

Case Study: HINE with Asymmetries



CP-NET
Childhood Cerebral Palsy
Discovery Network

Holland Bloorview
Kids Rehabilitation Hospital



kids
brain health
network



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Case Summary

- 24 weeks gestation
- GBS meningitis
- Right periventricular venous infarct
- Bronchopulmonary dysplasia status post systemic steroids
- Discharged home on NG-tube feeding



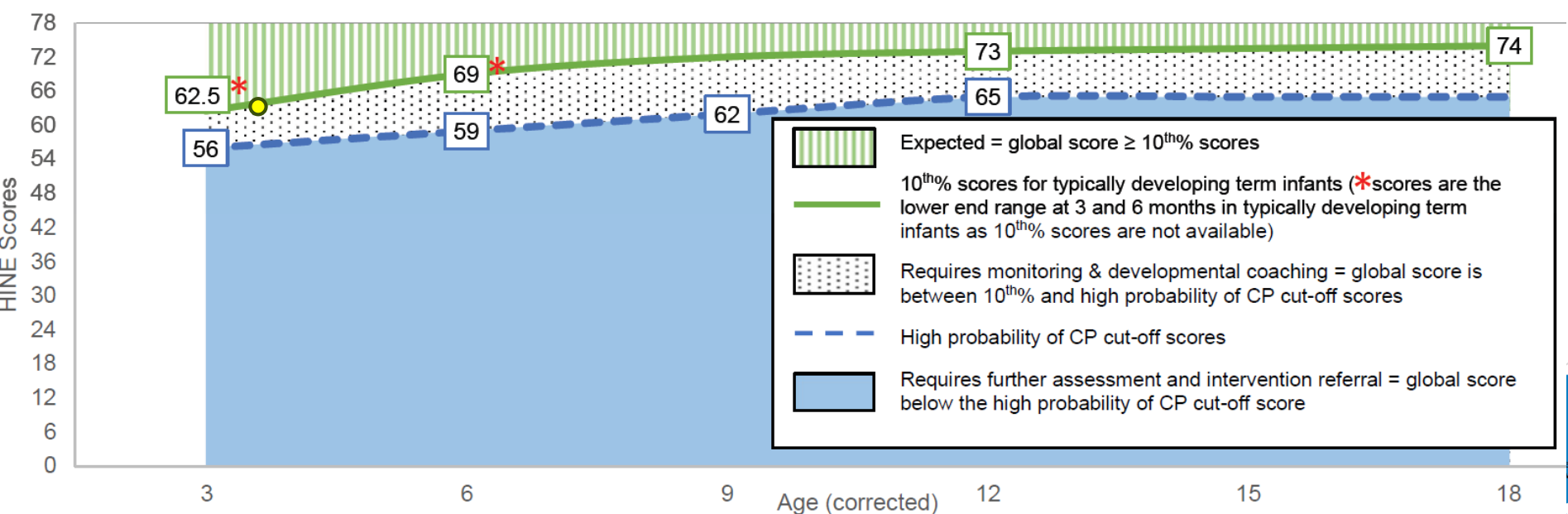
Hammersmith Infant Neurological Examination (HINE): Score Interpretation Aid for Children Receiving Neonatal Follow-Up Care

Clinical history: 23 6/7 weeks, R venous infarction, Mild BPD status post systemic steroids, GBS meningitis. Discharged home on NG-tube feeding

Brain imaging (if available): HUS: Right venous infarction and right periventricular echogenicity

- Infants with unilateral CP may not have low global scores but can have ≥ 4 asymmetries representing significant asymmetric neurologic performance⁶. Refer for early intervention if ≥ 4 asymmetries are present regardless of infant's age.

