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APPENDIX

Manual for the Assessment of Preterm Infants' Behavior (APIB)

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INTRODUCTION

The following manual is an attempt to outline a strategy to systematically document behavioral ingredients of the prematurely born infant, from the stage when he can first be handled in room temperature and room air, without medical, technological aids, to the stage when the infant's attentional system is relatively independent from the other subsystems and when he can use it freely to regulate and control his inspection of the environment, i.e., by approximately one month post term for the healthy, fullterm infant.

The goal of this manual is to provide an instrument for the documentation of patterns of developing behavioral organization. The strategy of examination is broadly derived and adapted from the Brazelton Neonatal Behavioral Assessment Scale (Brazelton, 1973). The items of the scale are used as graded maneuvers in order to "test" the current status and organization of the infant's subsystems of functioning and their interplay.

The maneuvers are grouped into six larger packages, each of which places a specific demand on the infant and is intended to bring out the functioning of his various subsystems and their integration in the face of this demand.

ASSESSMENT OF PRETERM INFANT BEHAVIOR (APIB)

INFANT'S NAME		MED. REC. NO.	DATE OF BIRTH	AGE (Post-conception)
TIME - LAST FEEDING	TYPE OF FEEDING		CURRENT INTERVAL BETWEEN FEEDS	
INITIAL CIRCUMSTANCES OF INFANT				
POSITION: <input type="checkbox"/> SUPINE <input type="checkbox"/> PRONE <input type="checkbox"/> SIDE HEAD: <input type="checkbox"/> RIGHT <input type="checkbox"/> LEFT <input type="checkbox"/> MIDLINE COVERING: <input type="checkbox"/> DIAPER <input type="checkbox"/> SHIRT <input type="checkbox"/> CLOTHES <input type="checkbox"/> BLANKET(S)				
INFANT'S INITIAL STATE			INFANT'S PREDOMINANT STATE	
WEIGHT		HEIGHT	HEAD CIRCUMFERENCE	PONDERAL INDEX
_____ LBS _____ OZS _____ GMS		_____ INCHES _____ CM	_____ INCHES _____ CM	
DATE OF EXAM	TIME OF EXAM	PLACE OF EXAM	PERSONS PRESENT	
			<input type="checkbox"/> MOTHER <input type="checkbox"/> FATHER <input type="checkbox"/> SIBLING(S) <input type="checkbox"/> OTHER _____	
INTERFERING VARIABLES		EXAMINER	VIDEO	DURATION OF EXAM

SCORE SHEET I - SYSTEMS

LEGEND: B = Baseline R = Reaction P = Post-package Status

	ORDER OF PKG.	PHYSIOLOGY			MOTOR			STATE			ATTN/INTERACT			REGULATORY			EXAM FACIL
		B	R	P	B	R	P	B	R	P	B	R	P	B	R	P	
PACKAGE I SLEEP/DISTAL																	
PACKAGE II UNCOVER/SUPINE																	
PACKAGE III LOW TACTILE																	
PACKAGE IV MEDIUM TACTILE/VESTIBULAR																	
PACKAGE V HIGH TACTILE/VESTIBULAR																	
PACKAGE VI ATTENTION/INTERACTION																	

COMMENTS:

SYSTEM ORGANIZATION GRAPH (APIB)
(From SCORE SHEET I)

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INFANT'S NAME _____ MED. REC. NO. _____ DATE OF EXAM _____ AGE (Post-conception) _____

PHYSIOLOGICAL SYSTEM

	Sleep/Distal			Uncov./Supine			Low Tactile			Med. Tact./Vest.			High Tact./Vest.			Attn./Interact.		
9																		
8																		
7																		
6																		
5																		
4																		
3																		
2																		
1																		
	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P
	* I ()			II ()			III ()			IV ()			V ()			VI ()		

MOTOR SYSTEM

	Sleep/Distal			Uncov./Supine			Low Tactile			Med. Tact./Vest.			High Tact./Vest.			Attn./Interact.		
9																		
8																		
7																		
6																		
5																		
4																		
3																		
2																		
1																		
	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P
	I			II			III			IV			V			VI		

STATE SYSTEM

	Sleep/Distal			Uncov./Supine			Low Tactile			Med. Tact./Vest.			High Tact./Vest.			Attn./Interact.		
9																		
8																		
7																		
6																		
5																		
4																		
3																		
2																		
1																		
	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P
	I			II			III			IV			V			VI		

REGULATORY SYSTEM

	Sleep/Distal			Uncov./Supine			Low Tactile			Med. Tact./Vest.			High Tact./Vest.			Attn./Interact.		
9																		
8																		
7																		
6																		
5																		
4																		
3																		
2																		
1																		
	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P
	I			II			III			IV			V			VI		

ATTENTION/INTERACTION

	Attn./Interact.		
9			
8			
7			
6			
5			
4			
3			
2			
1			
	B	R	P
	VI		

EXAMINATION FACILITATION

	Sleep/Distal			Uncov./Supine			Low Tactile			Med. Tact./Vest.			High Tact./Vest.			Attn./Interact.		
9																		
8																		
7																		
6																		
5																		
4																		
3																		
2																		
1																		
	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P	B	R	P
	I			II			III			IV			V			VI		

* Fill in order of administration

SCORE SHEET II – PACKAGES AND MANEUVERS

								ORDER
I: SLEEP/DISTAL LIGHT RATTLE BELL	Decrement	BNBAS	Ease of Elicitation	Timing	Recycling	Dis-organization	Discharge	
	Decrement	BNBAS	Ease of Elicitation	Timing	Recycling	Dis-organization	Discharge	
	Decrement	BNBAS	Ease of Elicitation	Timing	Recycling	Dis-organization	Discharge	
II: SLEEP PRONE/SUPINE UNCOVER PRONE TO SUPINE	Capacity to deal with	_____→						
	Capacity to deal with	_____→						
III: LOW TACTILE FREE FEET/HANDS HEEL TOUCH PLANTAR GRASP FOOT SOLE STROKE (Babinski) CLONUS PALMAR GRASP PALMAR MENTAL GRASP PASSIVE MOVEMENT ARMS PASSIVE MOVEMENT LEGS ARM/LEG DIFFERENTIATION GLABELLA ROOTING SUCKING	Capacity to deal with	_____→						
	BNBAS	Ease of Elicitation	Timing	Recycling	Dis-organization	Discharge	_____→	
	BNBAS/R	BNBAS/L	_____→					
	BNBAS/R	BNBAS/L	_____→					
	BNBAS/R	BNBAS/L	_____→					
	BNBAS/R	BNBAS/L	_____→					
	APIB	_____→						
	Resistance R	Resistance L	Recoil R	Recoil L	BNBAS/R	BNBAS/L	_____→	
	Resistance R	Resistance L	Recoil R	Recoil L	BNBAS/R	BNBAS/L	_____→	
	APIB	_____→						
	BNBAS	_____→						
	BNBAS/R	BNBAS/L	_____→					
	BNBAS	_____→						

SCORE SHEET II – PACKAGES AND MANEUVERS (Continued)

								ORDER	
IV: MEDIUM TACTILE/ VESTIBULAR	Capacity to Deal With	_____→							
	UNDRESS								
	PULL TO SIT	BNBAS	Hyper-extension	Hyper-flexion	_____→				
		Umbrella	BNBAS	_____→					
	STANDING	Umbrella	BNBAS	_____→					
	WALKING	Umbrella	BNBAS	_____→					
	PLACING	Umbrella R	Umbrella L	BNBAS/R	BNBAS/L	_____→			
		BNBAS/R	BNBAS/L	_____→					
	INCURVATION	APIB	BNBAS	_____→					
	CRAWL	Vertical	Fetal Tuck	Horizontal	Fetal Tuck	BNBAS	_____→		
BNBAS/R		BNBAS/L	_____→						
TONIC NECK REFLEX	BNBAS	_____→							
DEFENSIVE REACTION	BNBAS	_____→							
V: HIGH TACTILE/ VESTIBULAR ROTATION	Head R	Head L	Eyes R	Eyes L	BNBAS/R	BNBAS/L	Nystagmus		
	MORO	Arms Extension	Arms Adduction	Legs	BNBAS	_____→			
VI: ATTENTION/ INTERACTION ANIMATE VISUAL & AUDITORY (Face&Voice)	Elicitation Maintenance	Orientation R L	Asymm P	Effort	Cost	Quality	_____→		
	ANIMATE VISUAL (Face)	Elicitation Maintenance	Orientation R L	Asymm P	Effort	Cost	Quality	_____→	
	ANIMATE AUDITORY (Voice)	Elicitation Maintenance	Orientation R L	Asymm P	Effort	Cost	Quality	_____→	
	INANIMATE VISUAL & AUDITORY (Rattle)	Elicitation Maintenance	Orientation R L	Asymm P	Effort	Cost	Quality	_____→	
	INANIMATE VISUAL (Ball or Rattle)	Elicitation Maintenance	Orientation R L	Asymm P	Effort	Cost	Quality	_____→	
	INANIMATE AUDITORY (Rattle)	Elicitation Maintenance	Orientation R L	Asymm P	Effort	Cost	Quality	_____→	

SCORE SHEET III — BEHAVIORAL SUMMARY SCALES

PHYSIOLOGICAL PARAMETERS					MOTOR PARAMETERS				
TREMULOUSNESS	BNBAS				TONUS	BNBAS	Balance		
	BNBAS					MOTOR MATURITY	BNBAS	Threshold	Postural Control
STARTLES					ACTIVITY		Spontaneous Activity	Elicited Activity	BNBAS
SKIN COLOR	Lability of Good Color	Lability of Comp. Color	Threshold	Jaundice		HAND-TO-MOUTH FACILITY	BNBAS		
SMILES	APIB	BNBAS							

STATE PARAMETERS										
ALERTNESS	Degree (B)	Degree (A)	Quality	Am't. Manipulation	STATE REGULATION	Lability	Range and Flexibility	BNBAS		

SELF REGULATION PARAMETERS										
WITHDRAWAL OR AVOIDANCE BEHAVIOR	CATALOG OF REGULATION MANEUVERS				APPROACH OR GROPING BEHAVIOR	CATALOG OF REGULATION MANEUVERS				
	Spit-ups	Gags	Hiccoughs	Bowel Mvt		Tongue Extension	Hand on Face	Sounds		
	Grimace	Arching	Finger Splay	Airplane		Hand Clasp	Foot Clasp	Fingerfold	Tuck	
	Salute	Sitting on Air				Body Movement	Hand to Mouth	Grasping	Leg/Foot Bracing	
	Sneezing	Yawning	Sighing	Coughing		Mouthing	Suck Search	Sucking	Hand Hold	
	Averting	Frowning				Ooh Face	Locking	Cooing		
QUIETING	Self-quiet 6 ↓	Self-quiet Motor ↓	Consolability 6 ↓	Consolability Motor ↓					EYEMST	
PEAK OF EXCITEMENT	BNBAS									
RAPIDITY OF BUILD-UP	Rapidity ↑ 6	Rapidity ↑ Motor								
IRRITABILITY	Irritability (B)	Irritability (A)								
ROBUSTNESS	Robustness									
CONTROL OVER INPUT	Control Over Input									
FACILITATION STIMULATION	Facilitation Stimulation									

SUMMARY

ATTRACTIVENESS

Infant's Name _____ Date of Exam _____ Age (Post-conception) _____

EYE MOVEMENTS: Score 0 1 2 3

0 = does not occur

1 = incidental occurrence, infrequent occurrence

2 = moderately frequent or occurrence can be inhibited moderately easily

3 = very frequent occurrence, pervasive occurrence, occurrence can be inhibited with difficulty or not at all

	<u>R</u>	<u>L</u>	<u>Comment</u>
Setting Sun	_____	_____	_____
Eye floating	_____	_____	_____
Eye roving	_____	_____	_____
Eye darting	_____	_____	_____
Storms	_____	_____	_____
Nystagmus	_____	_____	_____
Disjugate movement	_____	_____	_____
Exotropic position	_____	_____	_____
Exotropic movement	_____	_____	_____
Esotropic position	_____	_____	_____
Esotropic movement	_____	_____	_____
Tuning out, staring (nonprocessing awake)	_____	_____	_____
Other	_____	_____	_____

Total Score: _____

PART I. SYSTEMS ASSESSMENT

Each of the five systems—the physiological system, the motor system, the state system, the attentional-interactive system, and the regulatory system—is assessed and scored for each of the six packages. Three system scores, ranging from 1 to 9 each, are arrived at: a baseline score (B), a reaction score (R), and a post-package status score (P). A separate score (E) is derived for the degree and kind of facilitation of regulation necessary from the examiner to set the stage for a package or maneuver, to bring out the infant's best performance and to facilitate his return to a baseline for the next package.

Baseline (B)

In assessing the baseline of a system the infant is observed prior to the administration of the maneuvers making up a package, and an estimate of the baseline organization of the system is made. It may be necessary occasionally to give the infant up to a minute of time out between packages to have enough evidence to make a baseline assessment.

Reaction (R)

In assessing the reaction of a system the infant is observed throughout the administration of the maneuvers making up a package. Then the performance of the systems in the course of the administration of the maneuver of the package is assessed and scored. The degree of reactivity and relative disorganization of a system is captured.

Post Package Status (P)

This is the state of the system after the infant has been brought through the maneuvers of a package and reflects an aspect of the infant's own regulatory ability. This score captures the level of organization to which the system can return without aid from the examiner.

Examiner Facilitation (E)

Various maneuvers of the examiner may be necessary to maintain an infant's self-regulation or to bring the infant back to a stabler baseline from which the next package can be administered. The maneuvers are seen as graded and cumulative interventions designed to optimize the infant's performance and his balance. The score reflects the degree of aid necessary.

Order of Package Administration

In the first column, the order in which the packages were administered is indicated. This will allow the examiner to reconstruct the flow of the examination.

Systems

I. PHYSIOLOGICAL SYSTEM. Behavioral indices of the physiological system assessed by observation are the infant's respiratory pattern, occasionally his heart rate, his skin color, autonomically mediated movements such as tremors, startles, autonomic eye movements such as eye floating and eye rolling, sounds such as sighs and whimpers, and behavioral indices of visceral control such as hiccoughing, spitting up, gagging, bowel movement straining, and grunting. The intensity or severity of the signs present, not their absolute number, is decisive in the assignment of a particular score.

SCORING

1. Smooth regular respirations and heart rate (if assessed), good healthy color, no spontaneous tremors or startles, no facial twitches or autonomic movements, no signs of upset visceral response.

2. Very mild respiratory irregularity, very mild cyanosis, paleness, webbing or flushing, mild occasional tremors or startles, occasional mild facial twitches, sighs or whimpers, possibly a hiccough or mild gag.
3. Mild respiratory unevenness, some cyanosis, paleness, or webbing or flushing, some tremors or startles, some facial twitches, some floating eye movements, some mild gagging, whimpering, or occasional hiccough.
4. Mild to moderate respiratory unevenness, mild to moderate cyanosis, paleness, webbing or flushing, repeated tremors or startles, repeated facial twitches, occasional gagging or mild eye movements or hiccoughing or bowel movement straining or whimpering or mild floating eye movements.
5. Moderate respiratory unevenness, i.e., several periods of very mild apnea, or a period of moderate tachypnea, moderate cyanosis, paleness, webbing or flushing, moderate degree of tremors and startles, and/or moderate facial twitches, whimpers, hiccoughing, gagging, spitting up, eye floating, autonomic eye movement, or bowel movement straining.
6. Moderate to considerable respiratory unevenness, moderate to considerable tachypnea or mild apnea, moderate to considerable cyanosis, paleness, webbing, or flushing, quite considerable degree of tremors and/or startles, quite considerable facial twitches and autonomic eye movements, whimpers, hiccoughing, gagging, spitting up, or bowel movement straining.
7. Considerable respiratory unevenness, considerable tachypnea and/or mild to moderate apnea, considerable cyanosis, paleness, webbing or flushing, considerable degree of tremors and/or startles, considerable facial twitches, autonomic eye movements, hiccoughing, whimpers, gagging, spitting up or bowel movement straining.
8. Quite severe respiratory unevenness, apneic episodes, retraction or nasal flaring, or quite severe tachypnea; quite severe cyanosis, paleness, webbing or flushing, quite severe degree of facial twitches, autonomic eye movements, whimpers, hiccoughing, gagging, spitting up and/or bowel movement straining.
9. Severe, definite apnea episodes with retraction or considerable nasal flaring, or considerable tachypnea accompanied by dusky color, or very pale or very “webbed” or flushed red color, tremors and/or severe facial twitches, and/or severe eye rolling.

Resp. pauses:
 2-3 sec mild
 4-5 sec medium
 6-7 sec considerable
 8+ severe

II. MOTOR SYSTEM. Behavioral indices of the motor system assessed by observation are reflected in the infant’s posture, movements, tonus, and amount and degree of differentiation of activity.

SCORING

1. Consistently smooth, well modulated controlled posture. If movement, smooth postural changes and adjustments, well modulated smooth movements of the extremities and head, good consistent tone throughout the body, moderate amount of smooth activity with well differentiated hand, arm, and leg movements.
2. Largely well-modulated and controlled posture. If movement, almost consistently modulated tone; no sudden arm or leg extensions; activity is predominantly modulated, and hand, arm, and leg movements are moderately well differentiated.
3. Somewhat flaccid, flexed or extended posture. If movement, considerable periods of modulated controlled posture, only occasional fluctuations to hyperextension or hyperflexion, only an occasional arm or leg extension (salute) into midair, tone fairly consistent with mild hypertonic or mild hypotonic episodes, only brief periods of mildly frantic or diffuse activity, only occasional whole arm and leg movements.
4. Mildly to moderately flaccid, flexed or extended posture. If movement, moderate periods of modulated controlled posture alternating with brief episodes of hyperextension and/or hyperflexion, mild or infrequent arm and leg extensions (salute) into midair; tone only occasionally fluctuating between hypertonic or hypotonic, mainly consistently moderately one or

<p>Legend for Edits</p> <ul style="list-style-type: none"> • Grey Text: Addition • Strikethrough: Eliminated • Underlined: Scoring Aid • Dividing Line Between Scales: Scoring Aid • Note in Margin: Scoring Aid
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the other, infrequent periods of frantic or diffuse activity, infrequent sudden arm or leg movements.

