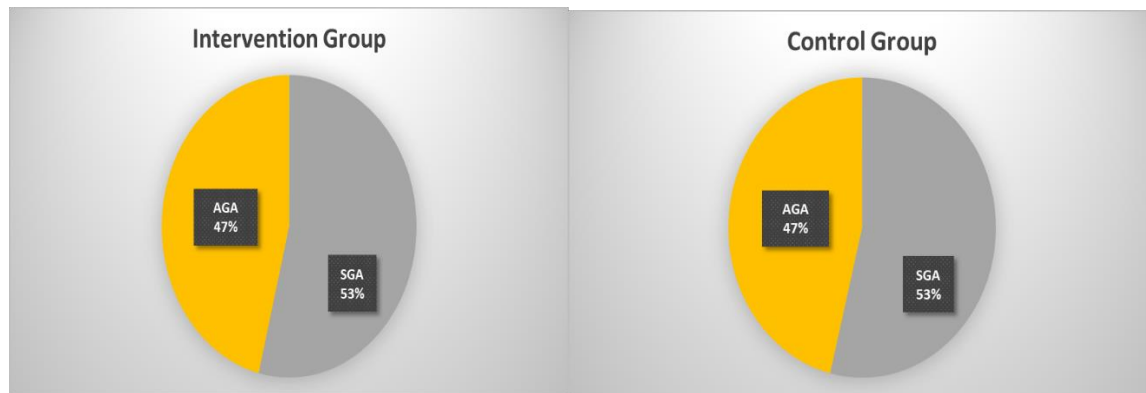


Figure 1. Homogeneity of SGA-AGA between the groups

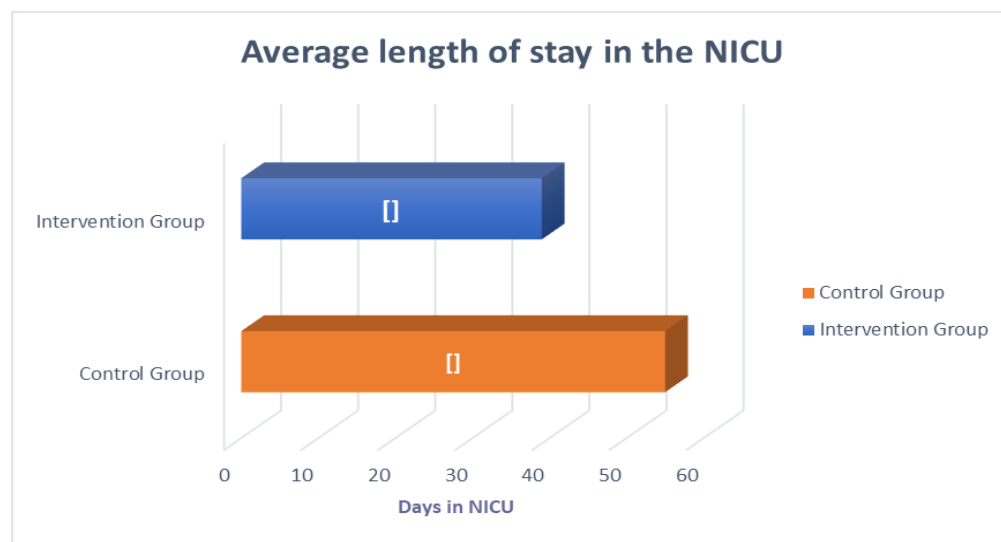


Figure 2. Days in NICU

In Figure (2) we can see the recorded data of days spent in NICU of the control and intervention group. A significant deviation of the intervention group, which followed an adapted program of physiotherapy, is recorded (Mean 39,27) in the days spent in NICU in comparison with the recorded stay of the control group (Mean 55,47). Our data show the importance and differentiation of the two groups in the total days spent in the NICU.