Visit	Child's Age (corrected)	Child's Global HINE Score	HINE Asymmetry Score	Corrected Age for GMA (if available)	GMA Category (if available)	Interpretation/Action	Discussed with family
1				15 wks		Fidgety movements present	<input checked="" type="checkbox"/>
2	3m21d	62	5 (L)			≥ 4 asymmetries, referred to early intervention	<input checked="" type="checkbox"/>



Even though global HINE score is close to optimal range, ≥ 4 asymmetries on the left suggests significant asymmetrical neurological performance especially in the context of right venous infarction on neuroimaging – refer to early intervention

Communication With the Family

1. Reference findings on imaging (periventricular venous infarct on the right)
2. Impact of injury on functional use observed
 - a) Easier to use the right and more often leads with right
 - b) Left hand with fisting
3. Use of HINE assessment and scoring aid to open dialogue for early referral to motor based therapies such as Baby CIMT, bimanual therapy, OT/PT/Early Interventionist

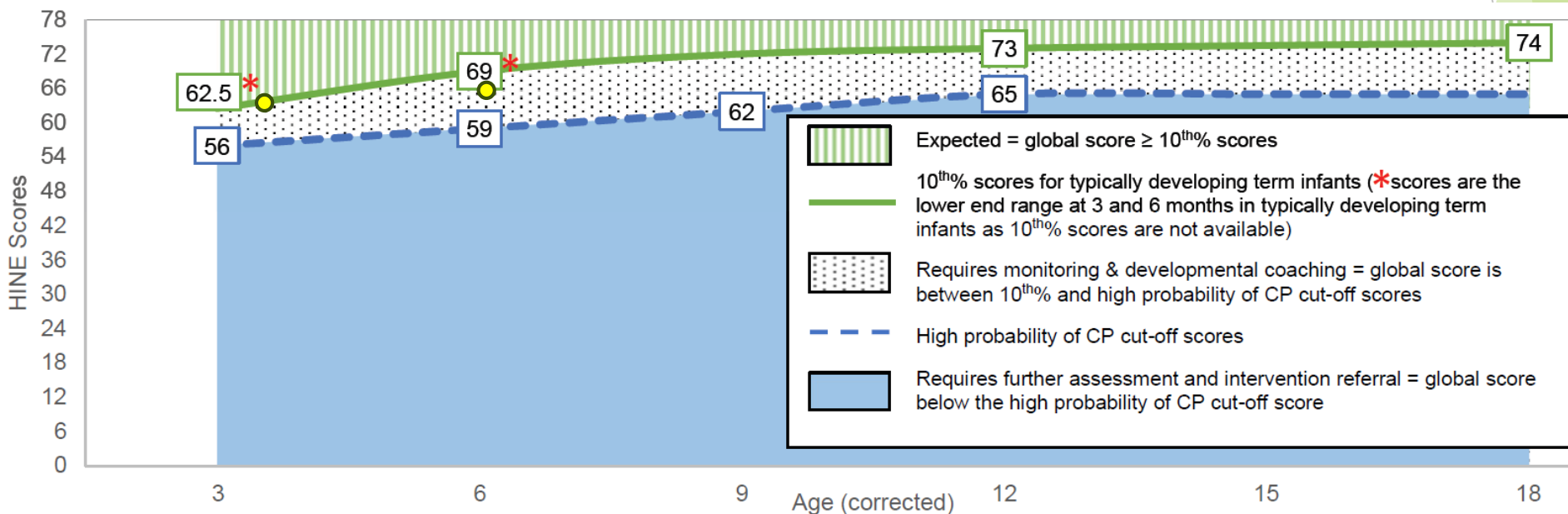


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1				15 wks		fidgety movements present R side; L side asymmetrical segmental	✓
2	3m21d	62	5L			≥4 asymmetries, refer to early intervention	✓
3	6m2d	65.5	9L			discussed left hemiplegic CP diagnosis; receiving Baby Constraint Induced Movement Therapy	✓



Arm and Hands – 6 Months



	score 3	score 2	score 1	score 0	sc	Asymmetry / comments
Arms at rest	In a neutral position, central straight or slightly bent RT		Slight internal rotation or external rotation Intermittent dystonic posture	Marked internal rotation or external rotation or dystonic posture hemiplegic posture LT	1.5	A
Hands	Hands open RT		Intermittent adducted thumb or fisting	Persistent adducted thumb or fisting LT	1.5	A