5. Moderately flaccid, flexed or extended posture. If movement, occasional periods of modulated flexed posture alternating with episodes of hyperextension and hyperflexion in fluctuation, occasional moderate arm and leg extensions into midair (salute), tone largely synchronous, either hypertonic or flaccid with brief fluctuations, yet occasional periods of frantic diffuse movement, occasional undifferentiated whole arm and leg movements.
6. Moderately to considerably flaccid, flexed or extended posture. If movement, some fluctuation of hyperextended posture and hyperflexed posture, very brief periods of modulated flexion, occasional sudden, abrupt changes and adjustments. Some amount of jerky movements with several dramatic arm and leg extensions into midair (salute), tone somewhat variable between hypertonic and flaccid, moderate fluctuation, some periods of frantic, diffuse activity, some undifferentiated whole arm and leg movements.
7. Considerably hyperextended or hyperflexed ~~or flaccid~~ posture. If movement, moderate fluctuation of hyperextended posture and hyperflexed posture with sudden abrupt changes and adjustments; jerky movements with a considerable amount of dramatic arm and leg extensions into midair (salute), tone variable much of the time ~~between flaccid and hypertonic~~ with considerable fluctuation, moderately frantic activity or several bouts of frantic activity alternating with no or very mild activity, predominantly undifferentiated whole arm and leg movements.
8. Strongly hyperextended, hyperflexed, and/or almost completely flaccid posture. If movement, hyperextension alternating with sudden, abrupt changes and jerky adjustments; or very jerky movements with dramatic arm and leg extensions into midair (salute), or completely flaccid tone alternating with hypertonicity in dramatic fluctuation, or with excessive, frantic or diffuse activity or alternating with no activity at all; undifferentiated whole arm and leg movements.
9. Completely flaccid posture essentially without active adjustments, tonus, or activity.

III. STATE SYSTEM. Various configurations of behaviors encompassing eye movements, eye opening and facial expressions, gross body movements, respirations, and tonus aspects are used in specific temporal relationships to one another to determine at what level of consciousness an infant is at a particular time. Although Prechtel *et al.* (1979) state that only by 36 weeks can states be identified, we believe that it is possible to make meaningful, systematic distinctions between dynamic transformations of various behavioral configurations which appear to correspond to varying states of availability and conscious responsiveness. We suggest the following spectrum of observable states. States labeled as A states are “noisy,” unclear, and diffuse (premie states); states labeled as B states are clean, well defined states.

Sleep States

State 1A: Infant in deep sleep with momentary regular breathing, eyes closed, no eye movements under closed lids; relaxed facial expression; no spontaneous activity, oscillating fairly rapidly with isolated startles, jerky movements or tremors and other behavior characteristic of State 2 (light sleep).

State 1B: Infant in deep sleep with predominantly regular breathing, eyes closed, no eye movements under closed lids, relaxed facial expression; no spontaneous activity except isolated startles.

State 2A: Light sleep with eyes closed; rapid eye movements can be observed under closed lids; low activity level with diffuse or disorganized movements; respirations are irregular and there are many sucking and mouthing movements, whimpers, facial twitchings, much grimacing; the impression of a “noisy” state is given.

If the infant moves from states 1A or 2A to a more stressed state, becoming diffusely unreachable due to respiratory pauses, this is marked 1AA or 2AA, depending on the state in which this severe diffuseness is embedded. The AA notation may occasionally be necessary in 3A or 5A. The examination may have to be shortened in such cases.

AA states: resp.
pause of 8 sec or
more

State 2B: Light sleep with eyes closed; rapid eye movements can be observed under closed lids; low activity level with movements and dampened startles; movements are likely to be of lower amplitude and more monitored than in state 1; infant responds to various internal stimuli with dampened startle. Respirations are more irregular, mild sucking and mouthing movements can occur off and on; one or two whimpers may be observed, as well as an isolated sigh or smile.

Transitional States

State 3A: Drowsy

Drowsy or semi-dozing; eyes may be open or closed, eyelids fluttering or exaggerated blinking; if eyes open, glassy veiled look; activity level variable, with or without interspersed, mild startles from time to time; diffuse movement; fussing and/or much discharge of vocalization, whimpers, facial grimacing, etc.

State 3B: Drowsy, same as above but with less discharge of vocalization, whimpers, facial grimacing, etc.

Awake States

State 4: Alert

4AL: Awake and quiet, minimal motor activity, eyes half open or open but with glazed or dull look, giving impression or little involvement and distance; or focused, yet seems to look through, rather than at, object or examiner; or the infant is clearly awake and reactive but has his eyes ~~open~~-closed intermittently.

4AH: Awake and quiet, minimal motor activity, eyes wide open, “hyperalert” or giving the impression of panic or fear; may appear to be hooked by the stimulus, seems to be unable to modulate or break the intensity of the fixation on an object or away from it.

4B: Alert with bright shiny look; seems to focus attention on source of stimulation and appears to process information actively and with modulation; motor activity is at a minimum.

State 5: Active

5A: Eyes may or may not be open, but infant is clearly awake and aroused, as indicated by his motor arousal, his tonus, and his mildly distressed facial expression, grimacing, or other signs of discomfort; fussing, if present, is diffuse or strained.

5B: Eyes may or may not be open, but infant is clearly awake and aroused, with considerable, yet well defined motor activity. Infant ~~is~~ may also clearly be fussing but not crying robustly.

State 6: Crying

6A: Intense crying, as indicated by intense grimace and cry face, yet cry sound may be very strained or very weak or even absent.

6B: Rhythmic, ~~intense~~ lusty crying which is robust, vigorous, and strong in sound

Behavioral indices of the state system assessed by observation are the range of states the infant has available and the degree and flexibility of modulation the infant has in moving from state to state

and in maintaining a quiet, alert state. These are scaled from 1 to 9 and are recorded in the top portion of the boxes for B, R, and P for each package. In the lower portion of the boxes the predominant or typical state (1A, 1B, 2A, 2B, 3A, 3B, 4AL, 4AH, 4B, 5A, 5B, 6A, 6B) is recorded for B, R, and P of each package. For each box, up to 3 or more states can be recorded. This will preserve the overall fluctuation and range of states available and is merely an aid for the memory of the examiner.

SCORING

1. The infant comes to a well-defined state 4B and may move only briefly to 5B, 6B or 3B; or he maintains a solid state 1B or 2B in package I or II, or the baseline for package III.
2. The infant comes into a state 4B for brief periods; the states he comes from or goes to are well-defined states 5B, 6B, or 3B; or the infant maintains a less well-defined state 1A or 2A during package I or II, or the baseline for package III.
3. The infant may come into a state 4AH or 4AL, although there are also brief periods of 4B with oscillations to state 5B or 6B; except during package I or II, or the baseline for package III, when he stays in a poorly defined state 1A, 2A, or 3A.
4. The infant comes into a state 4AL or 4AH and 4B minimally, but there are oscillations to 3A with B, 5A and/or 6A with B. One or the other state bordering on the 4 states is a clear B state, at least at times.
5. The infant comes into a state 4AH or 4AL, with oscillations to state 3A with B, 5A or 6A with B. ~~or he is in 5A and B or 6A and B exclusively and 4A or B cannot be achieved.~~
6. The infant has clean states 1B, 2B, or 3B available and may come into 5B or 6B briefly; or he repeatedly oscillates between 3B and 5B or 6B.
7. The infant has periodic, sudden brief shifts from states 1A or B, 2A or B, or 3A or B to state 5A and 6A; or he is in 5A or 6A more or less continuously.
8. The infant has periodic, sudden brief shifts from states 1A with B or 2A with B to state 3A with B, or he maintains himself essentially mainly in state 3A and 3B. In package I, II, or the baseline for package III, he briefly moves to 1AA, 2AA, or 3AA from other sleep states: he recovers spontaneously.
9. The infant moves only between states 1A and 2A and at the most 3A. In package I, II, or the baseline for package III, he moves to AA states and needs facilitation to recover.

2B/3B in sleep
band robust:
Score of 2

IV. ATTENTIONAL/INTERACTIVE SYSTEM. Behavioral indices of the attentional/interactive system are the quality of the infant's alert state, its robustness and its availability, the duration of the infant's responsivity to animate and inanimate stimuli, and the modulation and differentiation with which the infant utilizes his alertness to attend to and interact with various social stimuli and inanimate objects. Some infants cannot be brought to an alert state by manipulations, depending on the point of their internal state rhythmicity. They may come to an alert state spontaneously at a later time. Nevertheless, it is meaningful information to know that the infant could not be brought to alertness by manipulations at a given time, since this reflects the relative degree of flexibility and differentiation the infant has available to modify his ongoing state regulation by responding to external events. The timing of the examination in the infant's sleep/wake/feed cycle and the infant's initial state need to be recorded and taken into account. Very young infants tend to be more easily arousable closer to their next awakening or rousing (feeding) than at midpoint between 3-hour feeds. Timing of the examination should be controlled for as much as possible in respect to the infant's current endogenous, sleep/wake or rouse cycle. For packages I through V this score is optional.

SCORING

1. Attention and responsivity are robust, of long duration; the infant actively selects his target of attention and shifts smoothly from one target to another at his own initiative, beginning

free inspection of environment. His face reflects bright-eyed, focused interest, his mouth and eyebrows may be involved, there may be an occasional coo or smile and/or cyclical facial adjustments of heightened and relaxed attention in alternation.

2. The infant's attention is of considerable duration, predominantly bright, focused, robust, and well-modulated, and there may be an occasional episode of active environment inspection or target selection.
3. The infant's attention is of moderate duration and robustness, predominantly bright, focused, and well-modulated, directed and maintained by the stimulus.
4. The infant's attention is of moderate duration and consistency, at times bright, focused and well-modulated, at other times it is either low-keyed or slightly hyperreactive.
5. The infant's attention is consistently low-keyed, with some focused attention occasionally, moderately well-organized, and of relatively short duration.
6. The infant's attention is moderately variable, may have periods of hyperalertness or diffuseness which can get intermittently modulated to more focused attention. There are some brief episodes of modulated processing embedded in more diffuse attention.
7. The infant's attention is highly variable, shifting from hyperalert or diffusely alert, possibly intermittent panicked facial expression or overly wide eyes to unavailable with floating or rolling eyes and/or eye close in rapid shifts. The duration is short, and there appears to be little modulation or control on the infant's part. Or, when awake, the infant is continuously in hyper and/or low keyed alertness. *or AL AH only*
8. The infant's attention or alertness is only barely available for fleeting periods. Then the quality of his attention is either diffuse or, although focused, very transient.
9. Alertness and attention ~~cannot be achieved at all~~ is not observed.

V. REGULATORY SYSTEM. Behavioral indices of the regulatory system assessed by observation are reflected in the infant's use of varying physiological, postural, and/or state strategies to maintain himself and to return to a balanced baseline consisting either of solid sleep states or calm alert states, the degree to which the infant is able to maintain himself, and the level at which he maintains himself.

SCORING

1. The infant maintains himself easily either at a well-modulated state 4 level or in a calm sleep state, without losing regulatory balance.
 2. The infant maintains himself successfully most of the time and/or can return to balance fairly easily and consistently. Some of his regulation strategies are highly sophisticated and differentiated (sneezing, yawning, subtle attentional cycling, etc.).
 3. The infant makes consistent efforts at maintaining himself and at returning to balance. He is generally able to do so, although at times with some difficulty.
 4. The infant makes repeated, prolonged and differentiated efforts at maintaining himself, and at returning to balance. He repeatedly is able to maintain himself for moderate periods or to return to balance occasionally.
 5. The infant makes repeated efforts at maintaining himself and at returning to balance, some of his efforts are quite differentiated and some are successful.
 6. The infant makes several noticeable efforts at maintaining himself and at returning to balance; they may be gross and/or minimally and transiently effective.
 7. The infant makes efforts at maintaining himself in balance and at returning to balance, yet they are unsuccessful.
 8. The infant cannot regulate himself at all. He responds to maneuvers and then is completely at the mercy of the manipulations. He cannot regain even partial balance.
 9. No effort at behavioral self-regulation is noticeable; the infant is essentially not responding to manipulations, and self-regulation is not an issue.
- If autonomic and/or motor system is 7 or better, regulation is at best a 6
 - If autonomic and/or motor system is 8 or 9 then regulation is at best a 7

VI. EXAMINER FACILITATION. Behavioral indices of the examiner's facilitation are found in the degree and amount of facilitation necessary from the examiner to set the stage for a package or a maneuver within a package to bring out the infant's optimal performance and to help him return to a baseline for the next package or maneuver. This examiner facilitation is scored in a summary fashion for each package. It requires the examiner's sensitive awareness of the infant's own regulatory capacities so that he times and gauges his help appropriately. It furthermore requires substantial experience in handling infants in order to determine and implement appropriate facilitation.

SCORING

1. The infant is able consistently to maintain himself and the examiner can proceed with ease; the infant may actively seek out the examiner for differentiated interaction (play dialogue).
2. The infant needs occasionally very mild aids such as occasional brief time out or adjustment of the interaction presentation; i.e., the examiner will present a maneuver somewhat more delicately or slowly.
3. The infant needs some facilitation from the examiner in order to maintain or regain his balance. This facilitation may be mild, such as movement inhibition by occasional hand-holding or by postural shifting, allowing the infant to brace his feet against the crib or the examiner, or some time out; *this works reliably*, or the infant sucks on the examiner's finger or his own pacifier but can maintain this on his own, essentially.
4. The infant needs a moderate degree of facilitation from the examiner in order to maintain or regain his balance. This help may consist of motoric inhibition by wrapping the infant in a blanket or holding the infant's hands or feet for moderate periods or by repeated time out. *This works quite well.*
5. The infant needs a considerable degree of facilitation from the examiner in order to maintain or regain his balance. This facilitation may consist in repeated moderately long times out, or motoric inhibition by hand holding, postural facilitation, and wrapping. *This works well.*
6. The infant needs quite a substantial degree of facilitation from the examiner in order to maintain or regain his balance. He may need repeated periods of considerable motoric inhibition and repeated time out, or he may be maintained with examiner induced and facilitated sucking. If these are provided he maintains himself quite easily each time.
7. The infant needs *quite* a substantial degree of help from the examiner in order to maintain or regain his balance. He may need prolonged and repeated motoric inhibition and sucking or lengthy periods of time out, with or without sucking, which eventually free his self-balance and maintenance for brief periods.
8. The infant needs a very substantial degree of help from the examiner, ~~either consisting of vertical rocking which brings him to balance fairly readily or consisting of~~ complete motoric inhibition and sucking and long resting periods, which work only moderately well.
9. The infant needs continuous, very carefully instituted and very considerable amounts of regulatory aid from the examiner, ~~such as large vertical rocking for prolonged periods~~, to bring him at least momentarily to examinable state, prolonged complete motoric inhibition with sucking and prolonged resting periods, which work only barely, or the infant needs to be completely left alone, and the examination is inappropriate.

PART II. PACKAGES AND MANEUVERS

The maneuvers used in the Assessment of Preterm Infant Behavior (APIB) are grouped into the six larger packages outlined in the introduction. All maneuvers are scored separately in order to retain as much detailed behavioral information as possible. There are some differences in the administration of some of the maneuvers and the overall flow of the examination between this examination and the BNBAS (Brazelton, 1973). These are necessary because of the nature of the premature infant's organization and because of the continuous focus on the degree of organization and differentiation of each of the infant's subsystems of functioning when the various maneuvers are presented.

The “reflexes,” for instance, are not primarily used in the traditional neurological sense to assess neurological intactness but provide Systematic Elicitations of Specific Movements (SEM), manipulations to bring out the range of various movements, postural and tonus capacities of the infant, and document their developmental course, while simultaneously watching for the effect of such manipulations on the autonomic, the motor, the state, and the regulatory systems. The administration of each of the Systematic Elicitations of Movement (SEM) is consistent with and derived from descriptions of Prechtel and Beintema (1964) where appropriate. Within each package these maneuvers are administered in as smooth a fashion as possible in order to control for idiosyncratic additional postural changes and manipulations between SEMs which would influence unsystematically the infant’s performance and organization. The order in which SEMs are administered is recorded in the far right column of the score sheet. This will permit the reconstruction of the flow of the assessment in detail, which carries much implicit information about the infant’s level of organization. If items had to be deleted, this is indicated by *A*, meaning the infant was too aroused, too weak, or otherwise too stressed to administer the item meaningfully; *X* indicates the examiner forgot to administer an item. *C* means the item was deleted because the circumstances were inappropriate, e.g., the infant was already undressed, etc.; *N* indicates an item is not scorable because another score makes it logically inappropriate to assign simultaneously this score.

In scoring each maneuver within a package, an attempt has been made to either retain the scoring of the BNBAS where appropriate or to provide a place and method for parallel scoring so that where applicable the BNBAS score for an item can be preserved. This will allow the user to compare data collected with the new manual to previously collected bodies of data on healthy term infants with the BNBAS. The aim of the new manual is usefulness for the assessment of preterm and term infants.

The behavior scales for all maneuvers and items are scaled from 1 to 9, with 1 meaning “little or none of a behavior” and 9 meaning “a lot of a behavior,” rather than being scaled from good to bad or vice versa. This is in keeping with the BNBAS and protects against routinized generalization from one scale to another. Each scale has to be considered separately.

Administratively, a few items have been changed, which should not influence the overall flow of the examination considerably:

1. The use of the bell in the sleep/distal package is optional: If the infant stays well organized during the light and rattle items, the bell is used; if the infant is stressed during light or rattle, the bell is deleted.
2. Pinprick has been replaced by a touch with a dull-pointed plastic stick (orange stick).
3. An inanimate visual *and* auditory stimulus has been introduced, consisting of the red plastic rattle.

The flow of the examination is somewhat more systematized by the notion of the packages and by the examiner’s attention to the infant’s self-regulation and his own facilitation necessary to bring the infant repeatedly to a balanced state. The infant’s organization always leads the examiner, yet he has the observation of clear organizational issues in mind at all times and interacts with the infant in such a way as to make these observations maximally possible.

The second part of this manual is structured to give a brief description of the goal of each package, the administration of each maneuver or SEM within each package, the scoring procedures for each, and the method to assess parallel scores where applicable. The following codes are used where numerical scores are not appropriate for the reasons specified:

A = n/a	not administrable; infant too stressed
C = n.a.c.	not appropriate circumstances, e.g., hands already free
R = n.r.	no response
N = n/N	not needed because item does not logically apply
X =	inadvertently omitted

Package I: Sleep/Distal

(Maneuvers: Repeated stimulation; light, rattle, bell)

One of the adaptive mechanisms developing in the newborn organism is his capacity to maintain a sleep state and decrease responses to repeated distal stimuli. In package I, an attempt is made to measure the infant's ability to deal with at least two repeated distal stimuli: a flashlight beam across his closed eyes repeatedly, and a soft rattle, rattled near one of his ears repeatedly. The bell may be deleted for the assessment of the premature infant since it may prolong this package inordinately and frequently becomes too taxing. Should an infant show good response decrement to light and rattle, the bell may be introduced. Some infants will not stay in a sleep state in the course of the first distal maneuver, the light. This is taken as a sign of the quality of their sleep organization and is assessed as such. Should this occur, the second response decrement item will not be administered. If there is no initial response, a second and, if necessary, a third stimulus is presented in 5-second intervals. If there is still no response, this will be indicated in the *Difficulty in Elicitation of Initial Response Scale*. The examiner should go on to the second response decrement item.

