

Efficacy of Early Physiotherapy Intervention in Preterm Infant Motor Development — A Systematic Review—

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Abstract. [Purpose] Although there has been an improvement in survival rates for extremely low weight infants over the last two decades, premature neonates have a greater risk of developing motor disorders than those born full-term. Our purpose here is to review the efficacy of early physiotherapy intervention in the normalization or improvement of motor development in preterm infants. [Subjects] We reviewed sixteen articles meeting the inclusion criteria which covered 1075 patients. [Methods] Randomized clinical trials, controlled or quasi-randomized clinical trials and cohort studies or control cases of preterm developmental early intervention programs were used if intervention began in the first 18 months of life. A systematic review of studies grouped by methodological characteristics of physical therapy intervention: type and characteristics and an assessment of intervention effects was undertaken. [Results] Studies included in this review were of a very heterogeneous nature which precludes meta-analysis and limits generalization of the conclusions arrived at in this review. The review results indicate that physical therapy interventions carried out on preterm infants must be adapted to an infant's age and individual characteristics.

Key words: Physiotherapy, Preterm infants, Motor development

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INTRODUCTION

Premature or low birth weight neonates have a greater risk of developing motor disorders than those born full term^{1–3)}. Although there has been an improvement in the survival rates of extremely low weight infants over the last two decades, the disability rate has kept relatively constant. Thus, up to 50% of preterm infants may later show motor disabilities^{1, 3)} and, between 5% and 15% may suffer cerebral palsy^{4, 5)}.

Minor motor disorders, nowadays classified as coordination development disorders, are more prevalent in premature infants with very low birth weight^{5–8)}. These motor problems continue during adolescence and may have an effect on school performance and self esteem⁹⁾.

Motor disorders in premature infants may also be linked to medical risk factors; however, these only represent some of the factors associated with the appearance of motor alterations in the long term. Non-medical factors such as social class, parental education, lifestyle and family structure are also related to the results of premature infant development^{10–12)}.

A large number of studies concur that early identification of children with motor disability is important for providing the earliest support and intervention, optimal treatment of motor problems may reduce cognitive and psychosocial

problems¹³⁾.

There are various types of physical therapy intervention focused on the improvement or normalization of motor development. These physical therapy interventions have the aim of optimizing motor development and, in general, are mainly based on Bobath's neurodevelopment treatment principles, which are used to modify sensory information and anomalous movement patterns in order to improve motor development through passive and active techniques^{14, 15)}. Systematic reviews of the effects of the Bobath method in children with neurologic dysfunction have not been conclusive. In 2001, Brown et al. reported there were positive results for neurodevelopment treatment in six out of 15 studies¹⁴⁾. In 1986, Ottenbacher et al. reported a small effect of the treatment on motor progress compared to a control group^{16, 17)}. The physical therapy interventions described below have been used as early intervention methods but there has been insufficient research to determine their effect on motor development.

- Vojta method which is based on neurokinesiology child development.

- Family Focus Physiotherapy, in which the physiotherapist and parents design a motor stimulation program adapted to the skills of the child, needs of the family, and possibilities of the child's environment.