*Persistent asymmetry and stiffness noted in LT arm in different positions

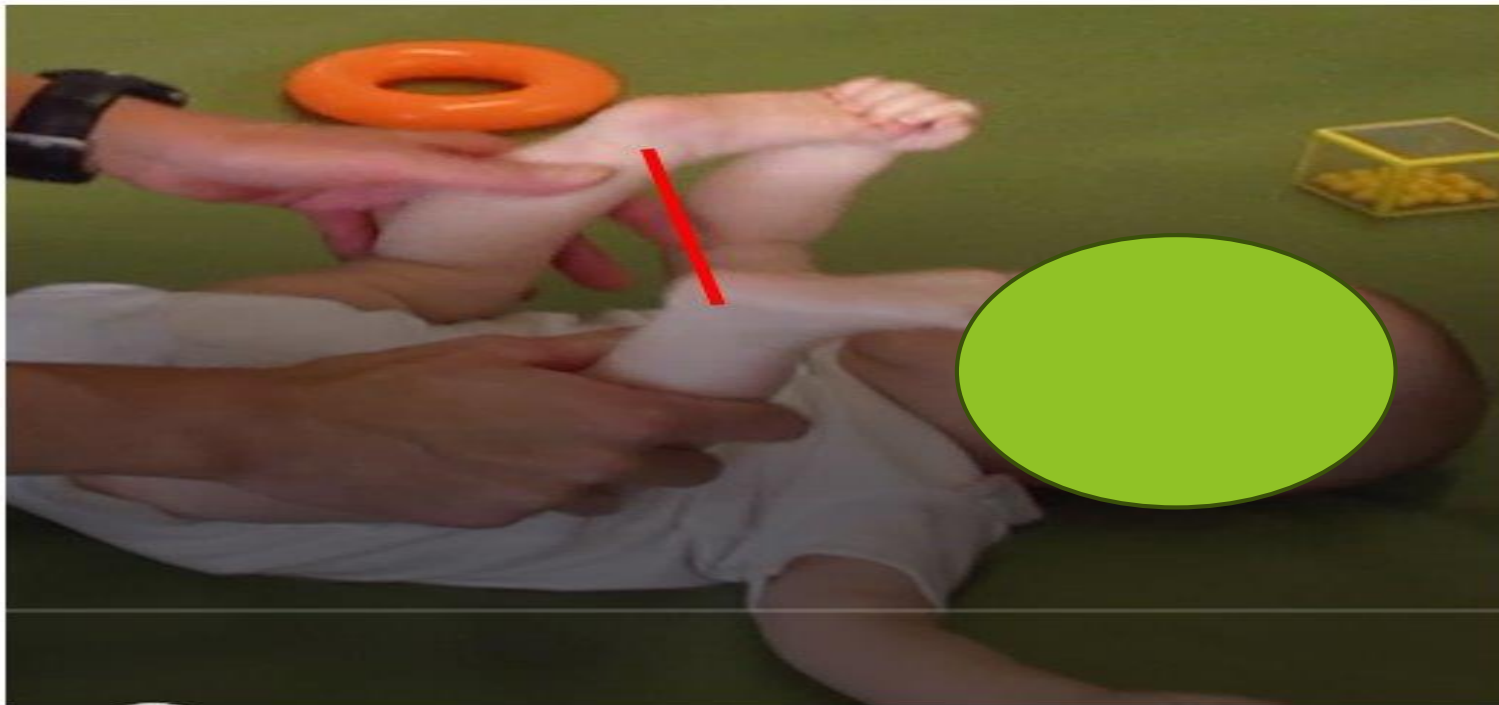


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Tone: Popliteal Angle

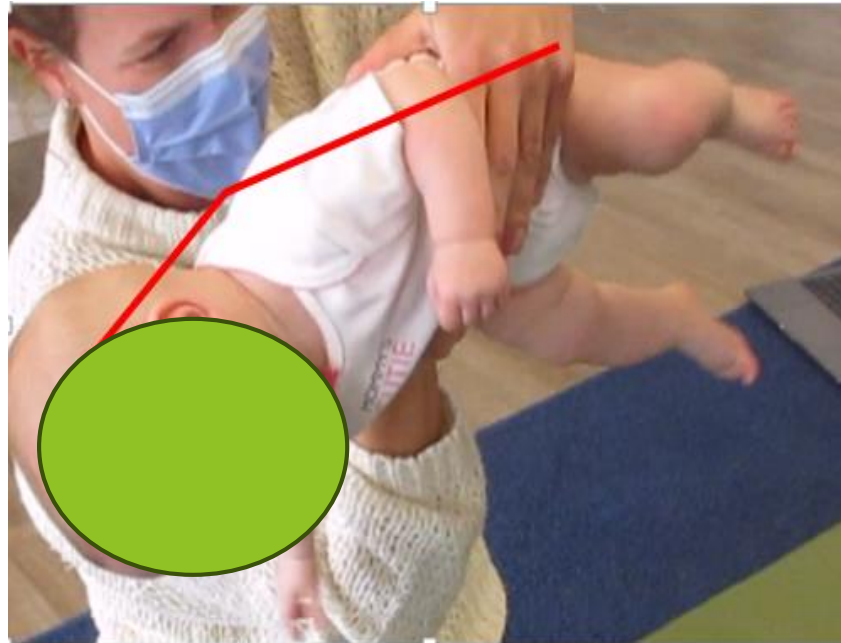


	Score 3	Score 2	Score 1	Score 0	sc	Asvm/Co
Popliteal angle Keeping the infant's bottom on the bed, flex both hips onto the abdomen, then extend the knees until there is resistance. Note the angle between upper and lower leg.	Range: 150°-100° R L R L	150-160° R L	-90° or > 170° R L R L	<80° R L	2	A

* Heels are not parallel = a difference in popliteal angle



Reflexes and Reactions: Lateral Tile



	Score 3	Score 2	Score 1	Score 0	sc	Asym / Co
Lateral tilting (describe side up). Hold infant up vertically near to hips and tilt sideways towards the horizontal. Note response of trunk, spine, limbs and head.					0.5	A

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Reflexes and Reactions: Forward Parachute



- Reaction seen on RT;
- No reaction seen on LT (arm is flexed)

	Score 3	Score 2	Score 1	Score 0	sc	Asym / Co
Forward parachute Hold infant up vertically and quickly tilt forwards. Note reaction /symmetry of arm responses,	 (after 6 months)		 (after 6 months)		2	A



Communication

Parents report [redacted] tolerated the baby CIMT program initially but quickly frustrated with blocking of the stronger arm/hand. Presently parents estimate [redacted] tolerates blocking of the stronger arm/hand for a few minutes at a time. They have found mealtimes are a better motivator for [redacted] to use her left hand. At present they continue to see differences in how [redacted] uses her hands when she is playing with toys; however, feel [redacted] s moving her left arm more than before. She is also weight bearing over her left arm in sitting, and she will occasionally bring in her left hand to hold toys briefly together with the right hand. Parents report more relaxation in the left arm and hand compared to the initial visit; however, report [redacted] s left hand remains fist ed approximately 50% of the time during the day, and her left toes frequently curl under. As per parents [redacted] does not tolerate touch to her left hand and often uses her right stronger arm to pull her left arm away. Gross motor, she is tolerating tummy time more and will roll out of this position comparatively less than before. On tummy she is taking weight through both forearms. She is sitting on her own. Mother informs [redacted] was given a diagnosis of cerebral palsy at the recent neonatal followup visit with Dr. [redacted]

[redacted] is now supported by [redacted] OT. Her previous OT monitored for a hand splint and didn't feel one was indicated. [redacted] has an upcoming appointment with a developmental pediatrician at ErinOak Kids.