If the infant stays asleep, up to 10 stimuli are used to assess his ability to maintain a sleep state. An 11th stimulus is presented if the infant shows shut-down on trial 10. The passing of two consecutive trials without response is taken as the criterion for assessing "shut down."

Stimuli should be presented approximately 5 seconds after the end of the previous response. This implies the observer's ability to judge the end of each reaction. The test should be carried out using a standard 8-inch flashlight in good working condition. A semi-lighted quiet environment is desirable for this assessment. The sound stimulus used is a small red Plexiglas container one-third filled with corn kernels. It is shaken in three consecutive shakes of approximately half a meter above or to the side of one of the infant's exposed ears.

LIGHT

Degree of Decrement. If an infant achieves a score of 9 on the APIB scale, then he should be scored on the BNBAS scale, and a score between 6 and 9 can be identified. BNBAS scale equivalents to the other scores are given in parentheses. If there is no response in 3 trials, give ~~R N (no response)~~.

BNBAS

EQUIVALENT	SCORING
(1)	(1) Increase of response over course of presentation and sleep state disrupted or item discontinued due to stress.
(1)	(2) Increase of response over course of presentation, yet sleep state generally maintained.
(2)	(3) Startles still present at end of 10 trials
(3)	(4) Large body movement still present at end of 10 trials
(3)	(5) Medium body movement and/or head movement still present at end of 10 trials
(3)	(6) Facial grimaces and/or small sounds and/or minute body movements (finger, foot) still present at end of 10 trials
(4)	(7) Blinks still present at end of 10 trials
(4)	(8) Moderate respiration response still present at end of 10 trials
(6 5-9)	(9) Shut-down achieved within 10 trials

Degree of Decrement (BNBAS)

1. No diminution of high responses over the 10 stimuli
2. Delayed startles and rest of responses are still present, i.e., body movement, eye blinks, respiratory changes continue over 10 trials
3. Startles no longer present but rest are still present, including body movement, in 10 trials

4. No startles, body movement delayed, respiration and blinks same in 10 trials
 5. Shutdown of body movements, some diminution in blinks and respiratory changes in 9-10 stimuli
 6. —in 7—8 stimuli
 7. —in 5—6 stimuli
 8. —in 3—4 stimuli
 9. —in 1—2 stimuli
- NA No response, hence no decrement.

Ease of Elicitation of Initial Response

Some premature infants are difficult to reach with environmental stimuli. This is not always a function of the level of sleep but may have to do with their generally less mature state control. Therefore, it becomes important to record the effort necessary in eliciting a response from which decrement can be observed.

SCORING

1. Initial response cannot be observed despite three stimulus presentations
2. Two or three stimuli needed before ~~full~~ initial response consisting of blinks and/or noticeable respiratory changes
3. Two or three stimuli needed before ~~full~~ initial response consisting of facial movement or sound
4. Two or three stimuli needed before ~~full~~ initial response consisting of startle or body movement
5. No difficulty, ~~full~~ initial response consisting of respiratory changes
6. No difficulty, ~~full~~ initial response consisting of eye blink
7. No difficulty, ~~full~~ initial response consisting of facial movement and sound
8. No difficulty, ~~full~~ initial response consisting of mild body movement or head move
9. No difficulty, ~~good full~~ initial response consisting of startle or body movement

Timing of Response

Some premature infants respond with excessive hyper-reactivity to any stimulation. Gradually inhibitory mechanisms mature. Before there is a modulated balance between inhibition and excitation, a period of varying degrees of delay to stimuli is observed. The degree of modulation in timing may reflect the capacity of the central nervous system to modulate its responsiveness. Little or no delay is expected in the healthy term infant, without excessively quick responsiveness.

SCORING

1. All responses instantaneous with *onset* of stimulus
2. Some responses instantaneous with onset of stimulus, some showing beginning inhibition
3. Considerable delay of most or all responses
4. Considerable delay of some responses
5. Moderate delay of most or all responses
6. Moderate delay of some responses
7. Minimal delay of most or all responses
8. Minimal delay of some responses
9. Responses in modulated interval from onset of stimulus

Recycling of Response

The quality of responses is variable in the premature newborn. A commonly observed feature is the lack of inhibition of an ongoing response leading to recycling of the initial response. The degree and amount of recycling can be used as a measure of developing inhibition.

SCORING

- | | |
|---|---------------------------------|
| 1. No recycling noted on any trials presented | <i>Mild: 1-2 cycles</i> |
| 2. Response shows mild recycling on one or a few trials only | <i>Moderate: 3-4 cycles</i> |
| 3. Response shows moderate recycling on one or a few two trials | <i>Prolonged: 5-6 cycles</i> |
| 4. Response shows moderate recycling on several trials | <i>Considerable: 7 + cycles</i> |
| 5. Response shows prolonged recycling on one or a few two trials | |
| 6. Response shows prolonged recycling on several trials | |
| 7. Response shows prolonged recycling on most or all trials | |
| 8. Response shows a considerable degree of recycling on most or all trials | |
| 9. Response shows a considerable degree of recycling with increasing magnitude, which makes the continuation of the item impossible | |

Degree of Disorganization of Response

Some premature and at risk infants are unable to shut down to redundant stimuli and with each successive stimulus react with increasing behavioral disorganization. Other infants attempt to shut down but are unable to maintain shutdown criteria. Fluctuation of high and low level responses characterize these infants. For example, we may see delayed responses, recycling, diffuse body movements, facial expressions, color changes, hiccoughing, and other such signs of disorganization. Still other infants have variable responses but eventually achieve criteria for shutdown in 10 trials. And, finally, some infants are able to achieve decrement without variable responses. If the infant moves to a calm alert state, mark the item N.

SCORING

1. Gradual diminution of high level to low level responses or low level response maintenance without fluctuation; shutdown achieved
2. Gradual diminution of high level to low level response, or low level response maintenance without fluctuation, and without shutdown; or high level responses without sleep state disruption
3. Periods of sustained low level responses with occasional return of a high level response, followed by shutdown
4. Periods of sustained low level responses with occasional return of a high level response, without achievement of shutdown
5. Variable high and low level responses followed by shutdown
6. Signs of disorganization may be present repeatedly between trials, yet shutdown is achieved
7. Repeated fluctuation between high and low level responses with some disorganization and without meeting shutdown
8. Signs of disorganization may be present repeatedly between trials and shutdown is not achieved
9. Attains increasing disorganization with succeeding stimulus presentations. Unable to proceed with decrement item(s)

Degree of Discharge after Termination of Stimulus Sequence

Some premature infants may be able to shut down body movement, facial movement, and even respiratory reactivity to repeated stimuli presented in sleep, but once the stimulation is terminated

they show a physiological imbalance, motoric discharge, and state disorganization, indicating the degree of imbalance between inhibition and excitation.

SCORING

1. There is no discharge noted after termination of stimulus sequence.
2. There is a mild respiratory response, possibly the sigh response, after termination of stimulus sequence.
3. There is some facial movement after termination of the stimulus sequence.
4. There is mild motor discharge after termination of stimulus sequence.
5. There is moderate motor discharge after termination of stimulation sequence.
6. There is prolonged motor discharge after termination of stimulus sequence.
7. There is noticeable tachypnea or a brief episode of ~~apnea~~, respiratory pausing, nasal flaring, gasping, etc., after termination of stimulus sequence. 2-3 sec
8. There is prolonged tachypnea or a moderate episode of ~~apnea~~, respiratory pausing, after termination of stimulus sequence. 4-5 sec
9. There is prolonged discharge of motoric or physiological nature leading to ~~state change after~~ termination of stimulus sequence.

RATTLE

Degree of Decrement. Scoring 1 through 9.

Degree of Decrement (BNBAS). Scoring 1 through 9.

Ease of Elicitation of Initial Response. Scoring 1 through 9.

Timing of Response. Scoring 1 through 9.

Recycling of Response. Scoring 1 through 9.

Degree of Disorganization of Response. Scoring 1 through 9.

Degree of Discharge after Termination of Stimulus Sequence. Scoring 1 through 9.

BELL (OPTIONAL)

Degree of Decrement. Scoring 1 through 9.

Degree of Decrement (BNBAS). Scoring 1 through 9.

Ease of Elicitation of Initial Response. Scoring 1 through 9.

Timing of Response. Scoring 1 through 9.

Recycling of Response. Scoring 1 through 9.

Degree of Disorganization of Response. Scoring 1 through 9.

Degree of Discharge after Termination of Stimulus Sequence. Scoring 1 through 9.

Package II: Sleep: Uncover and Prone to Supine

(Maneuvers: Uncovering and placing into supine)

The infant's ability to deal with and adjust to being uncovered and then placed into supine position is assessed. There will be differences in the way the infant is found at the beginning of the examination. Some infants will be wrapped tightly in several blankets and placed in prone, possibly with blanket rolls against their backs, sides, or legs; others may be covered only lightly or not at all; some may already be in supine. The assessment of the degree of autonomous regulation demanded and available to the infant throughout by these two procedures is the goal of these two scales. In certain circumstances this cannot be assessed. It should then be scored C. On the basis of the infant's behavior during the response decrement items during the initial observation period, a judgment is arrived at as to how carefully the infant needs to be uncovered and placed into supine. Once these maneuvers are initiated, the infant is observed closely, and the degree of care in handling can be adjusted.

CAPACITY TO DEAL WITH UNCOVERING

SCORING

1. The infant is uncovered or unwrapped very gradually and very gently. The infant goes into hyperextension or flexion, respiratory pauses, flaccidity, and/or changes out of sleep state. The disorganization is severe and does not abate.
2. The infant is uncovered with great care; there is moderate disorganization physiologically and motorically. The infant attempts to regain control by postural adjustment but fails to do so.
3. The infant is uncovered with great care; there is moderate to mild disorganization physiologically and motorically. The infant successfully regains adjustment eventually.
4. The infant is uncovered with great care; there is no, minimal, or very brief disorganization physiologically and motorically, and the infant regains adjustment gradually.
5. The infant can be uncovered with moderate care, and there is moderate disorganization, which abates.
6. The infant can be uncovered with moderate care, and there is minimal, brief, or no disorganization.
7. The infant can be uncovered without special adjustments and care, and there is moderate disorganization which abates.
8. The infant can be uncovered without special adjustments and care, and there is minimal disorganization.
9. The infant is already uncovered and shows no disorganization, or the infant can be uncovered without special adjustments and care and shows no disorganization.

CAPACITY TO DEAL WITH BEING PLACED IN SUPINE

SCORING

1. The infant is placed in supine very gradually, carefully and gently; the infant goes into hyperextension and/or hyperflexion and/or changes out of sleep state. The disorganization is severe and does not abate.
2. The infant is placed in supine very carefully and gently; there is moderate disorganization physiologically and motorically. The infant attempts to regain control but fails to do so.
3. The infant is placed in supine very carefully and gently; there is moderate to mild disorganization physiologically and motorically. The infant successfully regains adjustment eventually.
4. The infant is placed in supine very carefully and gently; there is minimal and brief disorganization motorically and physiologically, and the infant regains adjustment gradually.
5. The infant can be placed in supine with moderate care; there is only moderate disorganization which abates.
6. The infant can be placed in supine with moderate care, and there is only minimal brief disorganization.
7. The infant can be placed in supine without special adjustments and care, and there is only moderate disorganization which abates.
8. The infant can be placed in supine without special adjustments and care, and there is only minimal disorganization.
9. The infant is already in supine and shows no disorganization; or the infant can be placed in supine without special adjustments and care and shows no disorganization.

Package III: Low-Grade Localized Tactile Input to Extremities and Face/Supine

(Maneuvers: Freeing of the feet and hands; foot:SEM; hand:SEM; passive movements of arms and legs; heeltouch; glabella; root and suck)

The maneuvers in this package all provide opportunities to observe the infant's capacity to deal with delimited tactile inputs to the extremities or to the face. Passive movement of arms and legs is the most massive maneuver included. Each specific elicited movement (SEM) is scored for its execution for left and right side separately where appropriate on a range from 0 (not elicitable) to 3, very strong hyperreactive or obligatory response, unless otherwise indicated.

FREEING OF FEET AND HANDS

The infant's ability to deal with having his feet and hands uncovered is an opportunity to observe the infant's organizational stability. Some infants find this manipulation very taxing and disturbing, while others are only minimally bothered by it or not bothered at all. Of course, not all infants will have their hands and feet covered. In such a case this item should be scored C.

SCORING

1. The infant's feet and/or hands are uncovered very gradually, carefully and gently; the infant goes into hyperextension and/or hyperflexion and/or changes to a disorganized state. The disorganization is severe and does not abate.
2. The infant's feet and/or hands are uncovered very carefully and gently; there is moderate disorganization physiologically and motorically. The infant attempts to regain control but fails to do so.
3. The infant's feet and/or hands are uncovered very carefully and gently; there is moderate to mild disorganization physiologically and motorically. The infant successfully regains adjustment eventually.
4. The infant's feet and/or hands are uncovered very carefully and gently; there is minimal and brief disorganization motorically and physiologically, and the infant regains adjustment gradually.
5. The infant's feet and/or hands are uncovered with moderate care; there is only moderate disorganization, which abates.
6. The infant's feet and/or hands are uncovered with moderate care, and there is only minimal brief disorganization.
7. The infant's feet and/or hands are uncovered without special adjustments and care, and there is only moderate disorganization which abates.
8. The infant's feet and/or hands are uncovered without special adjustments and care, and there is only minimal disorganization.
9. The infant's feet and/or hands are uncovered without special adjustments and care, and there is no disorganization.

HEEL TOUCH

—As a test of response decrement to repeated localized tactile stimulation, a plastic stick with a dull point (such as the orange stick included with the scrub brush in the nursery) may be used to touch the heel of the infant's foot when he is asleep. If the infant, after foot freeing, is no longer asleep, this item is not administered and is scored C. If the infant is asleep, this touch may be repeated several times. This is preferred over the pin of the BNBAS since the premature infant is often tactually sensitive and gets too taxed with the pain. The examiner watches for how totally and how rapidly the whole body responds to this touch. The degree, rapidity, and repetition of the "spread" of stimulus to the rest of the body is measured. The other aspect is the infant's capacity to shut down this spread of generalized response.

—The foot should be touched up to six times. If no response decrement occurs, the stimulation should be stopped after the fourth touch. The APIB and BNBAS scoring of the degree of decrement is the same.

Degree of Decrement

SCORING

- 1. Response generalized to whole body and increases over trials.
- 2. Both feet withdraw together; no decrement of response.
- 3. Variable response to stimulus. Response decrement but return of response.
- 4. Response decrement after five trials; localized to stimulated leg. No change to alert state.
- 5. Response decrement after five trials; localized to stimulated foot.
- 6. Response limited to stimulated foot after 3-4 trials. No change to alert state.
- 7. Response limited to stimulated foot after 1-2 trials. No change to alert state.
- 8. Response localized and minimal.
- 9. Complete response decrement.

Ease of Elicitation of Initial Response

SCORING

- 1. Initial response cannot be observed despite three stimulus presentations.
- 2. Two or three stimuli needed before full initial response consisting of blinks and/or noticeable respiratory changes.
- 3. Two or three stimuli needed before full initial response consisting of facial movement or sound.
- 4. Two or three stimuli needed before full initial response consisting of startle or body movement.
- 5. No difficulty, full initial response consisting of respiratory changes.
- 6. No difficulty, full initial response consisting of eye blink.
- 7. No difficulty, full initial response consisting of facial movement and sound.
- 8. No difficulty, full initial response consisting of mild body movement or head move.
- 9. No difficulty, full initial response consisting of startle or body movement.

Timing of Response

SCORING

- 1. All responses instantaneous with onset of stimulus.
- 2. Some responses instantaneous with onset of stimulus, some showing beginning of inhibition.
- 3. Considerable delay of most or all responses.
- 4. Considerable delay of some responses.
- 5. Moderate delay of most or all responses.
- 6. Moderate delay of some responses.
- 7. Minimal delay of most or all responses.
- 8. Minimal delay of some responses.
- 9. Responses in modulated interval from onset of stimulus.

Recycling of Response

SCORING

- 1. No recycling noted on any trials presented.
- 2. Response shows mild recycling, on a number of trials only.
- 3. Response shows moderate recycling on a few trials.
- 4. Response shows moderate recycling on several trials.
- 5. Response shows prolonged recycling on a few trials.

6. Response shows prolonged recycling on several trials.
7. Response shows some degree of recycling on most or all trials.
8. Response shows a considerable degree of recycling on most or all trials.
9. Response shows a considerable degree of recycling with increasing magnitude, which makes the continuation of the item impossible.

Degree of Organization of Response

SCORING

- 1. Gradual diminution of high level to low level responses or low level response maintenance without fluctuation. Shutdown achieved.
- 2. Gradual diminution of high level to low level response, or low or high level response maintenance without fluctuation, and without shutdown.
- 3. Periods of sustained low level responses with occasional return of a high level response, followed by shutdown.
- 4. Periods of sustained low level responses with occasional return of a high level response, without achievement of shutdown.
- 5. Variable high and low level responses followed by shutdown.
- 6. Signs of disorganization may be present repeatedly between trials, yet shutdown is achieved.
- 7. Repeated fluctuation between high and low level responses without achieving shutdown.
- 8. Signs of disorganization may be present repeatedly between trials and shutdown is not achieved.
- 9. Attains increasing disorganization with succeeding stimulus presentations. Unable to proceed with decrement item(s).

Degree of Discharge after Termination of Stimulus Sequence

SCORING

1. There is no discharge noted after termination of stimulus sequence.
2. There is a mild respiratory response, possibly the sigh response, after termination of stimulus sequence.
3. There is some facial movement after termination of stimulus sequence.
4. There is mild motor discharge after termination of stimulus sequence.
5. There is moderate motor discharge after termination of stimulus sequence.
6. There is prolonged motor discharge after termination of stimulus sequence.
7. There is noticeable tachypnea or a brief episode of apnea, nasal flaring, grasping, etc., after termination of stimulus sequence.
8. There is prolonged tachypnea or a moderate episode of apnea after termination of stimulus sequence.
9. There is prolonged discharge of motoric or physiological nature leading to state discharge after termination of stimulus sequence.