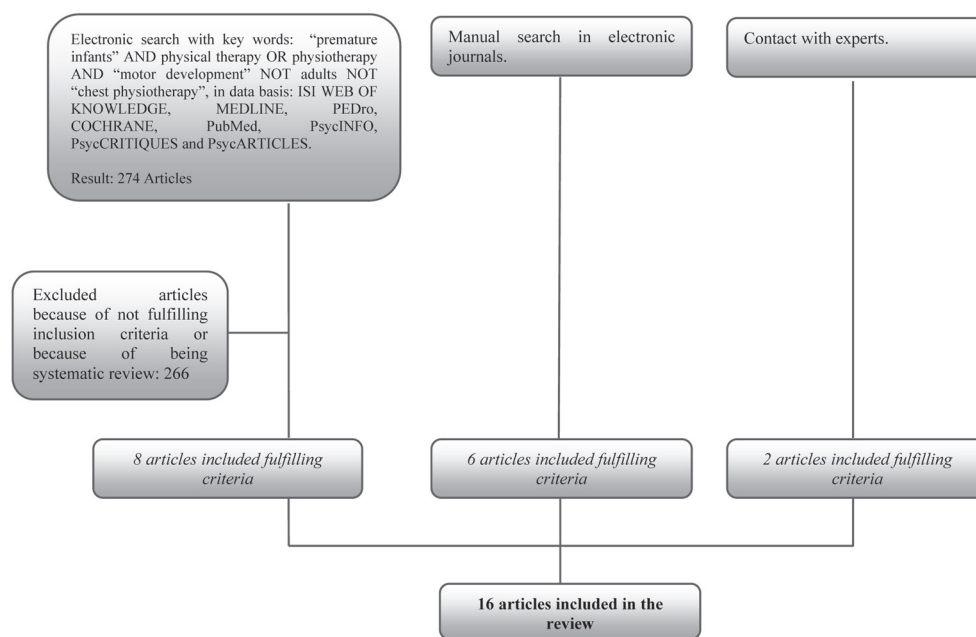


Fig. 1. Search strategy

- Sensoriperceptive Physiotherapy which stimulates kinaesthetic development by activating the motor reaction of the CNS through afferent stimuli, above all tactile.

- Physiotherapy based on Motor Development, comprising a set of active and passive techniques with a certain degree of collaboration by the child in order to stimulate motor development learning on their centres of interest.

These motor interventions are generally carried out by physiotherapists and by parents guided by these professionals.

Our purpose here is to review the efficacy of early physiotherapy intervention in the normalization or improvement of motor development in preterm infants.

SUBJECTS AND METHODS

Our criteria for the study assessment were types of study, characteristics of participants, types of intervention and outcome measure.

Regarding the types of study, we included randomized clinical trials (RCT), controlled or quasi-randomized clinical trials and cohort studies or control cases.

The characteristics of participants were premature infants of a gestational age inferior to 37 weeks (P) and motor high risk infants (MHR). We included preterm infants with a gestational age below 37 weeks who showed one or more of the following risk factors: sharp foetal suffering, degree IV intra-ventricular haemorrhage, periventricular leukomalacia, respiratory distress, parenchymatous lesions, neurologic pathologic clinical exam (alteration of primitive reflex, alteration of muscular tone, delay in acquisition of motor skills), moderate or serious alteration of central coordination according to Vojta postural screening.

Subject sample sizes were 5 or greater for each group

(experimental/ control).

The types of intervention included in this review were physiotherapy based on the Bobath Method, Vojta Method, Motor Development, sensoriperceptive techniques and family-focused physiotherapy.

For more than 50% of participants, intervention began between birth and 18 months corrected age.

The outcome measures were not specific; only a motor skill was required to be evaluated.

The search strategy that we used is described below:

From January to May 2011, a systematic review of the scientific literature in the databases of ISI WEB OF KNOWLEDGE, MEDLINE, PEDro, COCHRANE, PubMed, PsycINFO, PsycCRITIQUES and PsycARTICLES was carried out. It included the type of study design, participants' characteristics and intervention types detailed above in the inclusion criteria from January 1960 to April 2010 in the English, French, Italian, Portuguese and Spanish languages. The following search strategy was used: "premature infants" AND "physical therapy" OR physiotherapy AND "motor development" NOT adult NOT "chest physiotherapy". As a result of this search, a total of 274 articles were found. After analysis, eight articles fulfilling the inclusion criteria were chosen. Six articles found in electronic journals were added to the results of the previous search. We also acquired two additional articles through our contact with experts making the total amount of collected articles fulfilling the criteria for inclusion in this review 16 (Fig. 1).

The corresponding author (FJFR) together with an external researcher with experience in this area (ICM) carried out a quality assessment of the 16 articles independently using the PEDro scale (Physiotherapy Evidence Database) adapted from the Delphi scale¹⁸⁾ and Van Tulder scale¹⁹⁾. Our evaluations had discrepancies in the marking of quality

with the PEDro and Van Tulder scales for two studies. These discrepancies were resolved through discussion.

Trials with a 3/10 score on the PEDro scale and with a 3/11 score on the Van Tulder scale were included. The score of both scales for all the studies are shown in Tables 1 and 2.

