The Earliest Intervention:
Empowering Professional and Families

References

Why "Early" Intervention is Needed

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2. Dudek-Shriber L, Zelazny S. The Effects of Prone Positioning on the Quality and Acquisition of Developmental Milestones in Four- Month-Old Infants. *Pediatr Phys Ther.* 2007; 19:48-55.
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4. Peyton C et al. TIMP at 3 Months Predicts Language, Cognitive and Motor Outcomes in Infants Born Preterm at 2 Years of Age. *Dev Med Child Neur.* 2018; 60:1239-1243.

Assessment Tools

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2. Lekskulkai R, Cole J. Effect of a Developmental Program on Motor Performance in Infants Born Preterm. *Aust J Physiother.* 2001;47(3):169-76.
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4. Øberg et al. Study protocol: an early intervention program to improve motor outcome in preterm infants: a randomized controlled trial and a qualitative study of physiotherapy performance and parental experiences. *BMC Pediatrics.* 2012, 12:15. http://www.biomedcentral.com/1471-2431/12/15
5. Ustad et al. Early Parent-Administered Physical Therapy for Preterm Infants: A Randomized Controlled Trial. *Pediatrics.* 2016;138(2): e2016027.[1]

[1] Empowering Professionals Conference March 6, 2020

The Earliest Intervention – Empowering Families and Providers for Our Youngest Clients

Presented by: Laura Zawacki MS, PT, PCS
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- "Our committee is seeking a breakout session geared towards understanding the importance of sensitively assessing the strengths and needs of premature infants. One of the things that CFCs are seeing is that children born prematurely look pretty good when 1st assessed, or their differences may be more subtle/not picked up easily by an assessment tool. These children are being determined ineligible and then the families are returning later with significant developmental concerns."

E-mail excerpt from EITP Sept 2019

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Learning Objectives

- Participants will review a few key studies demonstrating why "the earliest intervention" is so critical.
- Participants will compare and contrast three DHS approved motor assessment tools and study the strengths and weaknesses of each.
- Participants will learn through case study example that the assessment tool selected can impact whether or not a baby qualifies for EI services.
- Participants will learn that is incumbent upon therapists to understand the tools of our trade and to choose the appropriate assessment tool for each early intervention client.
- Participants will learn evidence based early treatment protocols to empower families and providers to avoid container syndrome, positional plagiocephaly and cognitive and language delays for our youngest EI clients.

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Laws Governing Assessment

- Individuals with Disabilities Education Act (IDEA)(1975, 1990, 1994 & 2004)
- AAP mandate for level III NICU's to run a high risk infant follow up clinic
- Child Find
  - *Earliest possible* identification of young children and their families who may benefit from early intervention
- Evaluations/Assessments conducted by qualified personnel
- IL actually dictates which tools are approved and mandates an additional evaluator credential

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Principles of Early Intervention

1) The primary goal of EI is to support families in promoting their child's optimal development and to facilitate the child's participation in family and community activities.

2) The focus of EI is to encourage the active participation of families in the therapeutic process by imbedding intervention strategies into family routines. It is the parents who provide the real early intervention by creatively adapting their child care methods to facilitate the development of their child, while balancing the needs of the rest of their family.

3) EI requires a collaborative relationship between families and providers, with equal participation by all those involved in the process. An on-going parent-professional dialogue is needed to develop implement, monitor, and modify therapeutic activities.

4) Intervention must be linked to specific goals that are family-centered, functional, and measurable. Intervention strategies should focus on facilitating social interaction, exploration, and autonomy.

5) Intervention shall be integrated into a comprehensive plan that encourages transdisciplinary activities and avoids unnecessary duplication of services. The plan shall be built around family routines, with written home activity programs to encourage family participation in therapeutic activities on a daily basis.

6) Intervention should be monitored periodically to assure that the strategies implemented are successful in achieving outcomes.

7) Children and their families in the Early Intervention System deserve to have services of highest quality possible. High standards will be set for the training and credentialing of administrative and intervention staff. Training, supervision, and technology will be focused to achieve excellence.

Adopted by the Illinois Interagency Council on Early Intervention (IICEI) - October 4, 2001

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Why is early identification so important?

- Sitting Matters! Differences Between Sitters and Non Sitters at 6 Months Adjusted Age in Infants At-Risk and Born Preterm
  - Jensen-Willett et al. *Pediatr Phys Ther* 2019*; 31:257-262*
- The Effects of Prone Positioning on the Quality and Acquisition of Developmental Milestones in 4 Month Old Infants
  - Dudek-Shriber et al. *Pediatr Phys Ther* 2007; 19:48-55
- Infants Born Preterm Demonstrate Impaired Exploration of Their Bodies and Surfaces Throughout the First 2 Years of Life
  - Babik et al *Phys Ther* 2017; 97:915-925
- TIMP at 3 Months Predicts Language, Cognitive and Motor Outcomes in Infants Born Preterm at 2 Years of Age
  - Peyton et al. *Dev Med Child Neur* 2018; 60:1239-1243

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Sitting Matters! Jensen-Willett et al 2019

- Developmental cascade theory – advances in motor skills drive/predict changes in cognitive, social, perceptual and language skills
- N=105 babies born<32 weeks
- 31.4% were sitters (>60 sec hands free sitting)
- Non-sitters born earlier, weighed less, more time on vent
- BSID-III cognitive & language composite scores statistically higher in babies sitting independently at 6 months implicating early developmental cascade associated with upright postural control
- Critical window for early ID of and intervention for movement difficulties lies between NICU DC and 6 months adjusted age - best practice <3 months!

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Effects of Prone Dudek-Shriber et al.2007

- N=100 4 month old infants
- AIMS & Parent Questionnaire about positioning during the day
- Found significant differences in acquisition of 7 prone, 3 supine & 3 sitting milestones in babies who spent more wakeful time in prone
- Conclude prone while awake promotes acquisition and quality of not just prone skills but supine and sitting too due to trunk extension and upper extremity weight bearing
- How much prone time is needed?
  - >1 hour 20 minutes/day

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Premies Impaired Exploration Babik et al. 2017

- Studied non-object oriented exploratory behaviors such as lifting head against gravity and bringing head and hands toward midline, mouthing hands
- 24 healthy FT, 30 PT 6 with brain injury PTI
- Holding head up in prone PTI<PT<FT gap worsens with age (diff 23% 1 month, 41% 2 months, 58% 9 months)
- PT & PTI especially struggle getting head to midline
- PT have poorer head control and midline head and hand behaviors
  - Limits exploration of environment and learning
  - Consider implications of these findings on reaching, visual tracking, visual motor skills, visual fixation on people and objects, joint attention, language acquisition, social emotional and cognitive development

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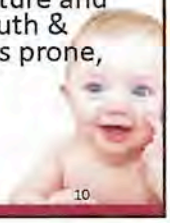
Babik et al. 2017 Continued

- Conclude that results are important for EI practice
- Key findings preterm infants vs term
  - Impaired antigravity head control
  - Less midline head and hands
  - More frequent asymmetrical one handed fisting
  - Poorer antigravity hand to mouth & visual motor coordination
  - Lower intensity and variability of non-object-oriented exploratory behaviors
- Above impairments cascade into delays in reaching and object exploration which in turn result in further motor and cognitive delays
- Potential interventions should focus on improving antigravity head control, midline head and hand behavior, hand posture and control for grasp, visual motor coordination, hand to mouth & intensity and variability of behavioral performance across prone, supine, sidelying & sitting