SYSTEMATICALLY ELICITED MOVEMENTS

Feet

Plantar Grasp (SEM scores equivalent BNBAS)

SCORING

- (0) Not elicitable
- (1) Weak, unsustained

- (2) Good, sustained response
- (3) Very strong obligatory response
- (A) Infant too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Foot Sole Stroke (SEM scores equivalent BNBAS Babinski Response)

SCORING

- (0) Not elicitable
- (1) Minimal spread of toes
- (2) Marked spread of toes
- (3) Obligatory spread of toes
- (A) Infant too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Clonus (SEM scores equivalent to BNBAS)

SCORING

- (0) No clonus
- (1) One beat only
- (2) Two or more beats, up to 4 or 5 if gradual decrease in intensity
- (3) More than 5 beats
- (A) Too tight in ankle or too aroused or stressed to administer or score meaningfully
- (X) Inadvertently omitted

Hands

Palmar Grasp (SEM scores equivalent to BNBAS)

SCORING

- (0) No grasping movement at all
- (1) Short, weak flexion
- (2) Strong, sustained, modulated grasp
- (3) Obligatory grasp with tips of infant's fingers or knuckles going white, difficult to terminate
- (A) Too aroused or too stressed to administer or score meaningfully.
- (X) Inadvertently omitted

Palmar Mental Grasp (SEM scores only)

SCORING

- (0) No grasping or mouth opening at all
- (1) Brief grasping and minimal mouth opening
- (2) Strong modulated grasping and mild yet recognizable mouth opening, possible mild head straining
- (3) Obligatory excessive grasping with pronounced mouth opening and/or head lifting
- (A) Too aroused or too stressed to administer or score meaningfully
- (X) Inadvertently omitted

Passive Movements: Arms***Resistance to Extension***

SCORING

- (0) No resistance to extension
- (1) Little resistance to extension
- (2) Moderate and modulated resistance to extension
- (3) Excessive resistance to extension; extension may not be possible
- (A) Too aroused or too stressed to administer or score meaningfully
- (X) Inadvertently omitted

Degree of recoil

SCORING

- (0) No flexion at all, possibly hyperextension
- (1) Minimal flexion
- (2) Moderate and modulated flexion
- (3) Excessive hyperflexion, overly brisk
- (A) Too aroused or too stressed to administer or score meaningfully
- (X) Inadvertently omitted

BNBAS Scores

If resistance and recoil scores are equivalent, they can be used as BNBAS scores.

Arms (BNBAS)

- (0) No resistance to extension and no recoil
- (1) Little resistance to extension and weak recoil
- (2) Moderate and modulated resistance to extension and good or moderate recoil
- (3) Hypertonic resistance to extension and obligatory recoil

Passive Movements: Legs***Resistance to extension***

SCORING

- (0) No resistance to extension
- (1) Little resistance to extension
- (2) Moderate and modulated resistance to extension
- (3) Excessive resistance to extension; extension may not be completely possible
- (A) Too aroused or too stressed to administer or score meaningfully
- (X) Inadvertently omitted

Degree of recoil

SCORING

- (0) No flexion at all, possibly hyperextension
- (1) Minimal or very delayed flexion
- (2) Moderate and modulated flexion
- (3) Excessive hyperflexion

- (A) Too aroused or too stressed to administer or score meaningfully
- (X) Inadvertently omitted

BNBAS Scores

If resistance and recoil scores are equivalent, they can be used as BNBAS scores.

Legs (BNBAS)

- (0) No resistance to extension or recoil
- (1) Little resistance to extension and weak recoil
- (2) Moderate and modulated resistance to extension and good or moderate recoil
- (3) Hypertonic resistance to extension and obligatory recoil

Arm/Leg/Head/Trunk Differentiation during Passive Movements

SCORING

- (0) No differentiation of arms, legs, head, and trunk, e.g., if arms are extended, legs and head come up; if legs are extended, arms come up, or trunk and head lift.
- (1) Some differentiation of arms, legs, head, and trunk: Only occasionally is there overflow to other parts when arms or legs are manipulated.
- (2) Good differentiation of arms, legs, head, and trunk; the movement of one part of the body does not elicit obligatory reactions in the other parts of the body.
- (3) Excessive differentiation of arms, legs, head, and trunk; it appears that the movement of one part of the body occurs in complete isolation from all other parts of the body; there seems much disconnection of body parts.
- (A) Too aroused or too stressed to administer or score meaningfully.
- (X) Inadvertently omitted.

Glabella (SEM scores equivalent BNBAS)

SCORING

- (0) No reaction
- (1) Weak response, barely discernible
- (2) Modulated response
- (3) Overly brisk closure, and total facial grimace and/or startle
- (A) Too aroused or too stressed to administer or score meaningfully
- (X) Inadvertently omitted

Rooting (SEM scores equivalent BNBAS)

SCORING

- (0) No lip or tongue movement
- (1) Only a weak turn or lip movement and/or slight tongue protrusion
- (2) Turn to stimulated side; mouth may open and grasp; tongue may move to stimulated side; lips may curl to stimulated side
- (3) Obligatory unmodulated turn and grasping movement
- (A) Too aroused or too stressed to administer and score meaningfully
- (X) Inadvertently omitted

Sucking (SEM scores equivalent BNBAS)

SCORING

- (0) No sucking movement at all; possibly expulsion or clamping
- (1) Weak or barely discernible sucking and stripping action of tongue, and/or intermittent single sucks
- (2) Modulated rhythmical suck
- (3) Exaggerated obligatory suck
- (A) Too aroused or too stressed to administer or score meaningfully
- (X) Inadvertently omitted

Dysregulation or difficulty in the organization of the components of the sucking response

Package IV: Medium Tactile Input Combined with Medium Vestibular Input

(Maneuvers: Undressing; Pull-to-Sit; Standing; Walking; Placing; Incurvation; Crawl; Cuddling; Tonic Neck Response; Defensive Reaction)

The various maneuvers in this package demand repeated whole body postural adjustments of the infant aside from the distinct responses expected to the specifically elicited movements. Again, the examiner aims for maximum smoothness in administering these maneuvers so as to keep low unnecessary extraneous manipulation beyond the maneuvers. The order of the maneuvers may vary somewhat depending on the infant's capacities, yet the examiner should keep in mind that certain postures and positions are natural transitions to the next maneuver, e.g., he should not take the infant from standing to placing and then back to walking; but from standing, through walking, to placing, or from placing to incurvation, to crawl, etc. Placing is most easily administered by leaning the infant's back against the examiner's chest, tucking one of the infant's legs up under the respective buttock, and then testing the free leg; then with minimal shifting of the infant's body the other leg is tucked and the released leg is tested. This procedure reduces gross body manipulation of the infant, which is not wanted at this point.

CAPACITY TO DEAL WITH UNDRRESSING

The infant's ability to deal with the tactile and vestibular manipulations necessary to remove his shirt, gown, or other clothing (the diaper need not be removed), combined with the change in temperature, can be a good index of his general organization. The examiner will need to take the ambient temperature into account. A cool environment can be very taxing for the preterm infant and should be avoided. Some infants will only be wearing a diaper; then this item has to be scored C. The infant who has great difficulty dealing with undressing may have to be dressed or wrapped again, at least partially, in order to prevent undue stress and exhaustion. This would be recorded under (E) examiner facilitation.

SCORING

- (1) The infant is undressed very gradually and very gently. He goes into hyperextension and/or hyperflexion. The physiological, motor, and state disorganization is severe and does not abate.
- (2) The infant is undressed with great care; there is moderate disorganization physiologically and motorically. The infant attempts to regain control but fails to do so.
- (3) The infant is undressed with great care; there is moderate to mild disorganization physiologically and motorically. The infant successfully regains adjustment eventually.

- (4) The infant is undressed with great care; there is minimal and brief disorganization physiologically and motorically, and the infant regains adjustment gradually.
- (5) The infant can be undressed with moderate care and there is moderate disorganization, which abates.
- (6) The infant can be undressed with moderate care, and there is minimal brief disorganization.
- (7) The infant can be undressed without special adjustments, and there is moderate disorganization, which abates.
- (8) The infant can be undressed without special adjustments, and there is minimal disorganization.
- (9) The infant can be undressed without special adjustments, and he shows no disorganization.

PULL TO SIT

The examiner places a forefinger in each of the infant's palms. With the arms extended, the infant's automatic grasp is used to pull him to sit. The shoulder girdle muscles respond with tone, and muscular resistance to stretching his neck and lower musculature as he is pulled into a sitting position. Usually he will also attempt to right his head into a position which is in the midline of his trunk and parallel to his body. Since his head is heavy and out of proportion to the rest of his body mass, this is not usually possible, and his head falls backward as he comes up. In a seated position, he may attempt to right his head, and it may fall forward. Several attempts to right it can be felt via the shoulder muscles as the examiner maintains his grasp on the infant's arms. A few infants make no attempt at all. The range of this performance is scored on the original BNBAS scale.

Some infants resist flexion and head-righting by arching backward. Their bodies may become rigid and hyperextended. This is presumably due to an imbalance of extensor and flexor tone. The degree to which this occurs is scored on the scale of Hyperextension of Head and Trunk. Other infants will come with hand grasp to an extreme flexed position in an exaggerated palmar-mental grasp response. Occasionally the infant will come to stand in this maneuver, since his legs hyperextend as his head and trunk go to hyperflexion. The degree to which this occurs is scored on the scale of Hyperflexion of Head and Trunk.

SCORING (BNBAS)

- (1) Head flops completely in pull to sit, no attempts to right it in sitting
- (2) Futile attempts to right head but some shoulder tone increase is felt
- (3) Slight increase in shoulder tone, seating brings head up once but not maintained; no further efforts
- (4) Shoulder and arm tone increase, seating brings head up, not maintained but there are further efforts to right it
- (5) Head and shoulder tone increase as pulled to sit, brings head up once to midline by self as well, maintains it for 1 – 2 seconds
- (6) Head brought up twice after seated, shoulder tone increase as comes to sit, and maintained for more than 2 seconds
- (7) Shoulder tone increase but head not maintained until seated, then can keep it in position 10 seconds
- (8) Excellent shoulder tone, head up while brought up but cannot maintain without falling, repeatedly rights it
- (9) Head up during lift and maintained for one minute after seated, shoulder girdle and whole body tone increases as pulled to sit

Hyperextension of Head and Trunk

SCORING

- (1) The infant shows no hyperextension of head and/or trunk and can be scored on the full-term scale.
- (2) There is initially noticeable head and/or trunk extension which can be gradually overcome.
- (3) There is moderate head and/or trunk extension which can be gradually overcome.
- (4) There is considerable head and/or trunk extension which can, however, be gradually overcome.
- (5) There is some mild head and trunk extension which cannot be overcome despite several efforts.
- (6) There is moderate head and/or trunk extension which cannot be overcome.
- (7) There is considerable head and/or trunk extension which cannot be overcome.
- (8) There is consistent head *and* trunk extension which cannot be overcome.
- (9) There is severe head and trunk extension which cannot be overcome.

Hyperflexion of Head and Trunk

SCORING

- (1) The infant shows no hyperflexion of head and/or trunk and can be scored on the full-term scale.
- (2) There is initially noticeable head and/or trunk flexion which can gradually be overcome.
- (3) There is moderate head and/or trunk flexion which can be gradually overcome.
- (4) There is considerable head and/or trunk flexion which can, however, be gradually overcome.
- (5) There is some mild head and/or trunk flexion which cannot be overcome despite several efforts.
- (6) There is moderate head and/or trunk flexion which cannot be overcome.
- (7) There is considerable head and/or trunk flexion which cannot be overcome.
- (8) There is consistent head *and* trunk flexion which cannot be overcome.
- (9) There is severe head *and* trunk flexion which cannot be overcome.

SYSTEMATICALLY ELICITED MANEUVERS**Standing**

Many premature infants cannot come to a stand in which both legs are next to one another but stand with a wide base. This is referred to as umbrella stand, since the shape of their legs during this maneuver resembles an open, curved umbrella roof. Varying degrees of support are assessable for umbrella stand and for the more modulated regular stand.

Umbrella Stand

SCORING

- (0) No support
- (1) Minimal response felt; brief transitory support
- (2) Supports weight
- (3) Obligatory hyperextension of legs and/or feet
- (A) Infant is too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Standing (BNBAS)

SCORING

- (0) No support
- (1) Minimal response felt; brief transitory support
- (2) Supports weight
- (3) Obligatory hyperextension of legs and/or feet
- (A) Infant is too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Walking

The umbrella position of the legs is also observed in walking. It should be assessed as to its differential degree of modulation. If an infant shows a mixture of umbrella walking and more narrow based walking, a judgment as to the more typical performance should be made.

Umbrella Walk

SCORING

- (0) No hip or knee flexion at all
- (1) Some indication of stepping action with slight hip or knee flexion
- (2) Modulated, discernible steps with knee and hip flexion
- (3) Obligatory hyperreactive response with hip and knee flexion and ankle extension
- (A) Infant is too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Walking (BNBAS)

SCORING

- (0) No hip or knee flexion at all
- (1) Some indication of stepping action with slight hip or knee flexion
- (2) Modulated discernible steps with knee and hip flexion
- (3) Obligatory hyperreactive response with hip and knee flexion and ankle extension
- (A) Infant is too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Placing

The equivalent in midair of the umbrella position in standing is often observed when the infant is held up to elicit placing. This response should be scored separately to document the poor leg posture which may be independent of the placing response as such.

Umbrella Placing

SCORING

- (0) No flexion or extension of leg or foot and no fanning of toes
- (1) Minimal flexion and extension of knee and hip and/or minimal ankle flexion and flaring of toes
- (2) Modulated flexion of knee and hip and ankle flexion and foot extension with toe fanning
- (3) Obligatory flexion of knee and hip and/or obligatory ankle flexion and extension of the foot

- (A) Infant is too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Placing (BNBAS)

SCORING

- (0) No flexion or extension of leg or foot and no fanning of toes
- (1) Minimal flexion and/or extension of leg and/or foot and minimal fanning of toes
- (2) Modulated flexion and/or extension of leg and/or foot with toe fanning
- (3) Obligatory flexion and extension of leg and foot
- (A) Infant is too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Incurvation (SEM scores equivalent BNBAS)

This is assessed as the infant is held across the examiner’s hand in prone position.

SCORING

- (0) No response
- (1) Minimal incurvation on movement with minimal hip swing
- (2) Good incurvation, modulated with moderate hip swing
- (3) Exaggerated response with excessive hip swing and/or leg extension
- (A) Infant is too aroused or too stressed to administer or score meaningfully
- (X) Inadvertently omitted

Crawling (SEM)

The crawling maneuver assesses various components of the infant’s posture and movement when he is placed prone on a smooth surface: the freeing of the face, flexion of legs and trunk, and the ability to relax and stop moving after some adjustment. BNBAS equivalents will be given in the margin. [HA: Add arm component in revision]

BNBAS

EQUIVALENT	SCORING	
(0)	(0)	No freeing of the face and no attempt at movement; legs flaccidly extended
(0)	(1)	No freeing of the face and no attempt at movement; legs flexed or in fetal tuck position, buttocks up
(0)	(2)	No freeing of the face but some attempt at movement; legs partially in fetal tuck with effort to get toes pushing off
(1)	(3)	Freeing of the face, but legs extended and no movement
(1)	(4)	Freeing of the face, legs flexed and no movement
(1)	(5)	Freeing of the face, legs flexed and some movement
(2)	(6)	Freeing of the face, legs flexed and coordinated, modulated movement which can be inhibited by the infant.
(3)	(7)	Freeing of the face, legs flexed and coordinated, modulated movement which cannot be inhibited by the infant.
(3)	(8)	Freeing of the face and/or lifting of the head; legs flexed and extended in alternation, some arching and movement, which can or cannot be inhibited by the infant.

- (3) (9) Freeing of the face and/or lifting of the head; legs extended, trunk arched at times, frantic movement which cannot be inhibited by the infant.
- (A) Infant too aroused or too stressed to administer or score the item meaningfully
- (X) Inadvertently omitted

Cuddling

Cuddling is a two-part maneuver which mirrors the maneuvers crawling and supine but uses the examiner's body as surfaces. This can make a remarkable difference to the infant. First, the examiner places the infant ventroventrally against his own body and observes how the infant adjusts. If the infant cannot settle in, the examiner makes adjustments to facilitate the infant's cuddle response. Then the examiner moves the infant into the horizontal position and nestles him supine in his arm. Again, he first waits to observe how the infant adjusts. If the infant cannot settle in the examiner's arm, he makes adjustments to facilitate the infant's cuddle response. Some infants will assume in either the vertical or horizontal position or both a fetal tuck position (hyperflexion) and do not stretch out enough to be able to cuddle. Others will be completely flaccid or will hyperextend, an index of poor balance of flexor and extensor tone. The degree to which this occurs is assessed. Cuddling as such may not be applicable under these circumstances and may have to be scored N. If vertical and horizontal cuddling are discrepant by not more than one point, the infant can be scored on the original BNBAS scale.

Vertical Position

SCORING

- (1) Actually resists being held, continuously pushing away, thrashing, or stiffening
- (2) Resists being held most but not all of the time; or is quite floppy
- (3) Resists being held some of the time; or is somewhat floppy
- ~~(4) Eventually molds into arms the examiner's body, but after a lot of nestling and cuddling by the examiner~~
- (5) Gradually ~~Usually~~ molds and relaxes when first held, i.e., nestles head in crook of the examiner's neck. ~~and of elbow Turns toward body; when held horizontally; and on shoulder seems to lean forward~~
- ~~(6) Readily Always molds initially with above activity~~
- (7) Always molds initially with nestling, and turning toward body, and leaning forward
- (8) In addition to molding and relaxing, he nestles and turns head, leans forward on shoulder, fits feet into cavity of ~~other~~ arm; all of body participates
- (9) All of the above, and infant grasps hold of the examiner to cling ~~to him~~

Fetal Tuck (Hyperflexion) and Extension

SCORING

- (1) The infant can be scored on the 9-point scale.
- (2) The infant shows minimal fetal positioning but predominantly stretches out.
- (3) The infant shows some fetal positioning but also some stretching out.
- ~~(4) The infant shows predominantly fetal positioning and rarely stretches out.~~
- (5) The infant always shows fetal positioning and does not stretch out.
- (6) The infant occasionally is completely limp, oscillates with fetal positioning and some hyperextension.
- (7) The infant oscillates between limpness, some effort at fetal tuck but also shows moderate hyperextension.
- (8) The infant oscillates between fetal tuck and hyperextension; hyperextension predominates; limpness may be observed occasionally.