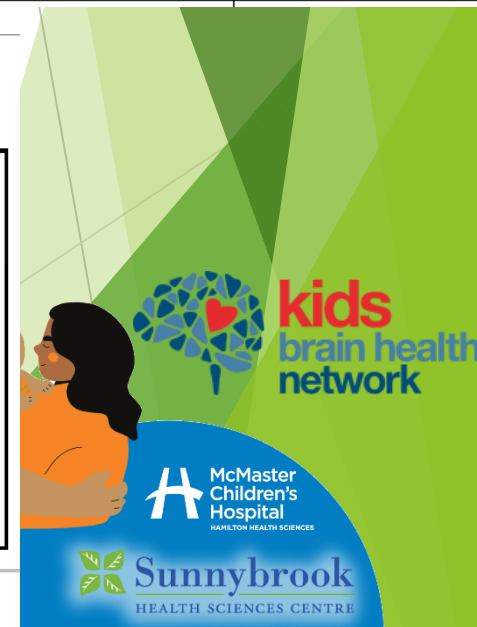
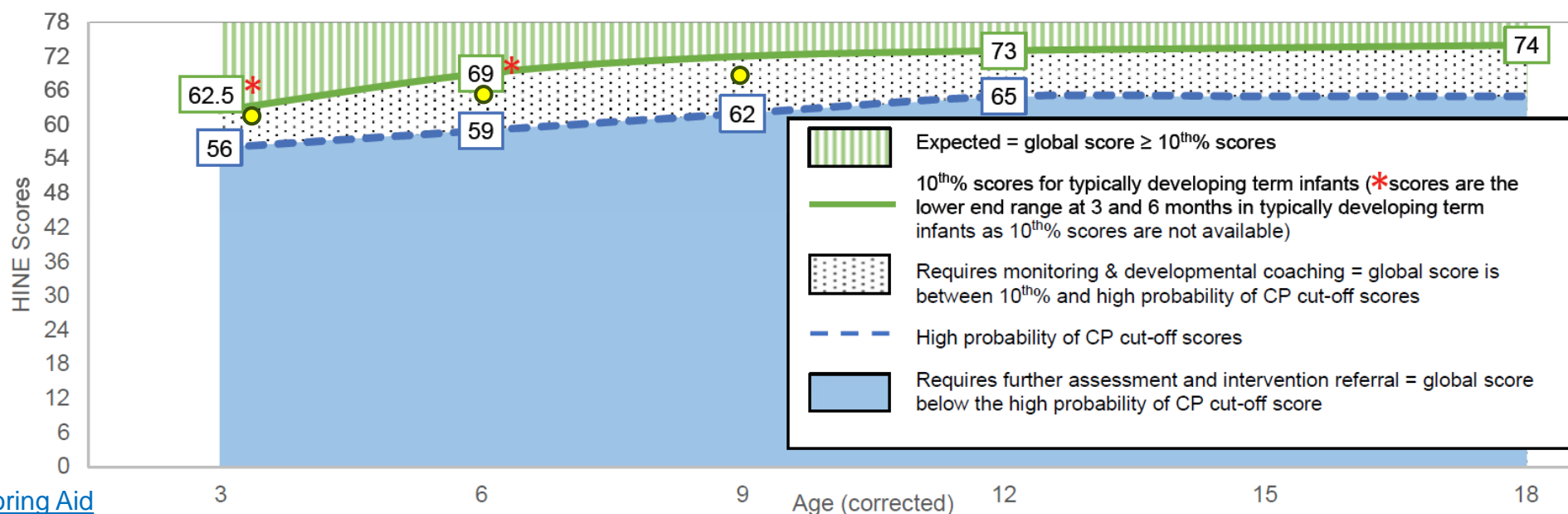


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3	6m2d	65.5	9L			discussed left hemiplegic CP diagnosis; receiving Baby CIMT	✓
4	9m3d	66	11L			Left hemiplegic CP diagnosis formalized	✓