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TIMP at 3 Months Predicts Language, Cognitive & Motor in PT's at 2 Years Peyton et al. 2018

- Emerging evidence suggests that developmental domains such as motor, cognitive and language are interrelated
- Relationship between early motor performance & cognitive & language development is multifactorial and interdependent
- Motor skills provide novel learning possibilities and ignite cognitive and perceptual developmental cascade
- N=106 PT <31 weeks, <1500g,O2 requirement at birth
- TIMP at 10-15 weeks, BSID-III 18-24 months
- TIMP significantly associated with ALL 3 subscales of Bayley
- Infant motor behavior may be important early indicator of developmental skill acquisition and future outcome
- TIMP users may want to cross refer to other disciplines if babies are failing given the results of this study

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Overview of TIMP

- Comprehensive assessment of posture and movement
- 34 weeks PMA to 4.5 months post term corrected age
- Designed for PT's and OT's
- Test of posture and selective motor control needed for functional performance in daily life in early infancy - not a test of tone or reflexes
- TIMP items look like movement demands experienced by infants during natural interactions with caregivers such as bathing, dressing and play
- Appropriate for both premature babies and full term babies
- Illustrated test form for parent education and anticipatory guidance for the next steps
- Norm referenced yields Z-score, percentile ranking, age equivalency, percent delay as required by DHS

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Purposes of the TIMP

- Identify infants <4-5 months of age with delayed motor development
- Measure change in development over time due to maturation or intervention
- Develop intervention plans
- Educate parents about development
- Prediction
  - never intended to be a purpose of the TIMP but studies have shown TIMP to be decent at this

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TIMP Materials & Costs

- Manual $38
- Age calculation wheel $15
- Test Forms $68 for package of 25
- Percentile ranking grids $10 for package of 2
- Self instructional learning program (CD) $70
- Rattle
- Red ball
- Squeaky toy
- Soft cloth
- $\boldsymbol{Starter\ cost} = \$121$
- $\boldsymbol{All\ in\ cost} = \$201$

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TIMP Items & Scoring

- TIMP has 42 items for a possible 142 points
  - All babies get all items except possibly the 2 hardest may be omitted if baby has limited head control
- Observed Item Scale
  - 13 items
  - Checklist
  - Scores as yes=1 or no=0
- Elicited Item Scale
  - 29 items
  - You handle/position the baby, present a functional movement problem/task and try to elicit a desired motor response
  - Scored as 0-3, 4, 5 or 6
- Calculate a total TIMP raw score
  - Convert to standard score, age equivalent score, percentile ranking, % delay

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OBSERVED ITEMS
13 Items

- Selective control
- Midline alignment
- Quality of movement

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ELICITED ITEMS
29 Items

- Postural control
  - anti-gravity
  - organized synergies
  - in functional context
  - elicited by natural handling
  - predictive--Grenier

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TIMP Normative Sample

- 990 Infants from 13 hospitals in 11 US cities
- National sample
- Infants selected to match the distribution of race/ethnicity for US population of LBW infants (<2500g)
- ~100 infants in each 2 week age bracket
  - 738 kids 0-4 months
- Equally divided among high, medium and low risk based on POPRAS
- Apples to apples

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SITE	Black	Hispanic	Native American	Asian	White	Total
Rainbow Babies Cleveland OH	61	0	0	1	58	120
Lutheran General Park Ridge IL	6	14	0	3	37	60
Univ. of Nebraska Omaha NE	20	10	1	2	87	120
Univ. of Chicago Chicago IL	42	6	0	1	11	60
Sioux Valley Sioux Falls SD	7	5	11	1	96	120
Wake Medical Ctr. Raleigh NC	68	13	0	2	37	120
Sacred Heart Hosp. Pensacola FL	23	7	0	5	85	120
LAC-USC Los Angeles CA	7	52	0	1	0	60
Good Samaritan Los Angeles CA	10	30	0	11	9	60
New England Med Boston MA	16	30	0	6	68	120
Children's Hospital Birmingham AL	46	3	0	1	70	120
Providence St. V's Portland OR	18	10	0	14	78	120
SAMPLE TO BE RECRUITED	324	180	12	48	636	1200
TARGET U.S. POPULATION	324	180	12	48	636	1200

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Overview of AIMS

- AIMS developers frustrated with using tools developed by psychologists, special educators and neurologists which had little regard for what we as therapists care about such as quality of movement, postural alignment, balance, coordination, functional motor skills
- AIMS developers set out to create a scale which could do the following:
  - Provide info for parents & clinicians about skills mastered, skills currently developing/emerging and skills not yet in the motor repertoire
  - Measure performance due to maturation &/or intervention
  - Measure small changes not picked up by BSID or PDMS
  - Serve as a research tool

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Overview of AIMS

- Observational gross motor assessment
- For use from birth through independent walking (0-18 months)
- Easy to administer
- Excellent parent teaching tool
- 58 items
- Norm-referenced so yields percentile rank, age equivalency, percent delay as required by DHS

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Purposes of the AIMS

- Discriminate
  - Asks the question, at this moment in time is this baby delayed compared to peers
  - Percentile rank, standard score, age equivalent score
- Evaluate
  - Measure the magnitude of change in function over time
    - Due to maturation
    - Due to intervention
- AIMS does both beautifully!
  - Physicians and service coordinators love it
- Most useful for babies with low muscle tone and delayed development but normal quality of movement
  - Babies that look healthy but several months behind

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AIMS Materials & Cost

- Manual $62-72
- Scoresheets $34.24 for package of 50
- Any toys of interest to the child
- Bench/table/chair for pull to stand
- Table for infants < 4 months
- *Total cost* ~$100

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AIMS Items & Scoring

- 58 items divided into 4 subscales
- Scored as "O" for OBSERVED or "N/O" for NOT OBSERVED
- Locate the least mature and most mature observed skill in each subscale (prone, supine, sitting, standing)
  - Skills between these make up the infant's motor repertoire for that subscale
  - Skills to the left of the motor window are assumed to have already been mastered
- Yields a raw score and percentile ranking score
  - Can calculate age equivalent score, percent delay & standard score

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Four Subscales

- Prone (21 items)
- Supine (9 items)
- Sitting (12 items)
- Standing (16 items)

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For Each Item Manual Provides:

- Descriptors - weight bearing, posture, antigravity movement and prompt if indicated
- Line drawing
- Graph
- Photographs

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Supported Standing (3)

Supported Standing (3)	
Weight Bearing	Weight on feet
Posture	Head in midline Hips in line with shoulders Hips abducted and externally rotated
Antigravity Movement	Active control of trunk Variable movements of legs, may bounce up and down, lift one leg, or hyperextend the knees

The antigravity movements are extremely variable. To pass this item, the infant must have the heels down at some point during the observation period and demonstrate spontaneous movement in the legs.

Prompt: Infant is supported by examiner at chest level.