- (9) The infant is almost continuously in hyperextension or complete limpness; flexion can only be induced with difficulty or not at all.

Horizontal Position

SCORING

- (1) Actually resists being held, continuously pushing away, thrashing or stiffening
- (2) Resists being held most but not all of the time or is quite floppy; sucking may prove facilitative
- (3) Resists being held some of the time; sucking may prove facilitative
- (4) Eventually molds into arms, but after a lot of nestling and cuddling by examiner
- (5) Gradually ~~Usually~~ molds and relaxes when first held, i.e., nestles head in crook of elbow of examiner, turns toward body
- (6) ~~Always~~ Readily molds initially with above activity
- (7) Always molds initially with nestling, and turning toward body, and leaning inward
- (8) In addition to molding and relaxing, he nestles and turns head, leans inward to body of examiner, fits feet into cavity of other arm, i.e., all of body participates
- (9) All of the above, and infant grasps hold of examiner to cling

Fetal Tuck (Hyperflexion) and Extension

SCORING

- (1) The infant can be scored on the 9-point scale.
- (2) The infant shows minimal fetal positioning but predominantly stretches out.
- (3) The infant shows some fetal positioning but also some stretching out.
- (4) The infant shows predominantly fetal positioning and rarely stretches out.
- (5) The infant always shows fetal positioning and does not stretch out.
- (6) The infant occasionally is completely limp, oscillates with fetal positioning and some hyperextension.
- (7) The infant oscillates between limpness, some effort at fetal tuck but also shows moderate hyperextension.
- (8) The infant oscillates between fetal tuck and hyperextension; hyperextension predominates. Limpness may be observed occasionally.
- (9) The infant is almost continuously in hyperextension or complete limpness. Flexion can only be induced with difficulty or not at all.

Cuddliness (BNBAS)

(If vertical and horizontal scores are equivalent or within one point of each other)

SCORING

- (1) Actually resists being held, continuously pushing away, thrashing, or stiffening
- (2) Resists being held most but not all of the time
- (3) Resists being held some of the time
- (4) Eventually molds into arms but after a lot of nestling and cuddling by examiner
- (5) Usually molds and relaxes when first held, i.e., nestles head in crook of neck and of elbow of examiner; turns toward body when held horizontally, on shoulder he seems to lean forward
- (6) Always molds initially with above activity
- (7) Always molds initially with nestling, and turning toward body, and leaning forward

- (8) In addition to molding and relaxing, he nestles and turns head, leans forward on shoulder, fits feet into cavity of other arm, i.e., all of body participates
- (9) All of the above, and infant grasps hold of examiner to cling

Tonic Neck Response (SEM score equivalent to BNBAS)

The infant's postural adjustment is assessed when he is placed in supine position on a smooth surface and his head is passively moved first to one side and then to the other. The examiner's one hand is placed on the infant's chest so that the infant's body does not turn onto its side. The examiner may hold the infant in this position up to 30 seconds or more. Premature infants are often slow in responding but eventually may show a modulated adjustment of arms and legs.

SCORING

- (0) No adjustment of arms and legs
- (1) Transient adjustment of arms and/or legs, not maintained
- (2) Gradual modulated adjustment of arms and legs
- (3) Obligatory response of arms and legs
- (A) The infant is too aroused or too stressed to administer or score the item meaningfully
- (X) Inadvertently omitted

Defensive Movements

A small cloth is placed with the examiner's fingers asserting light pressure over the upper part of the face without occluding the nose. It is kept in place for up to one minute, or until the infant responds with a series of responses graded as to their degree of differentiation. The infant's hands should not be under the cloth. The scoring is the same for the APIB as for the BNBAS. A may have to be scored if the infant is too aroused or too stressed.

SCORING

- (1) No response
- (2) General quieting
- (3) Nonspecific activity increase with long latency
- (4) Same with short latency
- (5) Rooting and lateral head turning
- (6) Neck stretching
- (7) Nondirected swipes of arms
- (8) Directed swipes of arms
- (9) Successful removal of cloth with swipes

Package V: Massive Tactile Input Combined with Massive Vestibular Input

(Maneuvers: Rotation (SEM); Moro (SEM))

The two maneuvers in this package provide opportunities to observe the infant's capacities in the five subsystem dimensions outlined, when the infant's whole body is repeatedly moved through space in a brisk manner in upright position and from a horizontal position. Aside from the infant's system organization, they allow specifically for the observation of the degree and kind of balance and differentiation of relative extensor and flexor tone and posture.

ROTATION (SEM)

The infant is suspended vertically by holding him with two hands under his arms, stabilizing his head with one's thumbs under his chin. The infant is raised slightly above the examiner's eye

level and facing the examiner; the infant's body is tilted forward about 30 degrees so that his face is closer to the examiner than his legs. Once the infant's head is in midline, the examiner briskly rotates him to one side at least 90 degrees. He stops the rotation having watched for the infant's head adjustment and eye adjustment. The examiner then brings the infant back to the original position and, when the infant's head is stabilized, rotates the infant now briskly to the other side, through an at least 90-degree excursion, again watching for head and eye adjustment during the rotation. Head and eye adjustments are scored separately, as is the degree of optokinetic nystagmus observed during the rotation. If head and eye adjustments are scored equivalently, the respective Tonic Deviation of Head and Eyes BNBAS score is appropriate. Nystagmus SEM scores are the same as on the BNBAS.

Head (SEM)

SCORING

- (0) No head movement
- (1) Weak head movement in the direction of the rotation
- (2) Good modulated head turn in the direction of the rotation
- (3) Immediate, obligatory head turn in the direction of the rotation
- (A) Infant too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Eyes (SEM)

SCORING

- (0) No eye movement
- (1) Weak eye adjustment in the direction of the rotation
- (2) Good modulated eye adjustment in the direction of the rotation
- (3) Immediate obligatory eye adjustment in the direction of the rotation
- (A) Eyes ~~cannot be~~ are not observed due to stress
- (X) Inadvertently omitted

BNBAS Tonic Deviation of Head and Eyes

SCORING

- (0) No head or eye movement
- (1) Weak, response barely discernible
- (2) Good modulated response
- (3) Immediate, obligatory head and eye turn

Nystagmus (SEM scores equivalent to BNBAS)

SCORING

- (0) No saccadic movement
- (1) 1 or 2 saccades during rotation
- (2) 3 or 4 saccades ~~per~~ during rotation
- (3) Many sustained saccades ~~per~~ during rotation

MORO

The examiner holds the infant suspended in supine horizontally in midair by placing his arm and hand under the infant's trunk and the other hand under the infant's head. When the infant is

stabilized in midline and his arms and legs are in symmetrical position, the examiner drops the hand supporting the head and observes the reaction of the infant's arms and legs. Arms and legs are scored separately and for the arms the extension and adduction component are scored separately. If the extension and adduction component are scored equivalently, the respective BNBAS score can also be given.

Arms (SEM)

Extension

SCORING

- (0) No response
- (1) Weak response, minimal extension
- (2) Modulated arm extension
- (3) Obligatory, excessive arm extension
- (A) Infant too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Adduction

SCORING

- (0) No response
- (1) Weak response, minimal adduction
- (2) Modulated, smooth adduction back to midline
- (3) Excessive, exaggerated adduction
- (A) Infant too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

Legs (SEM)

Extension and Adduction

SCORING

- (0) No response
- (1) Minimal leg extension noticeable
- (2) Modulated, moderate leg extension and relaxation
- (3) Excessive, exaggerated leg extension followed by no relaxation or exaggerated flexion
- (A) Infant too aroused or too stressed to administer or score item meaningfully
- (X) Inadvertently omitted

BNBAS Equivalent Score

- (0) No response
- (1) Weak response with minimal abduction of shoulders and extension of elbow and wrist; followed by minimal or no adduction of shoulder and flexion of elbow and wrist; minimal extension of hip and knee
- (2) Modulated, good abduction of shoulders and extension of elbow and knee; followed by modulated adduction of shoulders and flexion of elbow and wrist
- (3) Obligatory, excessive abduction of shoulders and extension of elbow and wrist; obligatory brisk extension of hip and knee; followed by obligatory unmodulated adduction of shoulders and flexion of elbow and wrist

Package VI: Social Interaction and Inanimate Object Orientation

(Maneuvers: Attention to examiner's voice and face (animate visual and auditory); attention to examiner's voice alone (animate auditory alone); face alone (animate visual alone); attention to red rattle (inanimate visual and auditory); attention to rattle alone (inanimate auditory alone); attention to rattle or ball (inanimate visual alone).

The maneuvers in the orientation and interaction package provide opportunities to observe the infant's attentional capacities and his social interaction capacities when the infant has been brought to his optimally alert state. To bring the infant to an optimally alert state is the examiner's primary administrative goal, and he will aim for it and take advantage of it whenever the infant's behavioral cues indicate this is appropriate. In the very immature or the very poorly organized infant, this may be very early on in the assessment. Often behaviors during the sleep/distal package alert the examiner to the fragility of the infant's organization. He may decide to move immediately to Package VI. If he then finds that the infant is too sleepy but more robust than he thought, he may decide to continue with Package II and possibly III and come back to Package VI later. Some infants will indicate by their severe physiological and motoric responses that Package VI is inappropriate, in which case the examiner will not pursue these items. Some infants can be brought into a more alert and well-organized state by items from Package VI. This should usually be attempted. In order to make appropriate decisions for the pursuit or the deletion of certain items, the examiner needs extensive training in the manipulation of the preterm infant and in the reading of his behavioral cues. He has to be a skilled observer and interactor simultaneously. This is important for the assessment of all infants but is particularly important for the preterm infant.

The order in which the various interaction and attentional items are administered may obviously vary. It is often easiest to organize the infant's alert state with one's own face and voice. The infant is gently taken onto the examiner's lap. He may need to be dressed and/or swaddled (see E). The examiner has to be in a comfortable sitting position, preferably with his feet on a footstool so that his lap provides an incline for the infant, propping him up.

The infant is highly sensitive to the examiner's own body tension and emotional and physiological state. The examiner needs to be aware of this at all times and attempts to be relaxed. Appropriate to training is an effort to control for examiner variability.

It is very important that there is no direct light shining on the infant's face. Direct light prevents many infants from opening their eyes. Optimally the examiner faces a window or other light source in midline, and the infant is faced away from it. The ambient lighting of the environment should be quite dim. Light sources to either side of the infant or from above can make for particular difficulty, even if they are fairly dim, and should be eliminated. It is recommended that the examiner arrange the circumstances as optimally as possible for the assessment prior to beginning the examination. This precaution will prevent extraneous manipulation and movement of the infant during the examination. Once the examiner is comfortably settled with the infant on his lap, he will need to be sensitive to the infant's cues and responses in order to time and space his administration optimally for the particular infant. He will first attempt to bring the infant to alert, then to have him follow the stimulus horizontally to assess the degree of lateral excursions possible, then vertically, and then in a circle. The infant's performance is the base for the decision to continue or end a particular sequence. Several parameters of attention are scored separately for each item.

1. The Degree to Which a Particular Stimulus Elicits and Maintains an Alert State and Responsivity: This is a measure of the relative flexibility and availability of the infant's attention. Some infants, once in an alert state, can perform quite well. Yet to achieve this state is a difficult task for them due to their low flexibility and autonomous control of the attentional state. Other infants, capable of coordinated attentional excursions, can maintain these only very briefly. Others may be attentive for longer periods, yet will not achieve the complexity of excursions. Maintenance of attention is a measure of the relative stability of a particular level of attentional flexibility.

2. *The Infant's Orienting Capacity as Such:* This is a measure of the degree of flexibility of the specific coordination of eyes and/or head the infant is capable of, once he is alert and when the various stimuli are presented. The original BNBAS scoring is retained for the infant who achieves an alert state of 4B and is assessed under Orientation B. The infant who comes predominantly to a state 4AL or 4AH is scored for this specific capacity in these states, and the respective score is noted under Orientation A. Orientation B is scored N in most of these cases unless there are usable periods in state 4B as well as in 4A. In such a case both scores may be given. If the infant cannot be brought to alertness, this is scored N.

Some mature infants are capable of actively selecting the targets of their attention. They may avoid the examiner's stimulus presentation; an initial stage setting for social play may be necessary to overcome their differential responsiveness.

3. *Effort to Shut Out and Effort to Attend:* The interplay of these two parameters is seen as an index of the developing balance of attentional excitatory and inhibitory capacities, mirroring the flexion-extension balance of the motor system. Some quite well organized infants make great efforts *not* to attend. They are actively attempting to shut out to preserve their current level of self-regulation. Once sufficiently stabilized, they may make efforts to varying degrees to attend. Other infants are overly drawn to each presented stimulus and the inhibitory balance is not yet achieved. This scale assesses the relative balance of these two poles of the attentional modulation process.

4. *Cost of Attention:* This parameter assesses the degree to which the other subsystems of organization are taxed or possibly enhanced by the activation of the attentional system. This provides an index of the degree and level of stable system integration. If no effort and no responsiveness are observable, this item is scored A.

5. *Quality of Responsivity:* This is a summary rating of the degree of attentional involvement as the infant's *face* communicates his attention to the examiner. It reflects the relative differentiation of his expressive interactive and attentional capacities. If an infant is robust and well organized in all subsystems but cannot be brought into alertness for whatever reason, this scale may not be applicable and should be scored N.

ATTENTION AND INTERACTION: FACE AND VOICE (ANIMATE VISUAL AND AUDITORY)

The examiner presents his face and voice to the infant, speaking softly and with animation. He attempts to cycle with the infant's attention. Once this synchrony is achieved, he draws the infant along, moving his face to one side, while continuing to talk to the infant. He brings the infant back into midline before drawing the infant to the other side. Then he attempts to draw the infant's attention vertically. If the infant can follow with him vertically, he moves his face in a 180-degree arc, the center of which is approximately at the infant's chest and the radius of which is the infant's saggital axis.

Elicitation and Maintenance of Attention

SCORING

- (1) The infant is not in an alert state to start with, and alertness cannot be achieved by the use of this stimulus; or the infant is in an alert state, but the stimulus moves him out of this state immediately and consistently; or the infant fails to attend to the stimulus.
- (2) The infant is not in an alert state to start with, and alertness can be achieved only momentarily and with difficulty by the use of this stimulus; or the infant is in an alert state and with this stimulus alertness can be maintained only minimally.
- (3) The infant is not in an alert state and by the use of this stimulus he can be brought to alerting with moderate difficulty and for a very brief period; or the infant is in an alert state and, with this stimulus, can be maintained with difficulty for a brief period.

- Brief: 1 excursion
- Moderate: 2-3 excursions
- Prolonged: 4 or more excursions

- (4) The infant is not in an alert state and by the use of the stimulus can be brought to alerting fairly easily once or twice and maintained for a fleeting period; or the infant is in an alert state and can be maintained moderately easily by the stimulus for a brief period.
- (5) The infant is not in an alert state and by the use of the stimulus can be brought to alerting once or twice easily and can be maintained for a brief period; or the infant is in an alert state and can be maintained easily for at least a brief period by the stimulus.
- (6) The infant is not in an alert state and by the use of the stimulus can be brought to alerting repeatedly and can be maintained for a brief period each time; or the infant is in an alert state and can be maintained easily for a moderate period by the stimulus.
- (7) The infant is not in an alert state and by the use of the stimulus can be brought to alerting readily and frequently and then can maintain alertness for a moderate period; or the infant is in an alert state and can be maintained quite easily for a considerable period by the stimulus.
- (8) The infant is not in an alert state and by the use of the stimulus can be brought to alerting reliably, then can maintain alertness for considerable periods; or the infant is in an alert state and can be maintained quite easily for extended periods by the stimulus.
- (9) The infant is not in an alert state and by the use of the stimulus he can be brought to alerting every time and then maintain alertness easily and for long periods; or the infant is in an alert state and the stimulus enhances and prolongs this state consistently.

Orienting Capacity (A) or (B) (BNBAS Equivalent)

SCORING

- (1) Does not focus on or follow stimulus
- (2) Stills with stimulus and brightens
- ____ (3) Stills, focuses on stimulus when presented, brief following
- (4) Focuses on stimulus, follows for 30-degree arc, jerky movements
- ____ (5) Focuses and follows with eyes horizontally and/or vertically for at least a 30-degree arc. Smooth movement, loses stimulus but finds it again
- (6) Follows for 30-degree arcs with eyes and head. Eye movement smooth
- ____ (7) Follows with eyes and head at least 60 degrees horizontally, maybe briefly vertically, partially continuous movement, loses stimulus occasionally, head turns to follow
- (8) Follows with eyes and head 60 degrees horizontally and 30 degrees vertically
- (9) Focuses on stimulus and follows with smooth, continuous head movement horizontally, vertically, and in a circle. Follows for at least 120-degree arc.

Orienting Capacity (A)

SCORING

- ~~(1) Does not focus on or follow stimulus~~
- ~~(2) Stills with stimulus and brightens~~
- ~~(3) Stills, focuses on stimulus when presented, brief following~~
- ~~(4) Focuses on stimulus, follows for 30 degree arc, jerky movements~~
- ~~(5) Focuses and follows with eyes horizontally and/or vertically for at least a 30 degree arc. Smooth movement, loses stimulus but finds it again~~
- ~~(6) Follows for 30 degree arcs with eyes and head. Eye movement smooth~~
- ~~(7) Follows with eyes and head at least 60 degrees horizontally, maybe briefly vertically, partially continuous movement, loses stimulus occasionally, head turns to follow~~
- ~~(8) Follows with eyes and head 60 degrees horizontally and 30 degrees vertically~~
- ~~(9) Focuses on stimulus and follows with smooth, continuous head movement horizontally, vertically, and in a circle. Follows for at least 120 degree arc.~~

Asymmetry of Performance

- A. Too stressed to score meaningfully.
- N. Cannot be scored.
- 1. Equivalent performance to the Right and to the Left.
- 2. Very mild performance asymmetry, only occasionally noticeable and not yielding a score point difference.
- 3. Mild performance asymmetry, not yielding a score point difference, yet intermittently noticeable.
- 4. Mild to moderate performance asymmetry, i.e., 1 score point difference between performance to the Right and to the Left.
- 5. Moderate performance asymmetries, i.e., 2 score points difference.
- 6. Moderate to considerable performance asymmetry, i.e., 3 score points difference.
- 7. Considerable performance asymmetries, i.e., 4 score points difference.
- 8. Considerable to severe performance asymmetry, i.e., 5 score points difference.
- 9. Severe performance asymmetries, i.e., 6 score points difference.