9 Month Clinical Presentation



	Score 3	Score 2	Score 1	Score 0	sc	Asym / Co
Arm protection Pull the infant by one arm from the supine position (steady the contralateral hip) and note the reaction of arm on opposite side.	 Arm & hand extend R L	 RT	 Arm semi-flexed R L	 Arm fully flexed R L	1.5	A

*RT hand is not open and taking weight, not a full response = score 2; LT arm is semi-flexed and hand fistled = score 1

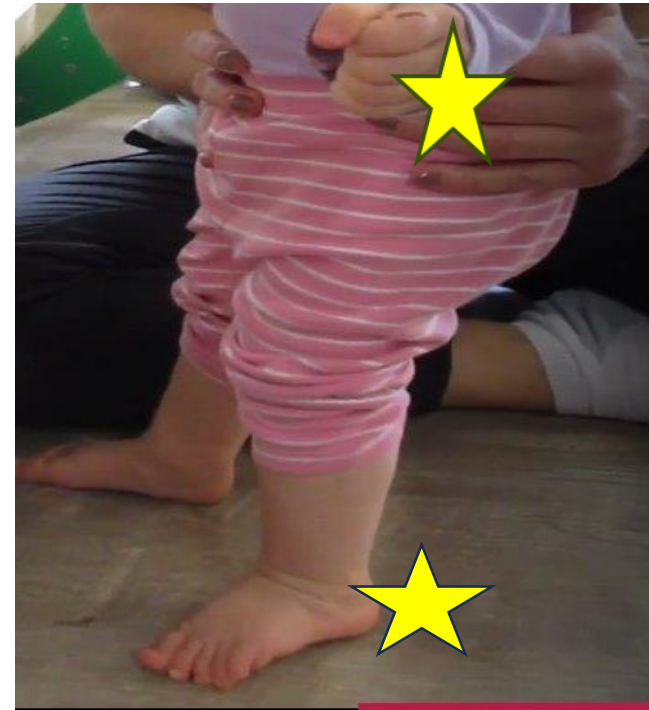


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9 Month Clinical Presentation



	score 3	score 2	score 1	score 0	sc	Asymmetry / comments
Feet in supine and in standing	<p>Central in neutral position</p> <p style="text-align: right;">RT</p> <p>Toes straight midway between flexion and extension</p>		<p>Slight internal rotation or external rotation</p> <p>Intermittent Tendency to stand on tiptoes or toes up or curling under</p>	<p>Marked LT internal rotation or external rotation at the ankle</p> <p>Persistent Tendency to stand on tiptoes or toes up or curling under</p>	1.5	A



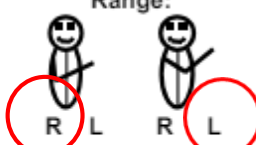

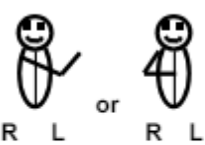



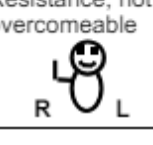




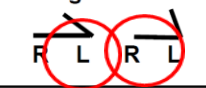
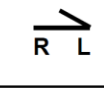
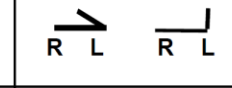
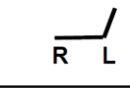





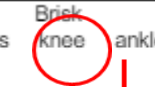
9 Months Clinical Findings on HINE

	score 3	score 2	score 1	score 0	sc	Asymmetry / comments
Arms at rest	In a neutral position, central straight or slightly bent RT		Slight internal rotation or external rotation Intermittent dystonic posture	Marked internal rotation or external rotation or dystonic posture hemiplegic posture	1.5	A
Hands	Hands open RT		Intermittent adducted thumb or fisting	Persistent adducted thumb or fisting LT	1.5	A
Feet in supine and in standing	Central in neutral position Toes straight midway between flexion and extension RT		Slight internal rotation or external rotation Intermittent Tendency to stand on tiptoes or toes up or curling under	Marked internal rotation or external rotation at the ankle LT Persistent Tendency to stand on tiptoes or toes up or curling under	1.5	A