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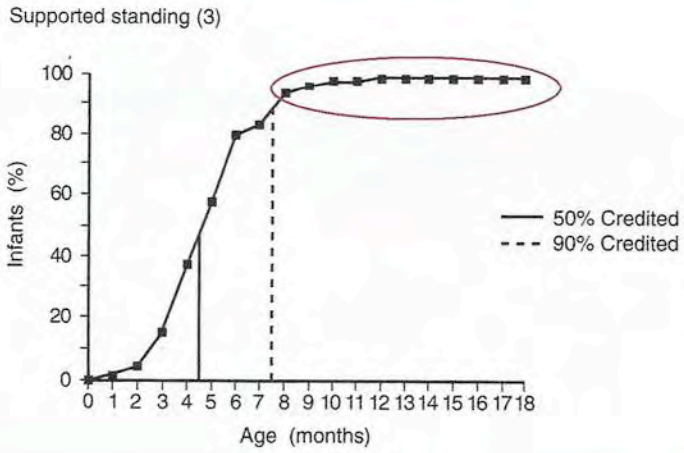
SUPPORTED STANDING GRAPH



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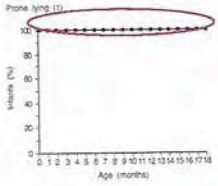
Prone Lying (1)

Prone Lying (1)	
Weight Bearing	Weight on cheek, hands, forearms, and upper chest
Posture	Head rotated to one side Physiological flexion Arms close to body; elbows flexed
Antigravity Movement	Turns head to clear nose from surface



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Supine Lying 1

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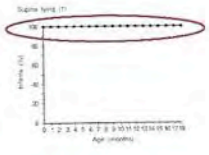
Supine Lying (1)	
Weight Bearing	Weight on face, side of head and trunk
Posture	Head rotated to one side Physiological flexion
Antigravity Movement	Head rotation: Mouth to hand Reaches, arm and leg movements (stretching)

The infant may move out of the flexed posture but returns to flexion as the resting posture.



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Supine Lying 2

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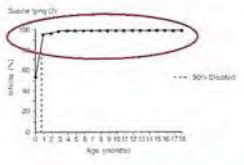
Supine Lying (2)

Weight Bearing	Weight on side of head, trunk, and buttocks
Posture	Physiological flexion diminishing Head rotated to one side Hips abducted and externally rotated Hands open or closed
Antigravity Movement	Head rotation toward midline Random arm and leg movements Nonobligatory asymmetrical tonic neck reflex may be present

The infant may move the head toward midline but cannot maintain the midline position.

Prompt: May use visual stimulus for head rotation.



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Sitting with Support

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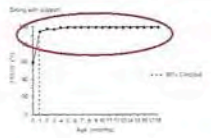
Sitting with Support

Weight Bearing	Weight on buttocks and legs
Posture	Hip flexion Trunk flexion
Antigravity Movement	Lifts and maintains head in midline briefly Upper extremity alpine extension

To pass this item, the infant must maintain the head in midline briefly. There may be more head control than "bobbing," but the head does not have to be maintained in midline indefinitely.

Prompt: The infant is supported by examiner around upper trunk



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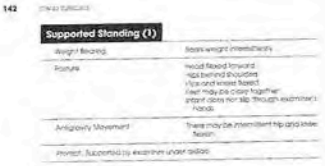
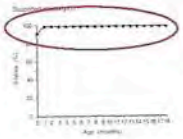
Standing 1





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Normative Sample

- 2202 infants from Alberta, Canada
- Stratified random selection from well baby clinics
- 200 babies 1-2 months
- 200 babies 3-4 months
  - 400 total birth to 4 months
- Equal males and females
- No gender differences

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0-3 Month Skills | 3-6 Month Skills | 6-9 Month Skills | 9-18 Month Skills

AIMS Scoresheet Foldout

Less mature skills on the left and more mature skills on the right

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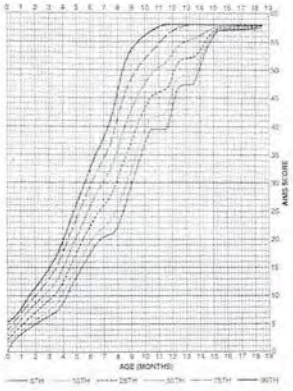
AIMS Scoresheet

Front Cover

ALBERTA INFANT MOTOR SCALE
Record Booklet

Back Cover

Percentile Ranks



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AIMS Treatment Planning

- Assist therapists in identifying a framework for intervention strategies
- Focus on the N/O items in the motor "window" as goals
- Work toward achieving missing components of movement listed in the manual as treatment strategies
- Parent education
- Clinical application
  - useful for students or recent graduates

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Typical Diagnoses Appropriate for AIMS Assessment

- Down's Syndrome
- Fetal Alcohol Syndrome
- Failure to Thrive
- Seizures
- BPD
- Hypotonia
- Developmental Delay
- Prematurity
- LBW
- Bacterial meningitis

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Overview of PDMS-2

- Composed of subtests the measure motor abilities in children birth through 5 years 11 months of age
  - REFLEXES (8) – react to environmental events
  - STATIONARY (30) – sustain control of body within center of gravity & retain equilibrium
  - LOCOMOTION (89)- move from one place to another
  - OBJECT MANIPULATION (24)- ball skills
- Can be used by PT/OT, diagnosticians, EI specialists, adaptive physical education teachers, psychologists and others interested in motor development

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Purposes of the PDMS-2

- Estimate motor competence relative to peers (ID Delay)
- Compare/Contrast GMQ/FMQ to determine disparity
- Educational/therapy intervention
- Evaluate child's progress with successive administrations
- Research tool

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PDMS-2 Materials Kit & Cost

- Examiner's manual $102
- Profile Summary Forms $39 for package of 25
- Examiner Record Booklet $90 for package of 25
- Guide to Item Administration $117
- Manipulatives $90
- Motor Activity Program $102
- $Cost = \$540$
- Peabody Motor Developmental Chart $34
- Optional Computerized Scoring Program $209

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PDMS-2 Items & Scoring

- Reflexes (8 items)
- Stationary (30 items)
- Locomotion (89 items)
- Object manipulation (24 items)
- Scored 0, 1 or 2
- Basal & ceiling rules apply
- Yields raw scores, standard score, percentile rank, age equivalent and GMQ

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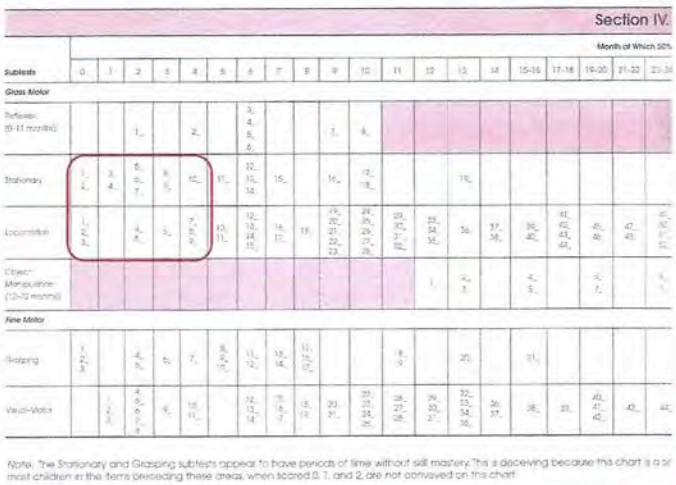
0-4 Month PDMS-2 Items Don't Differentiate