As in the assessment of methodological quality, the corresponding author of the review (FJFR) and the external researcher (ICM) determined the level of evidence of the clinical trials, based on the Centre for Evidence Based Medicine (CEBM) using the Oxford classification (Table 3). Both evaluators came to an independent unanimous agreement when scoring the evidence level of the trials. Trials showing a level of evidence 3b or better were accepted.

RESULTS

The 16 studies meeting the inclusion criteria were analyzed. Table 4 lists the methodological characteristics of the studies, participants, study groups and experimental design. Table 5 includes the intervention characteristics, age at beginning of intervention, type of intervention, duration, frequency, intensity and place of implementation. Table 6 shows the assessment of intervention effects, measurement instruments used, ages when the measurements were conducted, and results.

DISCUSSION

Studies included in this review were of a highly heterogeneous nature. There is a wide variety not only in the number of participants included in the studies, but also in the type of physical therapy intervention carried out, in the duration, frequency and intensity of therapy, in the age at the beginning of the intervention, in the instruments used to assess intervention, and in the age when evaluations were performed. This heterogeneity precludes a formal meta-analysis and restricts the conclusions that may be drawn from this review.

It is important to point out that 5 of the 16 studies used in this review had high methodological quality, a score of six or higher on the PEDro scale,^{15, 25, 29–31} five had medium methodological quality, a score of five,^{20, 22, 26, 27, 33} and six had low methodological quality, with scores of less than five,^{21, 23, 24, 28, 32, 34}. Two out of five studies with high methodological quality reported favourable results for the intervention groups^{15, 29} (40%). One of the five studies with medium methodological quality (20%) reported favourable results for the intervention group²⁶ and three of the six studies with low methodological quality reported favourable results for the intervention groups (50%)^{23, 28, 32}. Previous reviews have reported that when there is increased methodological rigour in studies, there tends to be a decrease in the results which support the efficacy of early physical therapy intervention in the motor progress of premature and high risk infants³⁵. We could draw a similar conclusions from the studies included in this review. However, taking into account the heterogeneity of the analyzed studies and the qualitative methodological differences among them, it is important to say that in all of the studies reported a favourable result for

the intervention group, i.e., children receiving early physical therapy treatment improve and progress in their motor development even though this improvement or change was not statistically significant in some studies.

Intervention methods during the period when premature children were in the Neonatal Intensive Care Unit varied from the Rice method, kinaesthetic stimulation³¹, to different types of physical therapy programs based on motor stimulation and neurodevelopment treatment principles^{15, 22, 23, 25, 34}. In those studies where intervention began when children were discharged from the Neonatal Intensive Care Unit, the Bobath method was the main method of physical therapy intervention^{26, 30, 32, 33}, but there were also studies with interventions based on the Vojta Method^{21, 28}, family-focussed physiotherapy¹⁵, physiotherapy based on motor development^{20, 27, 29, 34}, and mixed treatments based on the Vojta and Bobath methods²⁴.

Nine of the sixteen studies analyzed in this review reported statistically significant results for early physical therapy intervention for preterm infants. Out of these 9 studies, 6 reported the efficacy of the physiotherapy treatment provided to preterm infants who did not show motor risk factors other than their characteristic immaturity (P). The different types of physiotherapy treatments were initiated in the first trimester of life. The most effective treatment during the NICU period was Bobath method²⁵, which improved the development of spontaneous motor activity and postural control preterm infants. In short term physical therapy treatments based on the administration of sensoriperceptive techniques³¹, and the stimulation of motor development using active and passive techniques²⁹, infants showed improved motor performance. It is interesting to highlight the results obtained by Heathcock et al.²⁷ who reported the earliness in the emergence of reaching in preterm infants after a training programme. In the medium term studies by Goodman et al.²⁶ and from Rothberg et al.³² reported favourable results for Bobath method, after initiating the intervention in the hospital and continuing it at home. Also, it is interesting to point out that Rothberg et al.³², also reported the positive effects of Bobath method on motor development were long-term.

Three studies reported favorably about early physical therapy intervention for infants with motor high risk (MHR). The most effective short-term treatment was the one based on the Coping with and Caring for Infants with Special Needs (COPCA) method¹⁵, which was mainly performed in the sitting position.