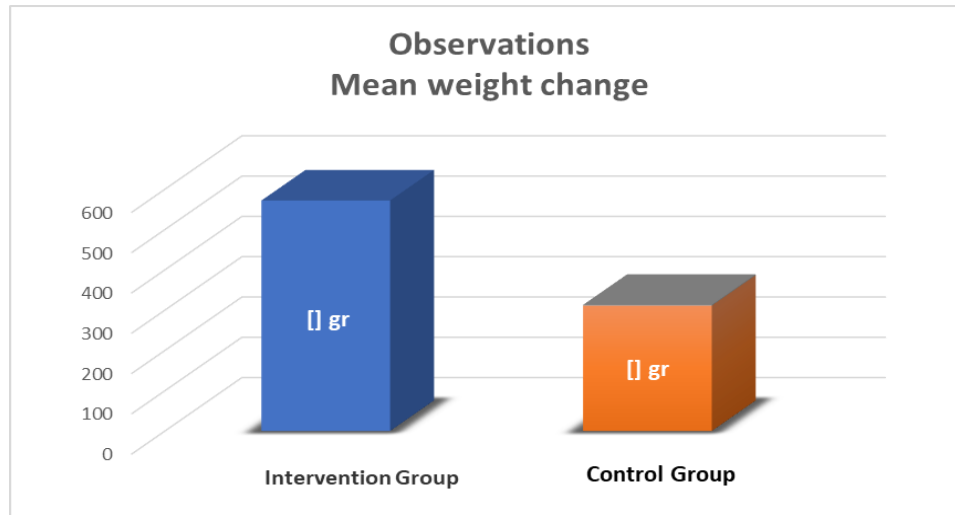


Figure 3. Weight gain (grams)

In Figure 3 we can see a bar graph of the mean weight gain of the two groups. We can see a significant deviation of the intervention group, which followed a customized motor physiotherapy program, (Mean 572gr) in comparison with the control group (Mean 311gr) in the recordings of average weight gain.

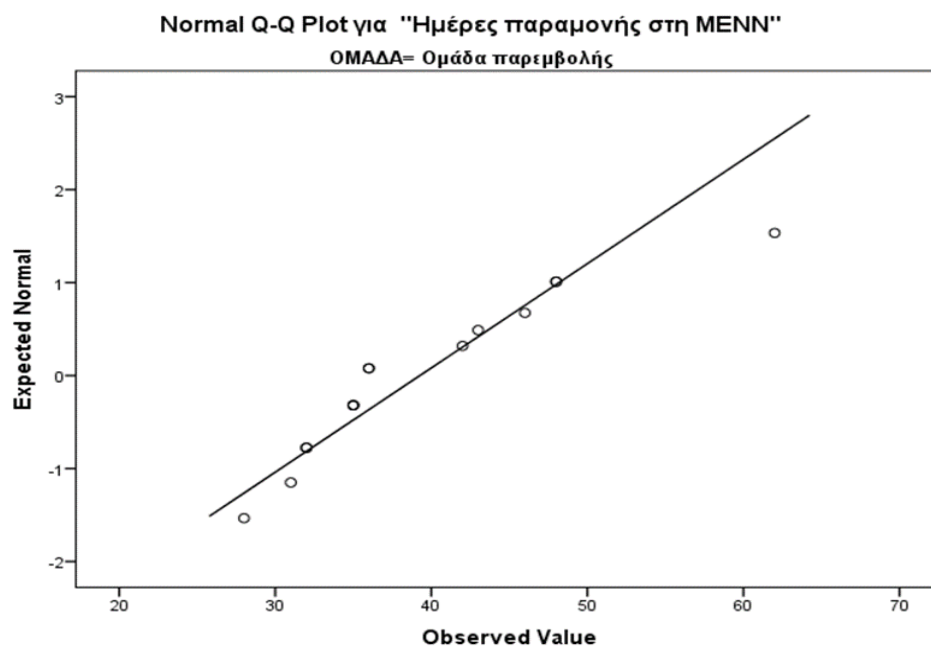


Figure 4. Days that the preterm stayed in the NICU

### Discussion

The adverse effects of the NICU environment have been discussed in many studies, with both short-term and long-term impacts on the development of the infants. One of the limitations of those studies as well as our own is the organization and enrichment of a positive experience tailored to each infant. Daily care in the NICU provides negative experiences through sound, lighting, and medical and nursing procedures (64-85).

Through bibliographical references, studies inform us of the neurodevelopmental importance of adapted motor sensory intervention and the need for interventions focused on enriching via targeted external stimulation in the NICU environment (1-18). Different studies have explored different techniques of motor sensory interventions and have found positive outcomes of such interventions (10-52). The main body of our study is focused on the short-term impact of those interventions up until the infant is discharged from the NICU. Based on those studies, our statistical outcomes are consistent with the findings of those studies mentioned on the areas of weight gain and duration of NICU stay.

A printed form for collecting data from medical history files after the customized motor sensory physiotherapy intervention was created. A sample of 30 premature infants who met the entry criteria was selected. Two groups were created, each of 15 infants, one intervention group and one control group. The statistical data were analyzed. Comparison of the numerical deviations of the two groups recorded by medical staff (medical history). An adapted motor sensory physiotherapy program was implemented in the intervention group and the data of both groups were analyzed based on the parameters of weight gain in grams and the days of stay in NICU. The originality of our study is in the combination of the adapted motor sensory physiotherapy techniques, in the time frame of vital sign collection, in the way the data were collected by the blood oximeters, and finally in the observation of the clinical presentation of the infant.