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PDMS-2 Normative Sample

- 2003 children from 46 states & Canada
- Only ~50 kids in each age group <11 months
  - ~200 kids birth – 4 months
- Matched US census
  - 80% white
  - Mostly healthy kids born at term

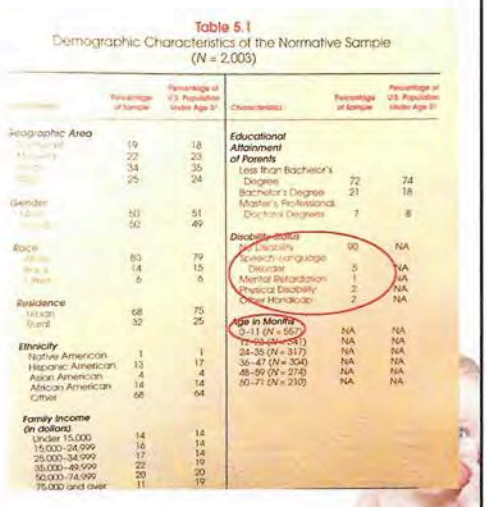

Table 5.1
Demographic Characteristics of the Normative Sample
(N = 2,003)

Characteristic	Percentage of Sample	Percentage of U.S. Population Under Age 5[a]
Geographic Area		
	19	18
	22	23
	34	35
	25	24
Gender		
	50	51
	50	49
Race		
	80	79
	14	15
	6	6
Residence		
Urban	68	75
Rural	32	25
Ethnicity		
Native American	1	1
Hispanic American	13	17
Asian American	4	4
African American	14	14
Other	68	64
Family Income (in dollars)		
Under 15,000	14	14
15,000–24,999	16	14
25,000–34,999	17	14
35,000–49,999	22	19
50,000–74,999	20	20
75,000 and over	11	19
Educational Attainment of Parents		
Less than Bachelor's Degree	22	74
Bachelor's Degree	21	18
Master's, Professional, Doctoral Degrees	7	8
Disability Status		
Typicality	90	NA
Speech-Language Disorder	5	NA
Mental Retardation	1	NA
Physical Disability	2	NA
Other Handicap	2	NA
Age in Months		
0–11 (N = 557)	NA	NA
12–23 (N = 541)	NA	NA
24–35 (N = 317)	NA	NA
36–47 (N = 304)	NA	NA
48–59 (N = 274)	NA	NA
60–71 (N = 210)	NA	NA

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Parent Education

- Multiple studies document efficacy of TIMP for parent education and treatment planning
  - www.thetimp.com
    - Annotated bibliography of hundreds of peer reviewed publications involving TIMP
- AIMS scoresheet is amazing for anticipatory guidance and showing progress
- PDMS-2 lacks the photos of the TIMP or line drawings of the AIMS
  - Can purchase activities program separately but quite inferior to both TIMP & AIMS

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Studies of Value for Parent Education

- Goldstein found that observation of a TIMP increased knowledge of premature infant development in African-American low-income mothers who also retained information on activities to work on (Goldstein & Campbell, PPT 2008)
- Dusing found that viewing a videotaped TIMP was one preferred method for parents to learn about infant development (Dusing et al, PPT 2008)

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Pros and Cons of the TIMP

- Sensitivity for identification of delay
  - .92 at 3 months to predict 12 month outcome/.76 to PreschoolPDMS-2
- Precision of measurement
- Initiate the cascade of early motor skills leading to better performance in cognitive, social and language skills
- Parent education
- One stop shopping with HEP incorporated in scoresheet
- Cost
- Measures functional movement and postural control – things we care about
- Large normative sample of actual NICU grads rather than full term healthy kids

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- More detail to learn the scoring system
- Narrow age range (34 weeks PMA-17 weeks post term)

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Pros & Cons of the AIMS

- Super easy to learn
- Excellent for parent education and tracking progress
- Cost
- Observational so minimizes stranger anxiety
- Developed by therapists so measures things we actually care about
- Broad age range 0-18 months
- Decent size normative sample
- Sensitivity of .77 at 4 months to predict atypical outcome at 18 months

---

- Too few items at the end age ranges (Liao et al. 2004)(Pin et al.2010)
  - Ceiling effect
  - Too few items <4 months and after controlled lower & walking
- First items in each position are "gimmes" so do not help discriminate at all

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Pros & Cons of the Peabody

- Psychometrically sound
- Covers birth to three age range

- Many items are contrived and do not reflect how babies actually move
- Little regard for quality of movement
- Too few items in baby age range
- Too many manuals, charts, scoresheets, profile summary forms
- Expensive
- Normative sample limited and unlike our EI clients
- Poor sensitivity & poor predictive validity

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MULTIVARIABLE COMPARISON

	Sensitivity	Norms	Ease	Parent Ed	HEP	Cost	STAR TALLY
TIMP	★★★ .92	★★★ 738	★★ SCORESHEET & MANUAL	★★&1/2 EVIDENCE BASED	★★★ PHOTOS	★★ $201	15.5
AIMS	★★ .77	★★ 400	★★★ SCORESHEET ONLY	★★&1/2 NEXT STEPS & PROGRESS	★★ LINE DRAWINGS	★★★ $100	14.5
PDMS-2	★ ABYSMAL	★ 200	★ NEED 8 PAPERS/CHARTS/ TABLES	★	★	★ $540	6

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Leo Case Study

- Born at 26 & 2/7 weeks weighing 850 g
- Prematurity
- RDS/BPD
- Hyperbilirubinemia
- Anemia, hypernatremia
- Sepsis, ROP
- PO feeding difficulty
- Periventricular echogenicity on HUS
- Referred to EI due to concerns with truncal low tone and positional plagiocephaly

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Leo's TIMP Results

Test of Infant Motor Performance Version 5.1

* nice proximity, mvts.
* ↓ d head control
* struggling with tummy time

RS = 78
Z-score = $\frac{78-93}{18}$ = -.83
Percentile Rank = 16th-25th
Age Equivalent Score = 4 weeks.
% Delay = $\frac{9-4}{9}$ = 56%

Infant	Leo
Test Date	19 | 5 | 20
Birth Date	18 | 12 | 8
Current Age	1 | 5 | 12
E.D.D.	19 | 3 | 14
Birth Date	18 | 12 | 8
Mo/Days Preterm	1 | 3 | 6
Adjusted Age	1 | 9 | 4
Tape Test Begins	Ends
Tester	Laura Zawacki