Among the medium- and long-term studies, Chunyan et al.²³ administered a combined treatment of Bobath-Vojta in hospital, and Kanda et al.²⁸ administered the Vojta method at home. Both studies reported improvements in the infants' motor development. Specifically, in Kanda's study, preterm infants with periventricular leukomalacia at risk of developing spastic diplegia, could maintain the standing position and perform early stepping when the treatment was completed. However, infants who were not provided treatment with the Vojta method and who did not complete the treatment, could not maintain the standing position. In these studies, the physical therapy intervention was initiated

Table 1. Methodological quality analysis results of the studies in accordance to PEDro Scale

PEDro Scale	1	2	3	4	5	6	7	8	9	10	S
Badr et al ²⁰	*		*			*			*	*	5
Blauw-Hospers et al ¹⁵	*		*			*	*		*	*	6
Brandt et al ²¹	*					*	*			*	4
Cameron et al ²²	*		*			*			*	*	5
Chunyan et al ²³	*		*						*	*	4
D'Avignon et al ²⁴	*						*			*	3
Girolami et al ²⁵	*		*	*		*			*	*	6
Goodman et al ²⁶			*	*		*			*	*	5
Heathcock et al ²⁷	*		*			*			*	*	5
Kanda et al ²⁸			*						*	*	3
Lekskulchai et al ²⁹	*	*	*			*	*		*	*	7
Piper et al ³⁰	*	*		*			*		*	*	6
Rice ³¹	*		*			*	*		*	*	6
Rothberg et al ³²						*			*	*	3
Weindling et al ³³	*	*				*			*	*	5
Yigit et al ³⁴	*		*						*	*	4

1.-Random allocation, 2.- Allocation concealment, 3.-Similar prognostic at the beginning, 4.-Subject concealment, 5.-Blinding of therapists 6.- Blinding of reviewer, 7.- Follow up over 85% of a significant result and report of the punctual assessment, 8.-The analysis includes an intention-to-treat analysis, 9.- Results from the statistical comparisons among groups are shown at least for one of the measurement, 10.- Variability measurements of, at least, a significant result, S= Score, *criteria fulfilled

Table 2. Methodological quality analysis results of the studies in accordance to Van Tulder Scale

Van Tulder Scale ¹⁹	1	2	3	4	5	6	7	8	9	10	11	S
Badr et al ²⁰	*		*			*			*	*		5
Blauw-Hospers et al ¹⁵	*		*			*		*	*	*		6
Brandt et al ²⁷	*					*		*	*	*		5
Cameron et al ²¹	*		*			*		*	*	*		6
Chunyan et al ²²	*		*					*		*		4
D'Avignon et al ²³	*							*	*	*		4
Girolami et al ²⁴	*		*	*		*			*	*		6
Goodman et al ²⁵			*	*		*		*	*	*		6
Heathcock et al ²⁶	*		*			*			*	*		5
Kanda et al ²⁷			*					*		*		3
Lekskulchai et al ²⁸	*	*	*			*		*	*	*		7
Piper et al ²⁹	*	*		*				*	*	*		6
Rice ³⁰	*		*			*		*	*	*		6
Rothberg et al ³¹						*		*	*	*		4
Weindling et al ³²	*	*				*			*	*		5
Yigit et al ³³	*		*					*	*	*		5

1.- Was the random allocation method adequate?; 2.- Was the allocation to the treatment concealed?; 3.-At the beginning, were the groups similar in relation to the most important prognostic factor?; 4.-Were the patients concealed?; 5.-Was the therapist blinded?; 6.-Was the evaluator blinded?; 7.-Were the co-interventions avoided?; 8.-Was the permanence of the participants acceptable in all of the groups?; 9.-Was the ratio of experimental death described and acceptable?;10.-Was the moment of assessment of the result similar in all of the groups?; 11.-Did it include the analysis of the results of the intention-to-treat?; S= Score, *criteria fulfilled

in the first trimester of the children's lives.

Studies of the effects of intervention for preterm and high risk infants often have specific problems. First, many studies include small groups with great heterogeneity in problems and degree of disability / impairment. This generalization reduces of statistical strength. Second, as the assignment

of participants to a control group not receiving treatment is not ethical, i.e. a premature or high risk child cannot be left without any intervention, it implies that the results only represent the additional value of the intervention being studied.