Effort to Shut Out and Effort to Attend

SCORING

- (1) The infant shows no active effort in either direction. Attention is not an appropriate issue. He is unavailable.
- (2) The infant occasionally makes ~~initially~~ a weak effort to attend. No further efforts are noted and he is unavailable.
- (3) The infant makes ~~initially~~ repeated mild efforts to attend, then no further efforts are noted and he is unavailable.
- (4) The infant makes some real efforts to attend; there may or may not be several efforts not to attend.
- (5) The infant makes repeated strong efforts to attend. At other times he may make very strong efforts not to attend.
- (6) The infant makes repeated very strong efforts to attend. At other times he may make very strong efforts not to attend. The amplitude of the vacillation is high.
- (7) The infant is showing some degree of smoothness in regulating his efforts to attend.
- (8) The infant is relatively smooth and well controlled in regulating his efforts to attend.
- (9) The infant is very smooth and autonomous in the regulation of his efforts to attend.

Cost of Attention

SCORING

- (1) There is no apparent cost to the other systems of behavioral organization. The infant's overall organization is enhanced by the interaction with the stimulus.
- (2) There is very mild cost mainly in terms of brief state fluctuations up or downward. These may be brief eye closure, mild sneezing, or an occasional yawn. The motor system and physiological systems are not taxed at all, or are taxed only minimally.
- (3) There is very mild cost involving very mild motor arousal and possibly a mild physiological reaction such as repeated sneezing, a mild hiccough, or a mild bowel strain, or mild color change.
- (4) There is mild to moderate cost involving the state system, the motor system, and/or the physiological system. There may be some fluctuation of states up or downwards, some motor arousal accompanied by physiological responses such as mild to moderate color change, some hiccoughing, or mild to moderate respiratory irregularity.
- (5) There is moderate cost involving the state fluctuations with gaze aversion, intermittent eye closure, brief occasional eye floating, and motor disorganization; or there is moderate motoric disorganization with motoric arousal and disorganized movements; or there is moderate physiological stress with hiccoughing, gagging or color change with moderate cyanosis, flushing, or paling.
- (6) There is moderate to considerable cost involving the state system: the infant oscillates into very aroused states repeatedly and sharply; or the motor system: the infant gets aroused motorically to a moderate to considerable degree; or to the physiological system: the infant shows moderate to considerable color change, hiccoughing, and repeated eye aversions or spitting up or gagging, or moderate to considerable tremors.
- (7) There is considerable cost involving the state system with repeated oscillations into aroused states accompanied by motor disorganization and/or physiological stress, such as intermittent eye floating, considerable paling, cyanosis, spitting up, apnea, possibly nasal flaring, bowel movement grunting and straining, and/or considerable tremors.
- (8) There is high cost to the motor and/or the physiological systems with frantic or disorganized motor activity and/or arching, or with shifts to motoric tuning out and flaccidity,

with very considerable eye floating, considerable hiccoughing and bowel movement straining, very considerable paling, flushing, or cyanosis, and/or tremulousness.

- (9) There is very high cost to the motor and/or the physiological systems with excessively frantic or disorganized motor activity and/or arching with or without repeated shifts to complete motoric tuning out and flaccidity. There may be much eye floating, paling, cyanosis, spitting up, gagging, apnea, bowel movement grunting and straining, and repeated prolonged tremors, or the infant may become completely diffusely unavailable.

Quality of Responsivity

SCORING

- (1) Attentional responsivity is not an appropriate issue for this infant.
- (2) The infant attempts to stay in lower states; he is only barely available for fleeting periods. His face may or may not appear pained and bothered.
- (3) The infant attempts to rouse himself and is fleetingly successful.
- (4) The infant comes to alertness with low intensity and flat or pained responsiveness, although he may show good following. 4AL
- (5) The infant comes to alertness but then appears to be in overly heightened, strained, and/or almost panicked alertness. He may appear easily overloaded or at the mercy of the input. He may show good following. 4AH
- (6) The infant shows bright-eyed, modulated, focused alertness at times for brief periods; he may be flat or hyperalert at other times. When he is modulated, his face is softened and participates in the response; his mouth may open and round; he may raise his cheeks and eyebrows for brief periods. 4B
- (7) The infant's responsiveness is usually of the modulated quality described above. Only rarely is he flat or hyperalert.
- (8) The infant's responsiveness is almost consistently modulated and differentiated; his face participates as described above.
- (9) The infant's responsiveness is consistently well modulated, and there may also be active elicitation and initiation of interaction by the infant.

ATTENTION AND INTERACTION: FACE (ANIMATE VISUAL)

The same criteria for scoring are used as in the preceding item. The examiner places his face in the infant's line of vision, once the infant is alert, and then moves it slowly in horizontal, then vertical, then sagittal arcs, until the infant stops following.

Elicitation and Maintenance of Attention. Score 1 through 9.

Orienting Capacity (B) (BNBAS Equivalent)

SCORING

- (1) Does not focus on or follow stimulus
- (2) Stills with stimulus and brightens
- (3) Stills, focuses on stimulus when presented, brief following
- (4) Stills, focuses on stimulus, follows for 30-degree arc, jerky movements
- (5) Focuses and follows with eyes horizontally and/or vertically for at least a 30-degree arc. Smooth movements, loses stimulus but finds it again
- (6) Follows for 30-degree arcs, with eyes and head. Eye movements smooth
- (7) Follows with eyes and head at least 60 degrees horizontally, maybe briefly vertically, partially continuous movement, loses stimulus occasionally, head turns to follow
- (8) Follows with eyes and head 60 degrees horizontally and 30 degrees vertically

- (9) Focuses on stimulus and follows with smooth, continuous head movement horizontally, vertically, and in a circle. Follows for at least 120-degree arc.

Orienting Capacity (A). Score 1 through 9.

Effort to Shut Out and Effort to Attend. Score 1 through 9.

Cost of Attention. Score 1 through 9.

Quality of Responsivity. Score 1 through 9.

ATTENTION AND INTERACTION: VOICE (ANIMATE AUDITORY)

The examiner removes his face from infant's line of sight and talks to him from one side (6 to 12 inches from ear). Continuous, soft and high-pitched speech is the best stimulus, e.g., infant's own name. The examiner has to take care not to move his own face to one side with the infant following him visually before he presents his voice. This can be a problem with very alert infants. Motorically poorly organized infants will need much containment of their own interfering movements by swaddling and hand holding. The examiner needs to be aware of the impact his shifting body has as he attempts to call to the infant from one side, while simultaneously providing the infant with optimal facilitation.

Elicitation and Maintenance of Attention. Score 1 through 9.

Orienting Capacity (B) (BNBAS Equivalent)

SCORING

- (1) No reaction
- (2) Respiratory change or blink only
- (3) General quieting as well as blink and respiratory changes
- (4) Stills, brightens, no attempt to locate source
- (5) Shifting of eyes or head to sound, as well as stills and brightens
- (6) Alerting and shifting of eyes and head turn to source
- (7) Alerting, head turns to stimulus, and search with eyes
- (8) Alerting prolonged, head and eyes turn to stimulus repeatedly
- (9) Turning and alerting to stimulus presented ~~on both sides~~ on every presentation of stimulus

Orienting Capacity (A). Score 1 through 9.

Effort to Shut Out and Effort to Attend. Score 1 through 9.

Cost of Attention. Score 1 through 9.

Quality of Responsivity. Score 1 through 9.

ATTENTION TO INANIMATE SOUND AND SIGHT (INANIMATE VISUAL AND AUDITORY: RED RATTLE)

The infant's ability to alert to inanimate sights and sounds is assessed. The red Plexiglas box rattle makes an attractive stimulus with its bright, shiny appearance and its soft sound. As with the social stimulus of face and voice, the infant's best performance should be brought out by holding the infant comfortably on the examiner's lap, slightly propped up. The examiner's face may be a competing stimulus and needs to be moved back once the infant's attention is available. The optimal distance for visual fixation varies considerably from infant to infant, and the examiner should be flexible. Some infants do better if the stimulus is further away, since it prevents them from getting overwhelmed. If the rattle is suddenly shaken harshly for a brief period, this stimulus can be used occasionally to break through the disorganization of hyperarousable infants; once their attention is caught, they can be modulated gradually by reducing the intensity of the stimulus as they are brought down. The rattle is moved gently to emit a soft continuous but varied sound, first in horizontal, then vertical, and then sagittal excursions, always starting in the infant's midline.

Elicitation and Maintenance of Attention. Score 1 through 9.

Orienting Capacity (A) or (B)

SCORING

- (1) Does not focus on or follow stimulus
- (2) Stills with stimulus and brightens
- (3) Stills, focuses on stimulus when presented, brief following
- (4) Stills, focuses on stimulus, follows for 30-degree arc, jerky movements
- (5) Focuses and follows with eyes horizontally and/or vertically, for at least a 30-degree arc. Smooth movements, loses stimulus but finds it again
- (6) Follows for 30-degree arcs; with eyes and head. Eye movements smooth
- (7) Follows with eyes and head at least 60 degrees horizontally, maybe briefly vertically, partially continuous movement, loses stimulus occasionally, head turns to follow
- (8) Follows with eyes and head 60 degrees horizontally and 30 degrees vertically
- (9) Focuses on stimulus and follows with smooth, continuous head movement horizontally, vertically, and in a circle. Follows for at least 120 degree arc

~~Orienting Capacity (A). Score 1 through 9.~~

Effort to Shut Out and Effort to Attend. Score 1 through 9.

Cost of Attention. Score 1 through 9.

Quality of Responsivity. Score 1 through 9.

ATTENTION TO INANIMATE OBJECT (INANIMATE VISUAL: RATTLE WITHOUT SOUND OR RED BALL)

This item is scored and administered like the preceding one, but without the sound component. The infant's ability visually to attend to and track a bright silent stimulus is assessed. The rattle, if held quietly, or a bright red ball may be used.

Elicitation and Maintenance of Attention. Score 1 through 9.

Orienting Capacity (A) or (B) (BNBAS Equivalent)

SCORING

- (1) Does not focus on or follow stimulus
- (2) Stills with stimulus and brightens
- (3) Stills, focuses on stimulus, little spontaneous interest, brief following
- (4) Stills, focuses on stimulus, following for 30-degree arc, jerky movement
- (5) Focuses and follows with eyes horizontally for at least a 30-degree arc. Smooth movement, loses stimulus but finds it again
- (6) Follows for 30-degree arc, with eyes and head. Eye movements are smooth
- (7) Follows with eyes and head at least 60 degrees horizontally, maybe briefly vertically, continuous movement, loses stimulus occasionally, head turns to follow
- (8) Follows with eyes and head 60 degrees horizontally and 30 degrees vertically
- (9) Focuses on stimulus and follows with smooth, continuous head movement horizontally, vertically, and in a circle. Follows for 120-degree arc

~~Orienting Capacity (A). Score 1 through 9.~~

Effort to Shut Out and Effort to Attend. Score 1 through 9.

Cost of Attention. Score 1 through 9.

Quality of Responsivity. Score 1 through 9.

ATTENTION TO INANIMATE SOUND (INANIMATE AUDITORY: RATTLE)

This is a measure of the infant's response to the rattle or a soft ball as an inanimate stimulus. The auditory stimulus should be presented to each side and out of sight so that one can observe the infant's eyes and head as they respond to the lateralized stimulus. Alerting, eye shift, and head turning to the stimulus are scored. Brightening of face and eyes are evidence of the infant's attention to the stimulus. The examiner should present the sound stimulus very softly; many preterm infants are easily overloaded by sound and will avert or become disorganized. If the infant alerts to the soft sound but does not attempt to orient to it, the sound may be increased slowly, but not beyond the infant's threshold of tolerance. Again, occasionally the sound may be used to break through an infant's disorganization and draw him into calmer availability.

Elicitation and Maintenance of Attention. Score 1 through 9.

Orienting Capacity (A) or (B) (BNBAS Equivalent)

SCORING

- (1) No reaction
- (2) Respiratory change or blink only
- (3) General quieting, as well as blink and respiratory changes
- (4) Stills, brightens, no attempt to locate source
- (5) Shifting of eyes or head to sound, as well as stills and brightens
- (6) Alerting and shifting of eyes and head turns to source
- (7) Alerting, head turns to stimulus, and search with eyes
- (8) Alerting prolonged, head and eyes turn to stimulus repeatedly
- (9) Turning and alerting to stimulus presented ~~on both sides~~ on every presentation of stimulus.

~~Orientation Capacity (A). Score 1 through 9.~~

Effort to Shut Out and Effort to Attend. Score 1 through 9.

Cost of Attention. Score 1 through 9.

Quality of Responsivity. Score 1 through 9.

PART III. BEHAVIORAL SUMMARY SCALES

Each of the summary scales documents the degree to which the infant has displayed specific organizational capacities or parameters of organizational functioning in the overall course of the examination.

These summary scales are grouped along the behavioral-organizational subsystems.

Specific Physiological Parameters

Tremulousness

Startles

Skin Color: Lability of Skin Color; Lability of Compromised Skin Color; Threshold of Color Change;
Degree of Jaundice.

Smiles

Specific Motor Organization Parameters

Tonus: General Tone; Balance of Tone.

Motor Maturity: General Motor Maturity; Threshold of Motoric Imbalance; Control over Posture; Symmetry of Tonus, Posture and Movement.

Activity: Spontaneous Activity, Elicited Activity; General Activity.

Hand-to-Mouth Facility

Specific State Organization Parameters

Alertness: Degree of Responsivity B & A; Quality of Responsivity; Amount of Manipulation Necessary.
 State Regulation: Lability of States A & B; Range and Flexibility of States.

Specific Self-Regulatory Parameters

Catalog of Regulation Maneuvers
 Quieting Activity: Self-Quieting from Crying; Self-Quieting from Motor Arousal.
 Consolability: Consolability with Intervention from Crying; Consolability with Intervention from Motor Arousal.
 Peak of Excitement
 Rapidity of Buildup: Rapidity of Buildup to Crying; Rapidity of Buildup to Motor Arousal.
 Irritability: Irritability with Crying; Irritability with Motor Arousal.
 Robustness and Endurance
 Control over Input
 Need for Facilitation and Use of Stimulation

One Overall Summary Parameter

Attractiveness

Many of these parameters are directly based on the BNBAS.

Where possible the original scoring is retained or equivalents are indicated. Additional scales were developed to capture the range of functioning along these parameters observable in preterm infants. Other scales are newly developed to document essential parameters of emerging organization.

Physiological Parameters

TREMULOUSNESS

In its severe form, tremulousness may be a measure of central nervous system irritation; it may occur for metabolic reasons, or may be a sign of motoric physiological imbalance. Milder forms of tremulousness are demonstrated at the end of a startle, and as an infant comes from sleeping to awake states. In light sleep or as he startles in deep sleep, tremors of the extremities are often noted. As he becomes alert and active, the tremulousness is often overcome with smoother behavior of the limbs. In some infants tremors may reflect the intensity of alerting. Tactile stimulation often is followed by tremulousness of the chin and extremities. Gradually tactile stimuli will no longer cause tremors. Tremulousness can be seen as one index of relative physiological lability.

~~BNBAS
 EQUIVALENT SCORING~~

- ~~(1) (1) No tremors or tremulousness noted~~
- ~~(2) (2) Tremors only during sleep~~
- ~~(3) (3) Tremors only after the Moro or massive tactile stimulation~~
- ~~(4) (4) Tremulousness seen 1 or 2 times in state 5 or 6, or with moderate tactile vestibular stimulation~~
- ~~(5) (5) Tremulousness seen 3 or more times in state 5 or 6, or with moderate tactile and vestibular stimulation~~
- ~~(6) (6) Tremulousness seen 1 or 2 times in state 4, or with very mild tactile stimulation~~
- ~~(7) (7) Tremulousness seen 3 or more times in state 4, or with very mild tactile stimulation~~
- ~~(8) (8) Tremulousness seen in several states and with most tactile or vestibular stimulation~~
- ~~(9) (9) Tremulousness seen consistently in all states and with any kind of stimulation~~

PART III: BEHAVIORAL SUMMARY SCALES**SPECIFIC PHYSIOLOGICAL PARAMETERS: TREMULOUSNESS****TREMULOUSNESS**

In its severe form, tremulousness may be a measure of central nervous system irritation; it may occur for metabolic reasons, or may be a sign of motoric physiological imbalance. Milder forms of T are demonstrated at the end of a startle, and as a infant comes from sleeping to awake states. In light sleep or as he startles in deep sleep, tremors of the extremities are often noted. As he becomes alert and active, the T is often overcome with smoother behavior of the limbs. In some infants tremors may reflect the intensity of alerting. Tactile stimulation often is followed by T of the chin and extremities. Gradually tactile stimuli will no longer cause tremors. T can be seen as one index of relative physiological lability.

**BNBAS
EQUIVALENT SCORING**

- | | |
|-----|--|
| (1) | (1) No tremors or tremulousness noted |
| (2) | (2) Incidental tremors |
| (3) | (3) Mild tremors |
| (4) | (4) Mild to moderate tremulousness |
| (5) | (5) Moderate tremulousness |
| (6) | (6) Moderate to considerable tremulousness |
| (7) | (7) Considerable tremulousness |
| (8) | (8) Pronounced tremulousness |
| (9) | (9) Continuous tremulousness |

STARTLES (BNBAS EQUIVALENT)

Both spontaneous startles and those which have been elicited in the course of the stimulation are included in this scale assuming the examiner manipulates the infant sensitively. Some infants never startle during an exam, except when a Moro is elicited. Highly sensitive infants react to many disturbing stimuli with a startle, and many have observable startles for no obviously observable reason. A startle is scored when there is sudden body jump or “jumping” of the extremities.

Note: startles during Pkg I are not scored if elicited by the stimuli presented

SCORING

- (1) No startles noted
- (2) Startle as a response to the examiner’s attempts to set off a Moro reflex only
- (3) Two startles, including Moro
- (4) Three startles, including Moro
- (5) Four startles, including Moro
- (6) Five startles, including Moro
- (7) Seven startles, including Moro
- (8) Ten startles, including Moro
- (9) Eleven or more startles, including Moro

SKIN COLOR

This measures the changes of color which take place during the period of exam, e.g., the acrocyanosis or peripheral mild cyanosis, the change from pink to pale or purple—mottling and a web-like appearance may occur occasionally in some infants, or paling. A normal full-term newborn is likely to demonstrate mild color changes several times in an exam. The changes are based on good color, and return to good color. The frequency and degree of change is scored. These scores are equivalent to the BNBAS; scorepoint one has been modified. No change in poor color may be the result of depressed or stressed autonomic system, as seen in pale or cyanotic infants. Marked changes are also frequently seen in preterm infants or in infants whose central and autonomic nervous systems are unable to master the changes during an exam. Some premature infants may start out with good color in sleep states before they are stimulated; in the course of the examination they change to varying degrees of paleness and/or webbing, color characteristics not typically observed in well-organized term infants. The recovery from these changes can be varied. Other infants may start out with poor color and throughout the examination may improve somewhat or may get even worse. These changes are scored under *Lability of Compromised Color*. The BNBAS score should be N in such a case.