Clinical Impression: Suspicious (S) X
Environment: Other Home

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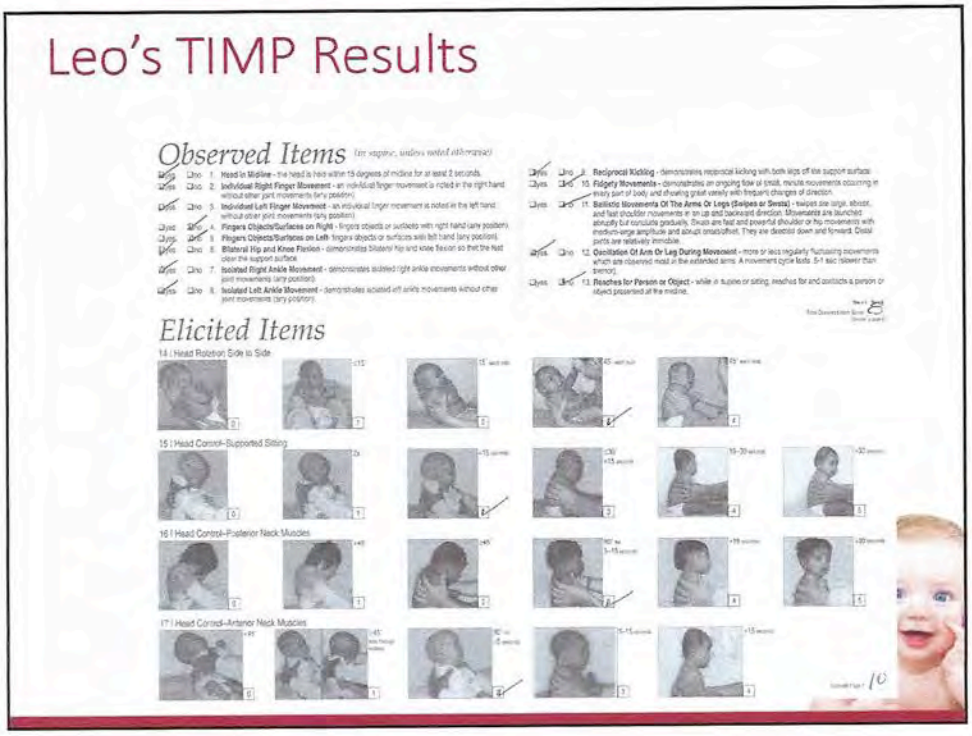
Leo's TIMP Results



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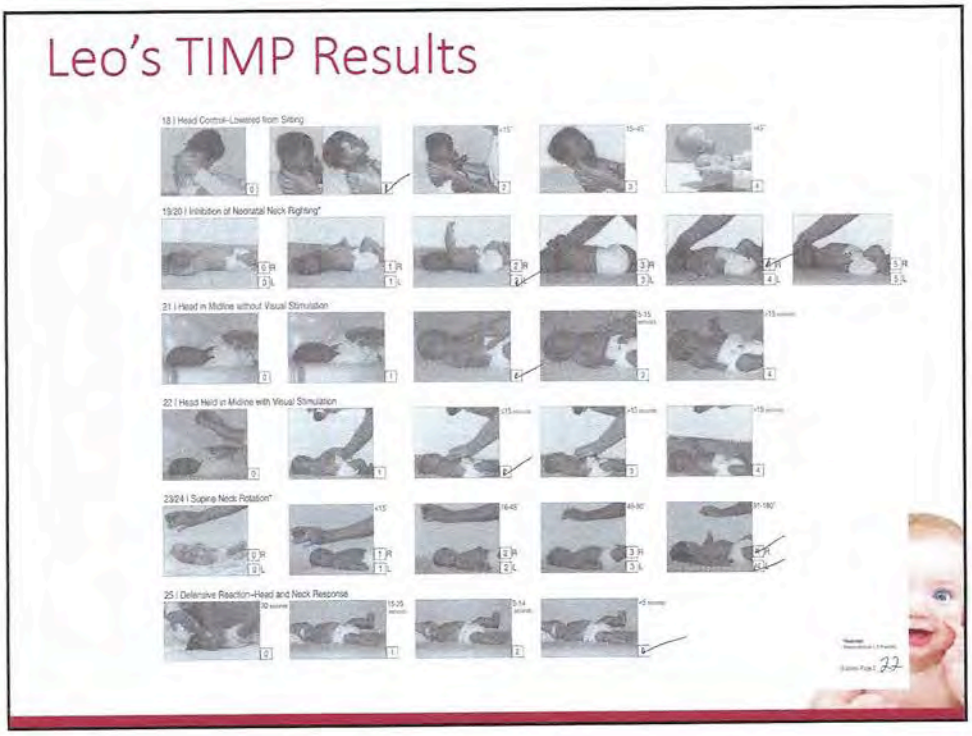
Leo's TIMP Results



54

Leo's TIMP Results

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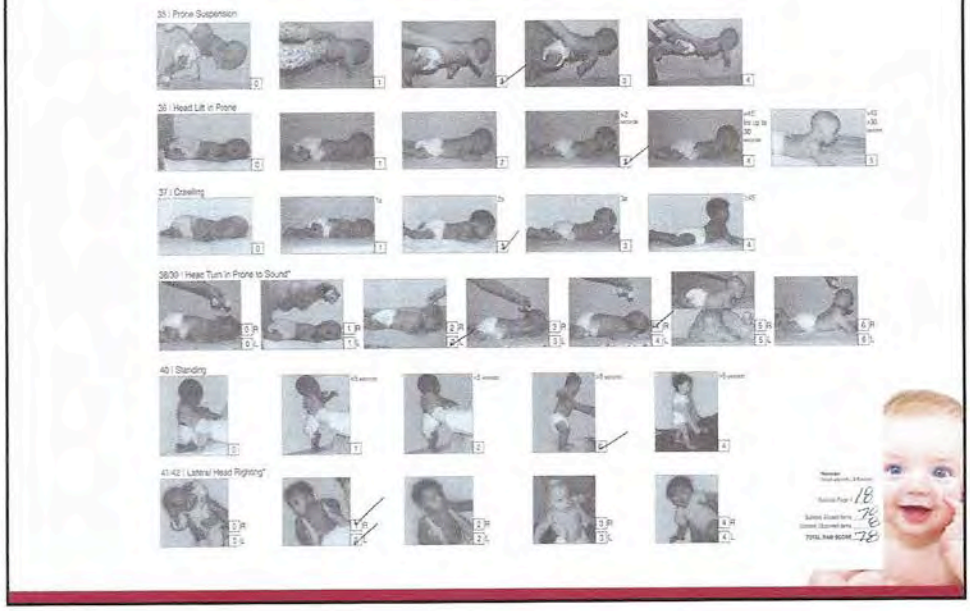
Leo's TIMP Results



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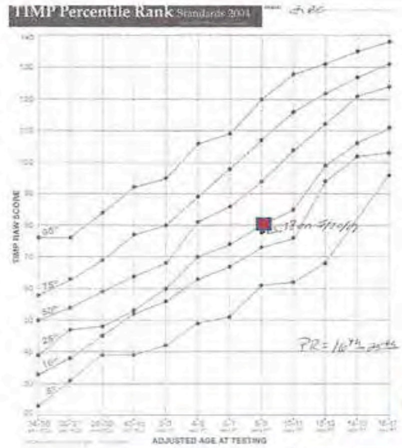
Leo's TIMP Results