Another common and significant problem is the existence

Table 3. Level of evidence according to CEBM from Oxford

Recommendation degree	Level of Evidence	Type of study
A	1a	RCT systematic review (homogeneous among them).
	1b	Individual RCT (with a narrow confidence interval).
	1c	Clinical practice (all of them or none).
B	2a	Systematic revision of the cohort studies (homogeneous).
	2b	Cohort individual Studies / individual RCT of low quality
	2c	Outcomes research. Ecological studies.
	3a	Systematic review of cases and controls (homogeneous).
	3b	Individual study of cases and controls.
C	4	Set of cases, cohort /cases studies and controls of low quality
D	5	Expert opinion based on no systematic revision of results or on physiopathologic design.

Table 4. Methodological characteristics of the studies.

Study	Year	Size of the sample			Attrition (%)		Group of study	Design	Level of Evidence	PEDro Scale	Van Tulder Scale
		N	n-E	n-C	E	C					
Badr et al ²⁰	2006	62	32	30	15.32	15.32	MHR	RCT	1b	5/10	5/11
Blauw-Hospers et al ¹⁵	2007	20	9	11	0	0	MHR	RCT	1b	6/10	6/11
Brandt et al ²¹	1980	51/34 ^C	21/15	30/19	26,66	5,26	MHR	RCT	2b	4/10	5/11
Cameron et al ²²	2005	72	34	38	3	14	P	RCT	1b	5/10	6/11
Chunyan et al ²³	2007	84	42	42	0	0	MHR	RCT	2b	4/10	4/11
D'Avignon et al ²⁴	1981	32	12/10 ^a	8	3	3	MHR	RCT	2b	3/10	4/11
Girolami et al ²⁵	1994	33	9	10/8 ^b	21	21	P	RCT	1b	6/10	6/11
Goodman et al ²⁶	1985	80	40:20/20 ^d	40:20/20 ^e	0	0	P	QRCT	2b	5/10	6/11
Heathcock et al ²⁷	2008	39	26	13	15	13	P	RCT	1b	5/10	5/11
Kanda et al ²⁸	2004	10	5	5	0	0	MHR	CC	3b	3/10	3/11
Lekskulchai et al ²⁹	2001	84	43	41	5.84	8.16	P	RCT	1b	7/10	7/11
Piper et al ³⁰	1986	134	66	68	7.46	5.22	MHR	RCT	1b	6/10	6/11
Rice ³¹	1977	30	15	15	0	6.66	P	RCT	1b	6/10	6/11
Rothberg et al ³²	1991	49	24:13/12 ^d	25:15/9 ^e	22.28	16.71	P	QRCT	2b	3/10	4/11
Weindling et al ³³	1996	105	51	54	8.60	12.40	MHR	RCT	1b	5/10	5/11
Yigit et al ³⁴	2002	190	78	76	1.1	2.1	P	RCT	2b	4/10	5/11

N: Number of participants in the study. n-E: Participants in the experimental group. n-C: Participants control group. E: % attrition in the group of intervention. C: % attrition control group. a: 2 groups of intervention. b: 2 control groups. c: 2 studies sample comparison (Brandt/D'Avignon). d: Group of intervention divided into two subgroups normal and high risk. e: Control Group divided into two subgroups normal and high risk. MHR: motor high risk. P: Premature. RCT: Random Clinical Trial. QRCT: Quasi randomized Clinical Trial. CC: Cohort Studies and Control Cases.

of standardized measurement or assessment instrument. In general, assessment instruments are characterized by a lack of sensitivity in detecting small changes in motor development, despite the fact that these changes may have an important influence on the child's functional skills. Studies included in this review, as we have been able to verify, used a wide range of measurement instruments (Table 7). These

measurement instruments usually focus on the comparison of the score of a child with an equivalent age score, and this might be one of the reasons why the results show only small effects of the early physical therapy intervention. Another problem linked to the measurements used is that they record results without providing the clinical significance or the size of the effect, and they quantify quantitative changes in motor