	Score 3	Score 2	Score 1	Score 0	score	Asymmetry / comments
Quantity Watch infant lying in supine	Normal		Excessive or sluggish	Minimal or none	1	A
Quality Observe infant's spontaneous voluntary motor activity during the course of the assessment	Free, alternating, and smooth		Jerky Slight tremor	<ul style="list-style-type: none"> • Cramped & synchronous • Extensor spasms • Athetoid • Ataxic • Very tremulous • Myoclonic spasm • Dystonic movement 	1	A



9 Months Clinical Findings on HINE

	Score 3	Score 2	Score 1	Score 0	sc	Asym/Co
Scarf sign Take the infant's hand and pull the arm across the chest until there is resistance. Note the position of the elbow in relation to the midline.	Range:  R L R L		 R L	 R L or R L	3	A
Passive shoulder elevation Lift arm up alongside infant's head. Note resistance at shoulder and elbow.	Resistance overcomeable  R L	Resistance difficult to overcome  R L	No resistance  R L	Resistance, not overcomeable  R L	2.5	A
Popliteal angle Keeping the infant's bottom on the bed, flex both hips onto the abdomen, then extend the knees until there is resistance. Note the angle between upper and lower leg.	Range: 150°-100°  R L R L	150-160°  R L	~90° or > 170°  R L R L	<80°  R L	3	A
Ankle dorsiflexion With knee extended, dorsiflex the ankle. Note the angle between foot and leg.	Range: 30°-85°  R L R L	20-30°  R L	<20° or 90°  R L R L	> 90°  R L	3	A
Arm protection Pull the infant by one arm from the supine position (steady the contralateral hip) and note the reaction of arm on opposite side.	Score 3  Arm & hand extend R L	Score 2 	Score 1  Arm semi-flexed R L	Score 0  Arm fully flexed R L	1.5	A
Tendon Reflexes Have child relaxed, sitting or lying – use small hammer	Easily elicitable biceps knee ankle 	Mildly brisk biceps knee ankle	Brisk biceps knee ankle 	Clonus or absent biceps knee ankle	2	A



Key Messages

- Infants with unilateral CP may not have low global scores but can have ≥ 4 asymmetries representing significant asymmetric neurologic performance.
- Refer for early intervention if ≥ 4 asymmetries are present regardless of infant's age.
- Use of HINE assessment and scoring linking with neuroimaging, GMA and baby's function to open dialogue for early referral for motor-based therapies.



References

HINE Scoring Aid

1. <https://onlinelibrary.wiley.com/doi/10.1111/dmcn.15977?af=R>

HINE Scoring Proforma

2. <https://www.mackeith.co.uk/hammersmith-neurological-examinations/hammersmith-neurological-examinations-subscriber-content/recording-and-scoring-proformas/>



Additional Resources



ELSEVIER



Research in Developmental
Disabilities

Volume 72, January 2018, Pages 191-201



Research paper

The effectiveness of Baby-CIMT in infants younger than 12 months with clinical signs of unilateral-cerebral palsy; an explorative study with randomized design

[Ann-Christin Eliasson](#)^a  , [Linda Nordstrand](#)^a, [Linda Ek](#)^a,
[Finn Lennartsson](#)^{b c}, [Lena Sjöstrand](#)^a, [Kristina Tedroff](#)^a,
[Lena Krumlinde-Sundholm](#)^a

RESEARCH REPORTS

Hammersmith Infant Neurological Examination Clinical Use to Recommend Therapist Assessment of Functional Hand Asymmetries

Pietruszewski, Lindsay PT, DPT; Nelin, Mary Ann MD; Batterson, Nancy OT/L, SCFES, CLC; Less, Julia MPH; Moore-Clingenpeel, Melissa MA, MAS; Lewandowski, Dennis PhD; Levengood, Katelyn PT, DPT; Maitre, Nathalie L. MD, PhD

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