Table A1: 2004 age standards for performance on the TIMP

At Age	Mean (SD) # Subjects	Average Range *	Low Average** (Delay)	Below Average ***	Far Below Average ****
34-35 wks PMA+	49 (15) N = 86	34-64	34-41	19-33	Below 19
36-37 wks PMA	54 (13) N = 81	41-67	41-47	28-40	Below 28
38-39 wks PMA	60 (14) N = 85	46-74	46-53	32-45	Below 32
40-41 wks PMA	65 (16) N = 96	49-81	49-57	33-48	Below 33
2-3 wks CA+	69 (15) N = 97	54-84	54-61	39-53	Below 39
4-5 wks CA	80 (15) N = 83	65-95	65-72	50-64	Below 50
6-7 wks CA	85 (17) N = 89	68-102	68-76	51-67	Below 51
8-9 wks CA	93 (18) N = 84	75-111	75-84	57-74	Below 57
10-11 wks CA	99 (21) N = 71	78-120	78-88	57-77	Below 57
12-13 wks CA	108 (19) N = 70	89-127	89-98	70-88	Below 70
14-15 wks CA	113 (22) N = 67	91-135	91-102	69-90	Below 69
16-17 wks CA	120 (16) N = 81	104-136	104-112	88-103	Below 88

+ PMA = postmenstrual age, CA = corrected age (all ages should be corrected for prematurity)

* Average Range = scores within +/- 1 SD of the mean for the age group. An estimated age equivalent for an infant with delayed development can be obtained by ascertaining the age at which the infant's obtained raw score is closest to the average for that age group.
** Low Average = range of scores between -0.5 and -1 SD below the mean, a subset of the Average Range and the threshold for delay.
*** Below Average = the range of scores between -1 SD and -2 SD below the mean for the age group.
**** Far Below Average = score more than -2 SD below the mean for age.



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Leo's AIMS Results


EDC 19-3-14
16 12 8
5 6

ALBERTA INFANT MOTOR SCALE
Record Booklet

Name: Leo — Date of Assessment: 19 5 20
Identification Number: — Date of Birth: 18 12 9
Examiner: Laura Zawacki — Chronological Age: 5 12
Place of Assessment: Home — Corrected Age: 2 6

	Previous Items Credited	Items Credited in Window	Subscale Score
Prone	0	3	3
Supine	0	4	4
Sit	0	2	2
Stand	2	1	3

Total Score: 12 — Percentile: >90th

Comments/Recommendations: Leo is a beautiful baby who was born prematurely at 26 4/7 weeks. He had a prolonged NICU stay & a complicated neonatal history. His raw score of 12 on the AIMS today places him at >90th percentile compared to his peers. He demonstrates nice midline orientation but he is struggling somewhat with his head control. Truncal low tone, mild plagiocephaly + BPD are issues of concern at this time.
Laura Zawacki MS, PT, PCS

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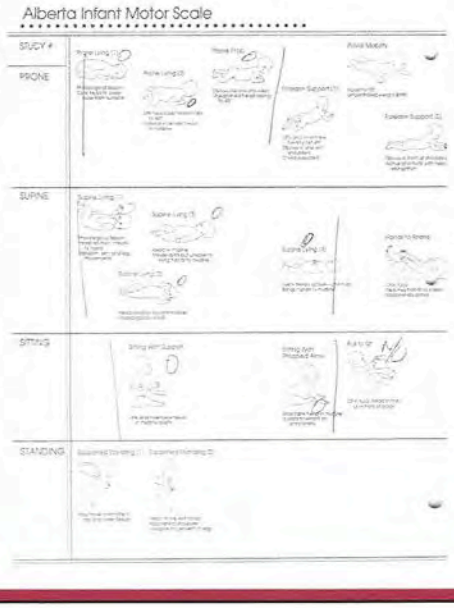
Leo's AIMS Results



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Leo's AIMS Results

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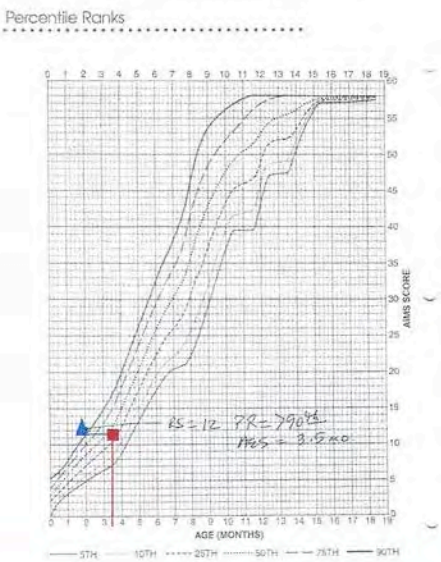
Leo's AIMS Results



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Leo's PDMS-2 Results

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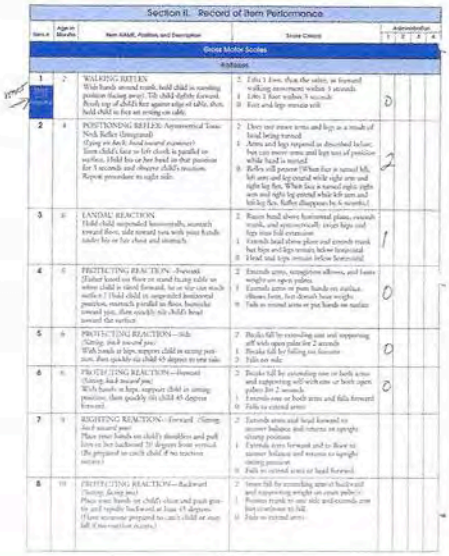
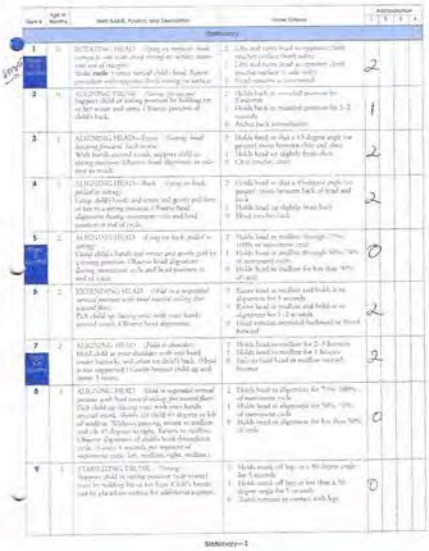
Leo's PDMS-2 Results Reflexes



63

Leo's PDMS-2 Results - Stationary



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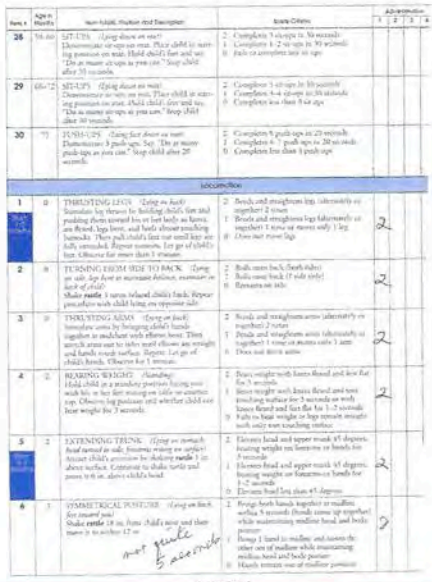
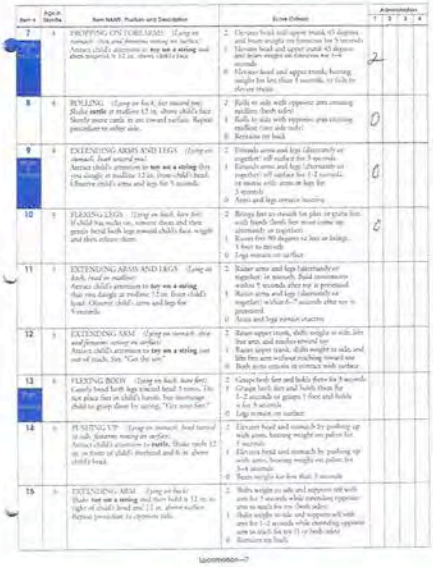
Leo's PDMS-2 Results Locomotion