The immediacy of color changes is an index of relative physiological stability and is scored under *Threshold of Color Change*.

Presence and degree of *jaundice* also is scored separately.

Lability of Skin Color

BNBAS

EQUIVALENT SCORING

- (1) Good color which is stable
- (2) Good color which changes only minimally during exam
- (3) Good color; no changes except change to slight blue around mouth or extremities when uncovered or to red when crying; recovery of original color is rapid
- (4) Good color; mild cyanosis around mouth or extremities only when undressed, slight change in chest or abdomen but rapid recovery
- (5) Good color, but changes color when uncovered or crying; face, lips, or extremities

- may pale or redden; mottling may appear on face, chest, or limbs; original color returns quickly
- (6) (6) Good color; change in color all over body during exam, but color returns with soothing or covering
- (7) (7) Good color at outset, changes color to very red or blue when uncovered or crying; recovers slowly if covered or soothed
- (8) (8) Good color which rapidly changes with uncovering; recovery is slow but does finally occur when infant is dressed
- (9) (9) Good color with marked, rapid changes to very red or blue; good color does not return during rest of the exam

Lability of Compromised Skin Color

SCORING

- (1) The infant has initially good color, but in the course of the examination he gets somewhat pale or webbed; he can recover quite well.
- (2) The infant has initially good color, but in the course of the examination he gets moderately pale, or webbed and can recover the original color with soothing and relaxing.
- (3) The infant is initially somewhat pale, flushed, or blue, but in the course of the examination he gets better, especially with containing or other facilitation.
- (4) The infant is initially somewhat pale, flushed, or blue, gets more webbed, blue, or pale during examination, but does recover with resting or soothing.
- (5) The infant is initially somewhat pale, flushed, or blue but in the course of the examination he gets very pale or flushed or webbed and cannot recover the original color.
- (6) The infant is initially moderately pale or shows some blueness or flushedness; in the course of examination he gets somewhat worse, but recovers eventually.
- (7) The infant is initially moderately pale or shows slight bluing or flushedness; he gets much worse in the course of the examination and recovers the initial color only barely.
- (8) The infant is initially very pale, gray, flushed, or blue, gets somewhat worse during the examination and recovers to originally poor color.
- (9) The infant is initially very pale, gray, flushed, or blue and gets worse in the course of the examination. He does not recover.

Threshold of Color Change

SCORING

- (1) The infant's color is stable throughout.
- (2) Color change ensues with massive tactile stimuli only.
- (3) Color change ensues with medium tactile stimuli.
- (4) Color change ensues in the course of low tactile stimuli.
- (5) Color change ensues with early low tactile stimuli.
- (6) Color change ensues during social interaction or object orientation.
- (7) Color change ensues with being placed supine.
- (8) Color change ensues with being uncovered.
- (9) Color change ensues with distal stimulation during sleep or during initial observation. ~~if infant is awake at start with first distal stimulation in awake state.~~

Degree of Jaundice

SCORING

- (1) No jaundice is noticed.
- (2) There is only very mild jaundice.

- (3) There is mild to moderate jaundice.
- (4) There is moderate jaundice.
- (5) There is moderate to considerable jaundice.
- (6) There is quite considerable jaundice.
- (7) There is considerable jaundice.
- (8) There is pronounced jaundice.
- (9) There is very pronounced jaundice.

SMILES

Smiles are seen in the neonate in various circumstances. They can be fleeting to soft auditory and/or visual cues, in drowsy or in alert states. Occasionally, when the infant is handled and restrained in a cuddling position, a smile comes across his face as he relaxes. Prolonged or frequent undifferentiated smiles mainly involving the mouth region during sleep and, in an occasional infant, also during awake state 4AL give an eerie impression and may be discharge behaviors of a more primitive kind, reflecting mild facial avoidance. There is no apparent connection to external stimulation. State and nature of the smile not only influence interaction, but may well reflect physiological differentiation. If no smiles are observed, this should be scored N. For BNBAS score number of smiles

SCORING

- (1) Frequent undifferentiated smiles which come on in any state and are apparently stimulus independent, and internally triggered
- (2) Frequent undifferentiated smiles which come on in sleep and drowsy states only, with an occasional spillover into higher states, internally triggered
- (3) Frequent undifferentiated internally triggered smiles in sleep states only
- (4) Some mild undifferentiated internally triggered smiles in sleep states only
- (5) An occasional internally triggered smile in sleep state and some smiles to soft auditory stimuli (voice, rattle), or in the course of relaxing, or in sleep or drowsy states
- (6) One or more ~~Several~~ smiles to soft auditory stimuli or in the course of relaxing in sleep or drowsy states
- (7) An occasional smile with eyes open to soft auditory stimuli or in the course of relaxing
- (8) One or two eyes-open smiles with focused attention to social or inanimate objects
- (9) Several eyes-open, differentiated smiles with focused attention to social or inanimate objects

Specific Motor Organization Parameters

TONUS

This assesses the characteristic motor tone the infant shows in the course of the assessment. The infant's posture reflects tonus to a large extent. In well-modulated tone there is a continuous smooth tonic balance between extensor and flexor tone, between avoidance and groping or approach. In the hypertonic infant, both flexor and extensor tone, avoidance posture and approach postures of trunk, head, and the extremities, are exaggerated, and the resistance to overcoming these postures is high. In the hypotonic infant, there is flaccidity and floppiness in these postures and movement; the infant shows limp extremities with no resistance to manipulations and his trunk and head have the behavior of a ragdoll.

Continuity of consistency of tone is a sign of increasing balance. Some infants show great fluctuation in tonicity, shifting suddenly and frequently from hypertonic to flaccid and back. Other infants show fluctuation in tone in different body parts, and floppier arms than legs is a common occurrence in young infants. The degree of these differences and the frequency of fluctuation can be seen as an index of relative maturity of the motor system.

The first tonus scale presupposes a fair degree of consistency in *overall tone*; it is equivalent to the BNBAS tonus scale. If this degree of consistency in tone cannot be observed, this scale is scored N. The second tonus scale grades the degree of *tonus balance*.

General Tone (BNBAS Equivalent)

SCORING

- (1) Flaccid, limp like a ragdoll, no resistance when limbs are moved, complete head lag in pull-to-sit
- (2) Little response felt as he is moved, but less than about 25% of the time
- (3) Flaccid, limp most of the time, but is responsive 25% of the time with some tone
- (4) Some tone half the time, responds to being handled with average tone less than half of the time
- (5) Tone average when handled, lies in fairly flaccid state in between handling
- (6) Good ~~Variable~~ tone in resting, responsive with good tone as he is handled approximately 75% of the time
- (7) Is on the hypertonic side approximately 50% of the time
- (8) When handled he is responsive with hypertonicity about 75% of the time
- (9) Hypertonic at rest (~~in flexion~~) and hypertonic all the time (~~abnormal~~)

Balance of Tone

(HA: Score is needed for always or consistently rigid; and for arms flaccid, legs fine)

SCORING

- (1) The infant has essentially no tone.
- (2) Arms and legs and trunk are alternately and independently hypertonic and completely hypotonic in repeated sudden fluctuations in the course of the examination.
- (3) Arms, legs, and trunk are quite hypertonic; there are some periods of sudden complete flaccidity.
- (4) Arms, legs, and trunk may differentially alter tone between hypertonicity and hypotonia, hyperextension and/or extensor overflow yet with facilitation there is some balance.
- (5) Arms are somewhat more modulated ~~flaccid~~ than legs which are very hypertonic, or vice versa, yet this remains fairly consistent throughout the examination.
- (6) Arms are relatively well-modulated and legs are predominantly hypertonic or hyperextended; there is some decrease in discrepancy with facilitation.
- (7) Arms are relatively well-modulated and legs are somewhat hypertonic or hyperextended; yet this is mainly due to tactile manipulation.
- (8) Arms are somewhat softer than legs, yet well modulated, and ~~but~~ this remains fairly constant during manipulation.
- (9) Arms, legs and trunk are of consistent modulated tone during resting and during manipulation.

MOTOR MATURITY

Motor maturity is demonstrated by smooth movements of the extremities and a free, wide range of movements. The arm movements are the easiest to score. The assessment of smoothness versus jerkiness reflects the balanced flexor and extensor tone and its differentiation. The degree to which flexors and extensors are competing also comes out in freedom of arcs of movement (45-90°) versus restricted arcs (45° or less). The preterm infant may have apparent unlimited freedom of movement in lateral, sagittal, and cephalad areas, but the movements are jerky and uncontrolled, sudden extensions of arms and legs with no modulation from the flexors, i.e., the avoidance and approach components are executed independently without respective modulation on one another.

The mature infant has controlled freedom of movement in all directions associated with a smooth respective balance of avoidance and approach components, making for smooth, differentiated, controlled movements.

Motor maturity is scored with very minor changes on the original BNBAS scale. If there is not enough activity to judge motor maturity, N is given.

The threshold of movement imbalance in the course of the examination is an index of the stability of the balance and should be scored separately on *Threshold of Motoric Imbalance*. The degree of postural control is reflected in the occurrence of occasional or predominant characteristic postures which changes with maturation. *Control over Posture* is another reflection of relative motor maturity. The fetal “natural” resting position is complete trunkal flexion which the preterm attempts to maintain once his extrauterine tonicity emerges. Gradually this fetal posture is more and more freed up and differentiated. In the process of this differentiation the struggle of balance of groping and avoidance behavior, of flexion and extension components is apparent. It comes out in characteristic hand-on-face behavior, fetal tucking, midline hand-grasping, all indices of flexion and groping; and on the other side, “salute” position of arms and legs, i.e., sudden arm and leg extensions into midair, and trunkal inversion, i.e., U-shaped body posture with head and feet off surface in a total body arch, arms flailing in airplane position and finger splaying, all indices of avoidance. The facial accompaniment of the postures is, on the one hand, tongue extensions and lip-pursing (groping), on the other hand, lip retraction, cheek retraction, and grimacing (avoidance). On the physiological level the extensions are sighing, yawning, and sneezing, and at a more intense level, the visceral analogues of avoidance are gagging, spitting up, and bowel movements. The specific postures of groping and avoidance are catalogued individually and graded on a range from 0 to 3 in the Catalogue of Regulation Behaviors. This will permit the identification of the level of modulation, e.g., balance may be achieved at the visceral level, yet is still being negotiated at the motoric level; or balance may be achieved at the motoric level but is being negotiated at the attentional sensory level, exemplified in visual locking as groping and yawning or sneezing as avoidance. All these behaviors gradually come under mutual balance and mutual inhibition.

For control over posture the motoric components are considered. The infant who is not yet grappling with the postural differentiation is typically in a flat out, at times frog-like, posture. The next stage is the beginning emergence of the imbalance postures mentioned, which gradually come under more and more balanced control.

Symmetry of Tonus, Posture, and Movement is a further sign of differentiation and intactness of the motor system. Right-left symmetry along the sagittal body axis is considered here. Symmetry is conventionally assessed for each of the standard reflexes separately. Aside from such systematically elicited movements, symmetry of tonus, posture, and movement should be assessed on a continuous basis in the course of the examination by observing facial expression and the spontaneously assumed preferred total body or head postures of the infant, differential movement of the extremities, paying attention to arms, legs, hands, and feet, and fingers and toes specifically. Tonus asymmetries may be observed during spontaneous movement or resting postures or when the infant is moved about or is interacted with socially. The locus and degree of asymmetry are noted on the supplemental List of Asymmetries (see Score Sheet).

Motor Maturity (BNBAS Equivalent)

SCORING

- (1) Overshooting of legs and arms in all directions
- (2) Mild overshooting and jerky movements
- (3) No overshooting, yet jerky movements
- (4) Only occasional jerky movements and tightness in limbs predominating arcs to 45°
- (5) Smooth movements predominate, arcs predominantly 60° half the time

- (6) Smooth movements, arcs predominantly 60°
- (7) Smooth movements and arcs of 90° less than half of the time
- (8) Smooth movements and unrestricted arms laterally 90° most of the time
- (9) Smoothness, unrestricted (90°) all of the time

Threshold of Motoric Imbalance

SCORING

- (1) The infant shows no motoric imbalance.
- (2) The infant shows motoric imbalance only with medium or massive tactile and vestibular stimulation in crying states or with massive tactile and vestibular stimulation in any state.
- (3) The infant shows motoric imbalance once medium tactile and vestibular stimulation is applied, when he is still in semi-alert and alert states.
- (4) The infant shows motoric imbalance with low tactile stimulation in a semi-awake or awake state.
- (5) The infant shows motoric imbalance when visual and auditory stimulation is presented, when he is in alert and semi-alert states.
- (6) The infant shows motoric imbalance with low tactile stimulation when in sleep state.
- (7) The infant shows motoric disorganization and imbalance as soon as he is uncovered and placed supine.
- (8) The infant shows motoric imbalance even during distal stimuli in sleep state.
- (9) The infant shows motoric imbalance even during the initial observation period ~~in sleep state.~~

Control over Posture

SCORING

- (1) Frog-like or flat posture without tonicity, or the infant is rigidly extended or overly flexed throughout
- (2) Some beginning fetal tuck, weak salutes of arms and legs, otherwise frog-like or complete flatness
- (3) Occasionally salutes of arms and legs; **only occasional flatness**; strong fetal tuck, well maintained
- (4) At times, beginning of balance, ~~with strong and frequent~~ salutes of arms and legs or arm and leg ~~rigid~~ extensions, fetal tuck and/or flatness
- (5) Beginnings of differentiated flexion and extension balance, moderately soft fetal tuck, moderate salutes
- (6) At times modulated flexion and extension balance, some fetal tuck, occasional salutes, but on the whole infrequent
- (7) Usually quite modulated flexion and extension balance, isolated arm or leg salutes or frantic movement, **only occasionally fetal tuck components**
- (8) Almost consistently well-modulated flexion and extension balance, with predominantly balanced arm, leg, and trunkal tone and movement
- (9) Well-modulated flexion and extension balance, differentiated “free” posture with balanced arm, leg, and trunkal tone and movement

Symmetry of Tonus, Posture, and Movement

SCORING

- (1) There is repeated, quite pronounced, consistent asymmetry in elicited and spontaneous movements and elicited and spontaneously assumed postures.

- (2) There is definite, reproducible, consistent asymmetry of movement, posture, and tonus which is somewhat modifiable by relaxation and organization.
- (3) There is intermittently fixed, reproducible asymmetry of movement and/or posture and/or tonus. This is not always consistent and is sometimes more pronounced in spontaneous movement, sometimes in elicited movement.
- (4) There is transient, but fairly reproducible asymmetry of movement and/or posture and/or tonus. This is reliably observable, although it is not fixed.
- (5) There is repeatedly definite but limited asymmetry of posture, tone, or movement. The occurrence may be either mild in intensity or quite limited in the extent of involvement, yet it is consistent.
- (6) There is repeatedly mild asymmetry of posture, of tone, of several systematically elicited movements, or of spontaneous movement. This asymmetry is fluid and modifiable by increased attention or facilitation.
- (7) There is an occasional transient asymmetry of posture, tonus, or of a systematically elicited movement. Two or three SEMs are more pronounced on the same side of the body, or a certain posture such as leg tucking or leg bracing is mildly but repeatedly more pronounced on one than the other side.
- (8) There is an occasional, mild asymmetry in a spontaneous preferred posture or in systematically elicited movement. This is not easily reproducible.
- (9) There is no asymmetry of tone, movement, or posture, neither spontaneously nor on elicited motor patterns.

Supplemental List of Asymmetries

Check, rate degree, and describe asymmetries noted; rate degree of asymmetry on a 0 – 3 continuum.

- 0 = no asymmetry noted; the item was not checked
- 1 = subtly and mildly present and/or very transient
- 2 = moderately pronounced and/or intermittent
- 3 = pronounced, strong

Asymmetries

- | | | |
|------------|--------------------|---------------------|
| 1. Arm | 4. Leg | 7. Head positioning |
| 2. Hand | 5. Foot/toes | 8. Face |
| 3. Fingers | 6. Trunkal posture | 9. Eyes |

ACTIVITY

This is a summary of the activity seen during the entire observation, especially during the alert states. The activity consists of two kinds – (1) spontaneous and (2) in response to the stimulation of handling and the stimuli used by the observer, which are scored separately. The discrepancy between spontaneous and elicited activity reflects the relative imbalance of the motor system. All or none activity is common in immature infants. If spontaneous and elicited activity are not more than a point apart, the infant can also be scored on the BNBAS scale.

A further dimension of activity is reflected in the inaccessibility of the activity, i.e., when the activity can be inhibited by the examiner’s maneuvers. Amount of activity is graded. Frantic excessive activity is uncontrolled, intense activity; intense high activity is somewhat more controlled activity at a high level; much activity is controlled activity which builds up first, perpetuates itself for a period after activity is initiated, and then dies out. Average activity has no buildup, but at least 3 cycles of activity which are decreasing all the time; little activity has 2 or 3 cycles of activity which die out quickly.

Spontaneous activity is observed when the infant is on his own, having returned to baseline after a manipulation sequence, either in the crib or on the examiner's lap. Opportunities for observation are before uncovering, after supine, before the orientation sequence, and between packages II through V. Elicited activity is the degree of activity and motor arousal produced by the infant by any of the examiner's manipulations.

Spontaneous Activity

SCORING

- (1) No activity at all
- 1 cycle = slight (2) Slight activity
- 2 cycles = moderate (3) Moderate activity
- 3 cycles = much (4) Much activity
- (5) Continuous activity which is easily consolable
- (6) Continuous activity which is increasingly moderately difficult to control
- (7) Continuous activity which is very difficult to control
- (8) Continuous, intense and at times frantic activity which is, at times, very difficult to control
- (9) Continuous intense and frantic activity which is not consolable

Elicited Activity

SCORING

- (1) No activity
- 1 cycle = slight (2) Slight activity
- 2 cycles = moderate (3) Moderate activity
- 3 cycles = much (4) Much activity
- (5) Continuous activity which is easily consolable
- (6) Continuous activity which is increasingly moderately difficult to control
- (7) Continuous activity which is very difficult to control
- (8) Continuous, intense, and at times frantic activity which is, at times, very difficult to control
- (9) Continuous, intense, frantic activity which is not consolable

Activity (BNBAS Equivalent)

SCORING

Spontaneous and elicited activity is scored separately on a four point scale: 0 = none, 1 = slight, 2 = moderate, 3 = much. Then add up the two scores. ~~If spontaneous and elicited activity have a difference of more than one point, this scale should not be used.~~ If the infant is spontaneously and with elicitation, continuously active, a score of 8 or 9 is considered.