Table 5. Physical Therapy Intervention. Type and characteristics

Study	Treatment Method	Desc.	Age I-I (months)	Intervention Period	Frequency	Intensity	Implementation of treatment	Location
Badr et al ²⁰	MDP	++	D≈1 M	12 MONTHS	5 W/S	20 MIN	P-O	HOME
Blauw-Hospers et al ¹⁵	COPCA	++	3 M	3 MONTHS	2 W/S	60 MIN	PT	HOSPITAL HOME
Brandt et al ²¹	VPT	-	4-6 ½ M	12 MONTHS			P	HOME
Cameron et al ²²	NDT	++	0-4 M	4 MONTHS	7 W/S	10 MIN	P	HOSPITAL HOME
Chunyan et al ²³	VPT-NDT	+	0-3 M 13% 4-6 M 33% 7-9 M 42% 10-12 M 12%	2-5 MONTHS	5 W/S	40 MIN	NI	HOSPITAL
D'Avignon et al ²⁴	VPT-NDT	-	<6 M	> 3 MONTHS- Bobath > 6 MONTHS- Vojta	NI	NI	PT	NI
Girolami et al ²⁵	NDT	++	N	7-17 DAYS	14 W/S	12-15 MIN	PT	HOSPITAL
Goodman et al ²⁶	NDT	-	3 M	9 MONTHS	1 M/S Daily	>45 MIN 45 MIN	PT P	HOSPITAL HOME
Heathcock et al ²⁷	MDP	++	2 ½ M	2 MONTHS	1W/S 5 W/S	30-45 MIN 20 MIN	PT P	HOME
Kanda et al ²⁸	VPT	++	< 3M	μ: 52 MONTHS	3-4 S/D	30 MIN	P	HOME
Lekskulchai et al ²⁹	MDP	++	FTA	4 MONTHS	1 M/S 7 W/S	NI	PT P	HOME
Piper et al ³⁰	NDT	++	FTA	12 MONTHS	1 W/S 0-3M 1 S/2S 3-12M Daily	60 MIN 60 MIN 30 MIN	PT PT P	HOME
Rice ³¹	SPP	++	0-1 M	1 MONTH	1 S/H 4 S/D	60 MIN 15 MIN	O P	HOME
Rothberg et al ³²	NDT	+	3 M	9 MONTHS	1 M/S Daily	>45 MIN 45 MIN	PT P	HOSPITAL HOME
Weindling et al ³³	NDT	-	FTA	12 MONTHS	1 W/S 0-6 M 1 S/2S 6-9 M 1 M/S 9-12M	NI	PT	HOME
Yigit et al ³⁴	MDP	-	N	24 MONTHS	1 M/S 0-9 M 1 S/3M 9-24M	NI	PT PT	HOSPITAL HOME

Desc.: Description of the intervention. Age I-I: Age at the beginning of the intervention. MDP: Physiotherapy Based on the Motor Development. COPCA: Physiotherapy focused on the family. VPT: Vojta Physiotherapy. NDT: Bobath Method. SPP: sensoriperceptive Physiotherapy. ++: Complete information. +: Incomplete information. -: without information. D: medical certificate of discharge M: Months. N: Birth. FTA: full term age (40 weeks post-conceptual). μ: mean. W/S: Weekly Sessions. NI: No indicated. M/S: Monthly Sessions. P: Parents. O: Others. PT: Physiotherapist

development rather than qualitative changes, or changes in functional skills. This is of vital importance for rendering an interpretation of the results of early physical therapy intervention, as on most occasions this intervention focuses on optimizing posture and movement quality with the aim of improving functionality.

The key points to be drawn from this review for clinical

practice are:

- Physical therapy intervention in preterm infants at risk of developing motor disorders or delay must be adapted to an infant's age, conditions and characteristics.

- Physical therapy treatments based on the Bobath method, the stimulation of the motor development, and the use of sensoriperceptive techniques have proved to be