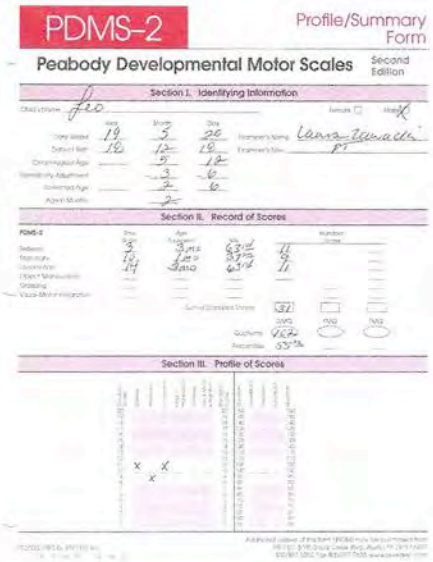
65

Leo's PDMS-2 Results Locomotion



66

Leo's PDMS-2 Results


PDMS–2

Profile/Summary Form

Peabody Developmental Motor Scales

Second Edition

Section I. Identifying Information

Section II. Record of Scores

Section III. Profile of Scores

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Comparison of Assessment Results

	Results	Percentile Rank	Age Equivalency	Percent Delay	Standard Score
TIMP	***Low Average***	***16th-25th***	***4 weeks***	***56%***	***-.83***
AIMS	Above Average	>90th	3.5 months	Not Delayed	+.84
PDMS-2					
Reflex	Average	63rd	3 months	Not Delayed	11
Stationary	Average	37th	***1 month***	***50%***	9
Locomotion	Average	63rd	3 months	Not Delayed	11

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Evidence for the Earliest Intervention

- Efficacy of a NDT Program to Improve Motor Control in Infants Born Prematurely
  - Girolami et al. *Pediatr Phys Ther* 1994; 6:175-184
- Effect of a Developmental Program on Motor Performance in Infants Born Preterm
  - Lekskulchai et al. *Aust J Physiother* 2001;47(3):169-76
- Supporting Play Exploration and Early Development Intervention From NICU to Home: A Feasibility Study
  - Dusing et al. *Pediatr Phys Ther* 2015;27:267–274
  - http://links.lww.com/PPT/A83
- Study protocol: an early intervention program to improve motor outcome in preterm infants: a randomized controlled trial and a qualitative study of physiotherapy performance and parental experiences
  - Øberg et al. *BMC Pediatrics* 2012, 12:15
  - http://www.biomedcentral.com/1471-2431/12/15
- Early Parent-Administered Physical Therapy for Preterm Infants: A Randomized Controlled Trial
  - Ustad et al. *Pediatrics.* 2016;138(2): e20160271

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GIROLAMI CLINICAL TRIAL RESULTS

- A group of preterm infants (n=9) treated with NDT had better scores on a pilot version of the TIMP than an untreated control group (n=10).
- Furthermore, treated infants performed more like a group of full term infants (n=8) in their postural control (Girolami & Campbell 1994).
- NDT treatment protocol included as an appendix in article including prone, supine sidelying and sitting activities

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LEKSKULCHAI CLINICAL TRIAL RESULTS

- 84 preterm infants in Thailand who scored poorly on the TIMP at 40 weeks PMA were randomly assigned to home physical therapy program versus regular care. Program reviewed monthly from discharge to 4 months.
- Infants who received intervention performed significantly better on the TIMP at 4 months corrected age and as well as a comparative group of infants who had done well on the TIMP at 40 weeks PMA.

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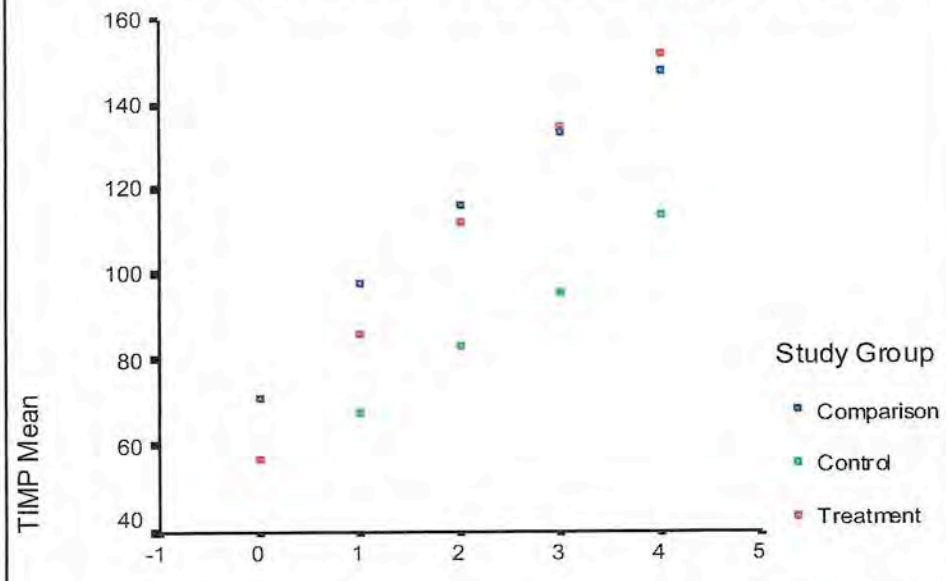
Average TIMP Scores for Study Groups



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SPEEDI Clinical Trial

- Supporting Play Exploration & Early Development Intervention (SPEEDI)
- Blends need for early/intense intervention with family support to engage the family and their child's development
- Teaches family to "play" with baby 5x/week 20 min/session
- Don't take "wait & see" approach as you'll miss critical window for efficacy of EI
- 8/10 referred to EI but only 2 got services by 3 months, 2 more by 6 months
- Parents reported
  - intervention helped them learn to communicate with their infants
  - Gained better understanding of the value of play and it provided the opportunity to learn through play every day

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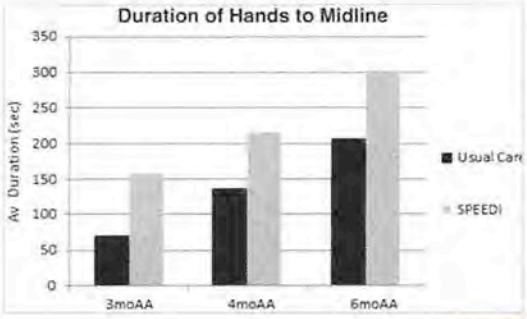
SPEEDI CLINICAL TRIAL

- encourage the infant's self-directed movements to bring the extremities and head toward midline and focus on toys or a face.
- intervention group received an activity booklet describing activities for working with their infant at home
- PT demonstrated or coached parents on how to complete the activities with their own infant or a doll



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Norwegian Physical Therapy Study for Preterm Infants (NOPPI) – Protocol

From: Study protocol: an early intervention program to improve motor outcome in preterm infants: a randomized controlled trial and a qualitative study of physiotherapy performance and parental experiences