While data collection from medical monitors is present in other studies, we didn't find any data collection and comparison as we performed in our research. The statistical outcome is strengthened by the fact that the adapted motor sensory physiotherapy intervention took place under the supervision of doctors working in NICU, and by the fact that our recordings were taken by the medical files of the infants who were filled by the medical and nursing staff of NICU.

One benefit of this procedure is that all our interventions were carried out in the same manner, by the same practitioner, without any difference in their implementation, while the arithmetic values of our data were taken from the medical files that were filled by the medical staff of NICU. One restriction of our study is that all the techniques were implemented in combination with each other, so it is difficult to examine the effect of each one separately in our recordings. In the statistical analysis of the data there are obvious differences in the average days of NICU stay of the intervention group (Mean 39,27) and those of the control group (Mean 55,47).

The average weight increase in grams of the intervention group was (Mean 572gr) while the control group was much lower at (Mean 311,33gr). Comparison of the above parameters during the period of the customized intervention gives us an idea of the improvement of vital sign recordings and the response and adaptability of the infants to the adapted intervention through external motor sensory stimulation.

## 4 Conclusion

Our statistical results reinforce the research hypothesis of the effectiveness of adapted motor sensory physiotherapy in preterm infants in NICU. In the first phase, we record an improvement in the intervention group in comparison to the control group in the areas of weight gain and the reduced stay in NICU. In conclusion, we conclude that the implementation of a customized motor sensory physiotherapy program in preterm infants inside NICU can improve and enhance their development and the response of infants to external stimulation as well as reduce the number of days they have to remain in NICU.

### *Acknowledgments*

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## Biography of Authors

|   |   |
|---|---|
|    | <p><b>George Tsigaras</b><br/>PT PhD, MSc, NDT, SI 1st Department of Pediatrics, Aristotle University Thessaloniki Hippokratio General Hospital Adress:49 Konstantinoupoleos str, Thessaloniki 54642, Greece.<br/><i>Email: <a href="mailto:tsigarasphysiopediatric@gmail.com">tsigarasphysiopediatric@gmail.com</a></i></p>  |
|    | <p><b>Alexandra Xristara-Papadopoulou</b><br/>She is a former teacher in the International Hellenic University. In 1978 she got her degree in physical therapy. In 2006 Ph.D title studies from the University National Sport Academy &lt;&lt; Vasil Levsky &gt;&gt; of Sofia from a physical therapy department, recognized by DOATAP, with theme &lt;&lt; Comparative study of effectiveness of three physical therapy methods in the treatment of cystic fibrosis &gt;&gt; , &lt;&lt; Comparative study of the efficiency of three physiotherapy methods in the treatment of Cystic Fibrosis.<br/><i>Email: <a href="mailto:hristara2@hotmail.com">hristara2@hotmail.com</a></i></p> |
|   | <p><b>Athina Georgiadou</b><br/>She has a degree from the School of Physiotherapy IHU Thess/nikis, and PhD candidate at Sofia University Department of Pediatric Physiotherapy. She participated in the EAP for a master's degree in Adult Education. She holds the title Senior NDT-BOBATH and is a member of the committee for reforming the study content of the basic postgraduate training in Neuroevolutionary Education – BOBATH Method and the reformation of the study content of the baby NDT-BOBATH courses.<br/><i>Email: <a href="mailto:athinandt@gmail.com">athinandt@gmail.com</a></i></p>  |
|  | <p><b>Anna Chalkia</b><br/>She is an Assistant Professor at the International Hellenic University of Thessaloniki, Department of Physiotherapy.<br/><i>Email: <a href="mailto:annachalkia18@gmail.com">annachalkia18@gmail.com</a></i></p>  |
|  | <p><b>Efthymia Vargiami</b><br/>MD, PhD Professor of Child Neurology Pediatrics 1st Department of Pediatrics Aristotle University of Thessaloniki Hippokratio General Hospital 49 Konstantinoupoleos str, Thessaloniki 54642, Greece<br/><i>Email: <a href="mailto:evargiam@auth.gr">evargiam@auth.gr</a></i></p>   |
|  | <p><b>Kallistratos A. Ilias</b><br/>PT, PhD Professor Vice President of Physiotherapy Department Faculty of Health Sciences International Hellenic University Lab of of Basic and Applied Research in Physiotherapy Rehabilitation, Director Dept. Physiotherapy.<br/><i>Email: <a href="mailto:elikall@hotmail.gr">elikall@hotmail.gr</a></i></p>  |