Table 6. Assessment of the intervention effects

Study	Ages of Evaluation			Measurement Instruments	Results	
	Initial	Final	Follow up		Statistical Significance (p)	Groups Contrast
Badr et al ²⁰	6 M	12 M	18 M	BSID II-PDI	p>0.05	E=C
Blauw-Hospers et al ¹⁵	3 M	6 M	18 M	PNE AIMS*	p=0.31 p=0.02	E=C E>C
Brandt et al ²¹	4-6 ½ M	12 M		VNE	p>0.05	E=C
Cameron et al ²²		4 M		AIMS	p=0.10	E=C
Chunyan et al ²³		12 M		NCE GDS	p<0.05 p=0.01	E>C E>C
D'Avignon et al ²⁴			33-72 M	NCE	p>0.05	E=C
Girolami et al ²⁵	N	7-17 D		NBAS-RM NBAS-AR SMT-SM* SMT-SM** SMT-CM	p=0.02 p=0.01 p=0.007 p=0.015 p=0.002	E<CT* E<CP** E>CP E>CT E<CP
Goodman et al ²⁶	6 M	12 M		GRIFFITHS-L	p<0.02	E>C
Heathcock et al ²⁷	2 ½ M	4 ½ M		Grasp Number of contacts Duration (MVA)	p<0.001 p<0.05 p<0.05	E-CT>CP E>CP E<CT
Kanda et al ²⁸	1 M	59 M		VNE	p<0.028	E>C
Lekskulchai et al ²⁹	FTA	4 M		TIMP	p<0.001	E>C
Piper et al ³⁰		12 M		PNE WRP MCMDST WOLANSKI GRIFFITHS-L	p>0.05	E=C
Rice ³¹	0-1 M	1-2 M	4 M	NCE BSID-PDI	p<0.001 p>0.05	E>C E=C
Rothberg et al ³²			72 M	GRIFFITHS-L	p<0.02	E>C
Weindling et al ³³		12 M	30 M	GRIFFITHS-L/12 GRIFFITHS-L/30	p=0.66 p=0.78	E=C
Yigit et al ³⁴	1 M	24 M		NCE	p>0.05	E=C

M: Months. N: Births. D: Day. FTA: Full term age (40 weeks post-menstrual). AIMS*: Sitting Subscale Score. E=C: no difference among groups. E<C: Best results for the control group. E>C: Favourable result for the intervention group. CT*: Control Group of full term children. CP**: Control Group of premature children. SMT-SM: Supplementary Motor Test of Spontaneous Motility. SMT-CM: Supplementary Motor Test of Controlled Motility. NBAS-RM: Motor Register Brazelton Scale. NBAS-AR: Auto regulation Brazelton Scale.

Table 7. Measurement instruments

Neuro-motor	Abbreviation	Year	Development Scale	Abbreviation	Year
Neurological Clinic Exam	NCE	NI	Bayley (BSID) Bayley II (BSID II)	BSID-PDI BSID-II PDI	1969 1993
Pretchl Neurological Exam	PNE	1999	Wolanski Gross Motor Evaluation	Wolanski	1973
Vojta Neurological Exam	VNE	1960	Neonatal Behavioral Assessment Score	NBAS	1984
Movement Video Analysis	MVA	2008	Movement Assessment of Infants	MAI	1980
Supplemental Motor Test of Postural Control.	SMT	1987	Test of Infant Motor Performance	TIMP	1995
Wilson Reflex Profile	WRP	1979	Alberta Infant Motor Scale	AIMS	1994
			Griffiths Developmental Scales- Locomotora	GRIFFITHS-L	1970
			Milani-Comparetti Motor Development Screening Test	MCMDST	1967
			Gesell Developmental Schedules	GDS	1974

NI: no indicated

effective for the improvement or normalization of preterm infants not showing risk factors, whereas COPCA treatment, the combined administration of Bobath-Vojta, and the Vojta methods improved the motor performance of the high motor risk preterm infants.

- The physiotherapy treatment must be initiated as soon as possible within the first trimester of life.

- The place where the treatment is administered whether in the hospital or at home is not a factor affecting the efficacy of the intervention. However, the continuity of the treatment is a determinant factor in the intervention efficacy.

- The treatments which improved the motor performance of preterm infants were carried out by physiotherapists and/or by the infants' parents who had been given guidelines by these professionals.

In relation to the research, it is important to point out:

- Random, high quality, clinical trials are required to identify the effective components of the successful motor development interventions for premature infants as well as long term follow up studies focusing on the motor results for this population.

- Measurement instruments must be sensitive at detecting motor efficacy and must also identify minor neurological problems in addition to determining qualitative and functional changes.

- A larger selection of the high risk population may help to identify infants that would benefit from more than one particular type of intervention.

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