Objectives	Performer activity	Activity goals for the child
1. Increase strength, balance. Control of the anterior and posterior neck muscles.	1. Activating neck flexors, shoulder and abdominal muscles through intermittent caudal compression.	1. Maintain head in midline and head turning to both sides.
2. Increase strength and control of the anterior shoulder and chest muscles and balance between anterior and posterior shoulder and chest muscles.	2. Horizontal intermittent pressure through the shoulders. Assist the child to bring arms forward to the mouth or on chest	2. Bringing hands forward, hands to mouth and hands on chest.
3. Increase strength and control of the abdominal muscles.	3. Through lifted pelvis and flexed legs, provide intermittent compression toward shoulder.	3. Antigravity pelvis and lower extremity lifting with hip and knee flexion
4. Affect alignment, righting reactions and antigravity muscle activity in the trunk in the sagital and frontal planes.	4. From the lifted pelvis and control at shoulders, shift the infant's weight in small increments from side to side. When possible allow the infant to control the head and arms without assistance.	4. Rolling from supine to side.
5. Affect alignment, righting reactions and balance and control between the anterior and posterior neck and trunk muscles.	5. Guide the child from supine through sidelying to upright sitting.	5. Maintaining head control in midline during the transition with minimal assist.
6. Increase strength of the anterior neck muscles lateral head righting and neck and cervical extensors when rolling into prone.	6. Guiding upper shoulder slightly backwards with small weight shifting movements while supporting the child with one hand under head.	6. Keep the chin tucked during movements from supine to prone and when in sidelying
7. Increase the strength of the anterior chest and shoulder muscles.	7. Horizontal intermittent compression through the shoulders. Assist the infant in bringing the hands to mouth or toward the midline.	7. Bring hands to mouth or bring hands forward to chest.
8. Elongation of thorax and lumbar muscles; increase strength, balance and control of abdominal and trunk muscle groups.	8. Lifting pelvis laterally upward to lengthen the weight-bearing side of trunk and activate lateral muscles of the trunk and head on the non-weight-bearing side. Facilitate rolling from supine to side. Head, neck, trunk and pelvis are in alignment.	8. Maintain the pelvis in a neutral position while flexing the hip and knee. Improved antigravity strength of the lateral neck and trunk muscles

1-5: The child is in supine. 6-8: The child is sidelying

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NOPPI PRONE/SITTING PROTOCOL

From: Study protocol: an early intervention program to improve motor outcome in preterm infants: a randomized controlled trial and a qualitative study of physiotherapy performance and parental experiences

Objectives	Performer activity	Activity goals for the child
1. Increase strength, balance and control in the anterior and posterior neck and upper back muscles.	1. Intermittent compression through shoulders in caudal direction is used to activate the neck muscles, pectoralis muscles and upper back extensors.	1. Lifting the head from the surface and turning the head to right and left side.
2. Increase strength and balance of the anterior and posterior shoulder muscles.	2. Mild intermittent horizontal compression through shoulders to activate the anterior and posterior shoulder and scapular muscles.	2. Bring the hands to mouth
3. Downward rotation and stabilization of the scapula.	3. Small weight shifts to one side to facilitate head turning by providing compression down the non-weight-bearing side and elongation of the weight-bearing side.	3. Strength and control of shoulder girdle to provide a stable base for head lifting and turning.
4. Increase activity and strength of the abdominal muscles.	4. Support and tactile input over the abdominal muscles to increase activation in the sagital and frontal planes.	4. Maintain the pelvis in neutral to provide stable base of support for trunk extension and sagital and frontal plane weight shifts.
5. Increase strength and control of neck muscles; elongation of cervical spine.	5. Intermittent compression through the shoulders in a caudal direction to facilitate balanced activation of the anterior and posterior neck, chest and abdominal muscles.	5. Maintain the head up and in midline.
6. Increase strength, balance and control of anterior and posterior neck muscles and downward rotation of the scapula.	6. Intermittent horizontal compression through shoulders and chest muscles to assist the infant to bring the hands together in midline or to the mouth.	6. Maintenance of scapular depression to assist in bringing hands to midline.
7. Integrate control of abdominal muscles and back extension muscles; increase the strength of abdominal muscles; improve balance of trunk flexor/extensor muscle activity.	7. Support the head and shoulders and tip the infant approximately 15 degrees backward to activate neck and abdominal muscles. From this position add very small lateral movements to activate trunk in the frontal plan, elongating the weight-bearing side of the body to promote lateral righting of the head and trunk.	7. Maintain capital flexion, chin toward the chest with hips and knees in neutral flexed position

1-4: The child is in prone. 5-7: The child is in sitting

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Playing When I'm Sitting

Exercise 13: I hold my head in the middle

Exercise 13
In a semi-sitting position with the baby's legs flexed toward the tummy, support the baby's head with your hands and arms toward the midline.
Give five gentle compressions from the shoulders down to the baby's bottom.

Gently rock the baby slightly forward and backward.

Exercise 14: I bring my hands to my mouth

Exercise 14
Remain in the same position as describe in Step 13.

Give five gentle compressions through the shoulders towards middle.

Help the baby bring his hands together in the middle of the chest or toward the mouth.

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NOPPI CLINICAL TRIAL RESULTS

Parents in the intervention group described increased attachment to their infant and

they felt empowered as a parent at term and 3 months.

The intervention improved short-term motor performance on the TIMP at term (37 weeks)

Ustad et al Pediatrics 2016

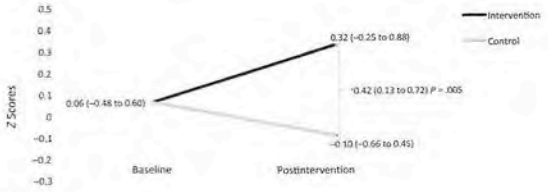

FIGURE 2
Motor performance reported by using *z* scores with 95% CIs of the TIMPSI at baseline and the TIMP postintervention. [a]Estimated between-group difference in change in *z* scores from baseline to postintervention between the intervention and the control groups.

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Summary/Conclusions

- Early identification is critical!
  - Cascade theory early motor drives cognitive, social, perceptual & language
  - Sitting sooner matters
- Assessment tool selection does indeed impact the outcome and whether baby qualifies for EI services
- From the EI Provider manual (Section 3.10.6 c)
  - In depth training in administering and interpreting the approved tools we use
- Incumbent upon us to know the tools of our trade
  - Not one size fits all
  - Should be one therapist knows all or at least many and selects appropriate one mindfully
- Infants < 4 & ½ months adjusted age nothing beats the TIMP
  - Normative sample
  - Precision of measurement (142 points vs 8-16)
  - Parent education, HEP & treatment planning – multiple peer reviewed studies
- Infants not yet walking 5-18 months AIMS is far superior to PDMS-2
  - Especially kids with low muscle tone/delayed skills
  - Outstanding for parent education, anticipatory guidance, evaluating change over time and showing progress
- Treatment Protocols for premie babies and their parents
  - Girolami, Lekskulchai, NOPPI &. SPEEDI
- Your homework

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Ordering Information

- TIMP
  - www.thetimp.com
- AIMS and AIMS scoresheets
  - Amazon
  - Elsevier
- PDMS-2
  - www.proedinc.com

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