- (1) = a total score of 0
- (2) = a total score of 1
- (3) = a total score of 2
- (4) = a total score of 3
- (5) = a total score of 4
- (6) = a total score of 5
- (7) = a total score of 6
- ~~(8)~~ = continuous but consolable movement
- (9) = continuous, unconsolable movement

HAND-TO-MOUTH FACILITY (BNBAS EQUIVALENT)

Hand-to-mouth coordination develops *in utero*. It is seen spontaneously as the infant attempts to control himself or comfort himself when aroused. It is a measure of differentiated motor coordination reflected in his ability to bring his hand to his mouth in supine as well as his success in insertion and maintaining it there. Some infants bring their hands to their mouths repeatedly, insert a part of the fist or fingers, and suck actively on the inserted part, which requires a fair degree of motoric balance, postural stability, and integration. The scoring is the same as on the BNBAS.

SCORING

- (1) No attempt to bring hands to mouth
- (2) Brief swipes at mouth area, no real contact
- (3) Hand brought to mouth and contact, but no insertion, once only
- (4) Hand brought next to mouth area twice, no insertion
- (5) Hand brought next to mouth area at least 3 times, but no real insertion, abortive attempts to suck on fist
- (6) One insertion which is brief, unable to be maintained
- (7) Several actual insertions which are brief, not maintained, abortive sucking attempts, more than 3 times next to mouth
- (8) Several brief insertions ~~in rapid succession~~ in an attempt to prolong sucking at this time
- (9) Fist and/or fingers actually inserted and sucking on them for 5 seconds or more for several brief insertions

Specific State Organization Parameters**ALERTNESS**

This assesses the *responsivity* shown in the course of the examination when the infant is in an alert state. This is best assessed during package VI when the examiner facilitates the infant's other systems to maximally free up and bring out his alertness and responsivity. Since very young infants are alert for only short periods if at all and are more responsive when they come to alertness spontaneously in the course of their endogenous circadian rhythm, the ability to come to alertness in the course of this examination is an index in itself of the infant's increasing overall state differentiation and state control. The degree of responsivity when alert becomes an index of the emerging and expanding differentiation of the alert state. Duration of responsivity and delay with which attention to stimuli can be brought about are indices of the degree of responsivity. The well-differentiated infant will no longer need the examiner's prompting to attend to stimuli, but will actively select and even initiate social interaction and visual exploration of stimuli.

The *Degree of Responsivity (B)* is scored essentially as on the BNBAS. This scale should be used only if the infant reaches state 4B during orientation. The score of 9 is changed to reflect active selection and exploration of the environment. *Degree of Responsivity (A)* is scored if the infant attains states 4AL or 4AH. Then degree of responsivity (B) should be scored N.

Aside from the degrees of responsivity, the *Quality of Responsivity* is scored on a facial animation continuum, again capturing increasing modulation and differentiation. Another component of responsivity assessed is the relative degree of autonomous stability of the level of responsivity achieved, measured by the *Degree of Manipulation Necessary* from the examiner.

Degree of Responsivity (A) or (B)

Alertness

BNBAS

EQUIVALENT SCORING

- | | | |
|---------|-----|--|
| (1) | (1) | Inattentive – rarely or never responsive to direct stimulation |
| (2) | (2) | When alert, responsivity brief and generally quite delayed – alerting and orientation very brief and general. Not specific to stimuli |
| (3) | (3) | When alert, responsivity brief and somewhat delayed – quality of alertness variable |
| (4) | (4) | When alert, responsivity somewhat brief but not generally delayed, though variable |
| (5) | (5) | When alert, responsivity of moderate duration and response generally not delayed and less variable |
| (6) | (6) | When alert, responsivity moderately sustained and not delayed. May use stimulation to come to alert state |
| (7) | (7) | When alert, episodes of responsivity are of generally sustained duration, etc. |
| (8 & 9) | (8) | Always has sustained periods of responsivity alertness in best periods of alertness. Alerting and orientation frequent and reliable. Stimulation brings infant to alert state consistently |
| | (9) | Always alert in best periods. Actively selects stimuli and explores the inanimate environment visually or actively initiates social interaction |

Degree of Responsivity (A)

- ~~(1) — (1) Inattentive — rarely or never responsive to direct stimulation~~
- ~~(2) — (2) When alert, responsivity brief and generally quite delayed — alerting and orientation very brief and general. Not specific to stimuli~~
- ~~(3) — (3) When alert, responsivity brief and somewhat delayed — quality of alertness variable~~
- ~~(4) — (4) When alert, responsivity somewhat brief but not generally delayed, though variable~~
- ~~(5) — (5) When alert, responsivity of moderate duration and response generally not delayed and less variable~~
- ~~(6) — (6) When alert, responsivity moderately sustained and not delayed. May use stimulation to come to alert state~~
- ~~(7) — (7) When alert, episodes are of generally sustained duration, etc.~~
- ~~(8 & 9) — (8) Always has sustained periods of alertness in best periods. Alerting and orientation frequent and reliable. Stimulation brings infant to alert state consistently~~
- ~~(9) Always alert in best periods. Actively selects stimuli and explores the inanimate environment visually or actively initiates social interaction~~

Quality of Responsivity

SCORING

- (1) Attentional responsivity is not an appropriate issue for this infant.
- (2) The infant attempts to stay in lower states; he is only barely available for fleeting periods. His face may appear pained and bothered.
- (3) The infant attempts to rouse himself, but is only fleetingly successful.
- (4) The infant comes to alertness with low intensity and flat responsiveness, although he may show good following. 4AL
- (5) The infant comes at times to alertness but then appears overly heightened, pained, or almost panicked. He may appear easily overloaded or at the mercy of the input. He may show good following. 4AH

- (6) The infant shows bright-eyed, modulated, focused alertness at times for brief periods; he may be flat or hyperalert at other times; when he is modulated, his face is softened and participates in the response; his mouth may open and round; he may raise his cheeks and eyebrows for brief periods.
- (7) The infant's responsiveness is usually of the modulated quality described above. Only rarely is he flat or hyperalert.
- (8) The infant's responsiveness is almost consistently modulated and differentiated; his face participates as described above.
- (9) The infant's responsiveness is consistently well-modulated, and there may also be active elicitation and initiation of interaction by the infant.

4 B

Amount of ~~Manipulation~~ Facilitation Necessary

SCORING

- (1) The infant was in an alert state to begin with or came to alert early with one attempt. From then on he stayed in alert state and responsive essentially throughout the examination.
- (2) The infant is almost continuously in alert states, after easily being brought to it or being there spontaneously.
- (3) The infant is easily brought into alertness and spontaneously prolongs alert periods.
- (4) The infant is spontaneously alert at some time during the examination and can maintain alertness for moderate periods.
- (5) The infant is spontaneously in an alert state some time during the examination, and can maintain this alertness for brief periods.
- (6) The infant's states need to be ~~facilitated manipulated~~ by the examiner a few times to elicit alerting; then alerting is of moderate duration.
- (7) The infant's states need to be ~~facilitated manipulated~~ most of the time to elicit or maintain alerting; alerting is brief.
- (8) The infant's states need to be ~~facilitated manipulated~~ continuously to elicit or maintain some alerting or although the infant was spontaneously awake, the infant could not be helped to attend to the stimuli presented.
- (9) The infant cannot be ~~facilitated manipulated~~ by any means into responsiveness, or it is inappropriate to expect alertness from the infant.

STATE REGULATION

The availability of certain states, the degree of fluctuation between them, the stability of the alert states and other well-defined states as sleep and robust crying, in contrast to more diffuse states as state 1A, 2A, 3A, 4AL, 4AH, 5A, 6A, which should gradually diminish, all are indices of expanding state organization.

Lability of states measures the infant's fluctuation of states by counting the number of state changes in the course of the examination. Each change is counted as soon as the state is recognizable which means operationally probably a period of 3 seconds or more.

Range and flexibility assess the degree of state expansion and respective robustness of the range available. Again the more diffuse states are expected to get solidified over time, and the range from sleep to solid alert to robust crying states is expected to unfold.

Lability of States

SCORING

The score corresponds to the frequency of swings.

- (1) 1 – 2 swings over course of examination
- (2) 3 – 5
- (3) 6 – 8
- (4) 9 – 10

- (5) 11 – 13
- (6) 14 – 15
- (7) 16 – 18
- (8) 19 – 22
- (9) 23 on up

Range and Flexibility of States

SCORING

- (1) The infant is only in low states (1A or B, 2A or B, or 3A) in the course of the examination.
- (2) The infant is mainly in low states, but can come to state 3 with maybe one excursion into state 4AL or 5A.
- (3) The infant is mainly in low states, including state 3, but has brief periods in state 5A or 6A.
- (4) The infant is mainly in low states, including state 3, and has some state 4AL or may have 4AH available, with or without an occasional 5A or 6A.
- (5) The infant is mainly in low states, has states 1, 2, and 3 available, no longer shows states 1A or 2A, also has state 5B available ~~and may or may not briefly state 4B~~; or the infant is in 4AL or H, 5A, and/or 6A yet has no B state; or ~~he~~ the infant is oscillating exclusively between states 3 and 5 and 6.
- (6) The infant has states 1, 2, 3, and 5 available, shows the beginnings of state 4B, possibly embedded either in 4AL or 4AH; state 6A is occasionally observable, embedded in state 5A and 5B or 6B; or the infant is continuously in states 5 and 6.
- (7) The infant has state 4B available and actively keeps himself there with minimal excursions to 5A or 5B indicating stress. The sleep states, if observed, are well organized; or the infant has state 6B available while state 4B is still embedded in 4AH or 4AL or is not very prolonged or stable, ~~and the sleep states are well organized.~~
- (8) The infant has state 6B available, as well as state 4B; the oscillations may still be abrupt and unmodulated.
- (9) The infant has the full range of organized states available with only fairly brief periods in either state 3 or states 5 and 6, or he may actively control himself in state 4B without stress to any of the other systems.

Lability of States (BNBAS)

SCORING

The score corresponds to the frequency of swings of state changes with 15 seconds or more duration per state.

- (1) 1 – 2 swings over 30 minutes
- (2) 3 – 5
- (3) 6 – 8
- (4) 9 – 10
- (5) 11 – 13
- (6) 14 – 15
- (7) 16 – 18
- (8) 19 – 22
- (9) 23 on up

Specific Self-Regulatory Parameters

CATALOGUE OF REGULATION MANEUVERS

All behaviors in this catalogue are scored on a range from 0 to 3: 0 = not observed; 1 = only occasionally used; 2 = used moderately frequently; 3 = frequently used; appears a reliably discernible pattern.

As indicated on pages 42 and 114, these maneuvers are seen on a continuum of developmental differentiation, from involving the physiological system (level 1) to involving the motor system (level 2) to involving the attentional system (level 3). Within each of these levels, there are the *groping* maneuvers, maneuvers directed *toward* the stimulus, representing the approach component of behavior; and there are *withdrawing* maneuvers, maneuvers directed *away* from the stimulus, representing the avoidance component of behavior. The task of the organism's development is seen as a gradual smoothing of the mutual acting of these two components, approach and avoidance, on each other, until this regulation as such becomes imperceptible, i.e., they are, in fact, smoothly regulated, and their relative preponderance is no longer behaviorally apparent, i.e., the organism appears to execute an action smoothly and freely. For example, when a visual stimulus is presented to the very young organism, the organism may first be reacting by being drawn toward the stimulus in a generalized fashion: The mouth may open into a groping "ooh" configuration, the tongue may extend strongly and repeatedly toward the stimulus, undifferentiated whimper-like sounds may be emitted, the eyes may widen and lock onto the stimulus; arms, legs, and head may strain toward the stimulus; hands, fingers, and toes may open in a groping fashion; respirations and heartrate may possibly speed up, and the whole organism is engaged in a strong, unchecked approach configuration. The modulation, regulation, and dampening configuration is then imposed by the subsequently ensuing avoidance components of behavior: Now the face withdraws into a grimace, mouth narrows and retracts, grunting and bowel movement straining ensue, eyes narrow, the tongue draws in, the infant may sneeze or yawn, or intensely gag, or spit up; the arms draw back or extend sideways and backwards, the trunk arches, hands open and fingers splay. The organism has swung from unchecked approach to unchecked avoidance. Now, as the second cycle starts and the approach component comes into play again, it may be more dampened, due to the action of the avoidance component on its amplitude. If the organism does not endogenously possess such regulatory facility, it may nevertheless be modulatable by environmental input, e.g., the amplitude of arm retraction and finger splay can be reduced by placing the examiner's finger into the infant's hands; this may induce the groping component, the infant's hands may close around the examiner's finger, his arms in turn may begin to flex, and the groping component may spread to trunk and face; trunkal arching will soften and gradually go into trunkal flexion; the facial retraction and grimace will relax, bowel movements, gags, and spit-ups may be prevented, and the face may return to a neutral baseline or move gradually into a new cycle of groping. Thus, the continuous action of avoidance and approach components at the various levels of organization upon each other will result in increasing periods of well-regulated balance, freeing up the organism for the grappling of the next level of functional balance and competence.

The catalogue of behaviors first lists the avoidance behaviors, then the approach and groping behaviors. Within each category the behaviors are roughly grouped by level. Many of these behaviors are self-explanatory. A brief description of each is given.

Withdrawal or Avoidance Behaviors

1. Spit-Ups

The infant spits up; more than a passive drool is required, although the vomitus as such may be no more than a drool or quite minimal.

2. Gags

The infant appears to choke momentarily or gulp or gag; the swallowing and respiration patterns are out of synchrony. This is often, but not necessarily, accompanied by at least mild mouth-opening.

3. Hiccoughs

The infant hiccoughs.

4. Bowel Movement Grunting or Straining

The infant's face and body display the straining often associated with bowel movements and/or he emits the grunting sounds often associated with bowel movements.

(HA: add cry face)

5. Grimace, Lip Retraction

The infant's lips retract noticeably and/or his face is distorted in a retracting direction (eyebrow knitting alone is not sufficient but is a likely part of this configuration).

6. Trunkal Arching

The infant's trunk arches and/or his head extends in an arching fashion. The upper extremities do not have to extend; often the legs may be extending.

7. Finger Splay

The infant's hands open strongly, and the fingers are extended and separated from each other.

8. Airplane

The infant's arms either are fully extended out to the side at approximately shoulder level or upper and lower arm are at an angle to each other but are extended out at the shoulder.

9. Salutes

The infant's arms are fully extended into midair, either singly or simultaneously.

10. Sitting on air

The infant's legs are extended into midair, either singly or simultaneously. This may occur when the infant is supine or upright.

11. Sneezing

The infant sneezes.

12. Yawning

The infant yawns.

13. Sighing

The infant sighs.

14. Coughing

The infant emits coughing sounds.

15. Averting

The infant actively averts his eyes. He may momentarily close them.

16. ~~Frowning—See item 19. below~~ ~~The infant knits his brows or darkens his eyes by contracting his periorcular musculature thus engaging in facial flexion.~~

Approach or Groping Behaviors

1. Tongue Extension

The infant's tongue either is extended toward a stimulus, or it repeatedly extends and relaxes.

2. Hand on Face

The infant's hand or hands are placed onto his face or over his ears and are maintained there for brief period.

3. Sounds

The infant emits undifferentiated, at times whimper-like, sounds.

4. Hand Clasp

The infant grasps his own hands or clutches his hands to his own body; the hands each may be closed but they touch each other.

5. Foot Clasp

The infant positions his feet against each other, footsole to footsole, or folds his legs in a crossed position with his feet grasping his legs or resting on them.

6. Finger Fold

The infant interdigitates one or more fingers of each hand.

7. Tuck

The infant curls or tucks his trunk or shoulders, pulls up his legs, and tucks his arms, or uses the examiner's hands or body to attain tuck flexion.

8. ~~Body Movement~~

~~The infant adjusts his body or extremities or head into a more flexed position, such as turning to the side, attempting to gain a toxic head response, etc.~~

9. Hand to Mouth

The infant attempts to bring his hand or fingers to his mouth. He does not have to be successful.

10. Grasping

The infant makes grasping movements with his hands either directed to his own face, his body, or in midair, or to the examiner's hands or fingers or body, or toward the side of the bassinette, etc.

11. Leg/Foot Brace

The infant extends his legs and/or feet toward the examiner's body, hands, the surface he is on, the sides of the bassinette, etc., in order to stabilize himself. Once touching, he may flex his legs or he may restart the bracing.

12. Mouthing

The infant makes mouthing movements with his lips and/or jaws.

13. Suck Search

The infant extends his lips forward or opens his mouth in a searching fashion, usually moving his head while doing so.

14. Sucking

The infant sucks on his own hand or fingers, on clothing, the examiner's finger, a pacifier or other object that he has either obtained himself or that the examiner has inserted into his mouth.

15. Hand Holding

The infant holds on to the examiner's hands or finger or arm, etc., with his own hands. He may have placed them there himself, or the examiner may have positioned them there; the infant then actively holds on.

16. "Ooh" Face

The infant rounds his mouth and purses his lips or extends them in an "ooh" configuration; this may be with his eyes open or closed.

17. Locking Visually and/or Auditorally

The infant locks onto the examiner's face or an object or sight in the environment, e.g., he may lock on above or to the side examiner's face but maintains his gaze in one direction for observable periods. The sound component of an environmental stimulus may contribute to his locking.

18. Cooing

The infant emits pleasurable cooing sounds.

19. Frowning

The infant knits his brows or darkens his eyes by contracting his periocular musculature thus engaging in facial flexion.

Maneuvers

Avoidance or Withdrawal Behaviors (Scoring 0 – 3)

- | | |
|-------------------------------------|--------------------------|
| (1) Spit up | (9) Salutes |
| (2) Gag | (10) Sitting on air |
| (3) Hiccough | (11) Sneezing |
| (4) Bowel movement grunt and strain | (12) Yawning |
| (5) Grimaces, lip retraction | (13) Sighing |
| (6) Trunkal arching | (14) Coughing |
| (7) Finger splay | (15) Averting |
| (8) Airplane | (16) Frowning |
| | (1) Tongue extension |

Approach or groping behaviors (Scoring 0 – 3)

- | | |
|---------------------------------|----------------|
| (1) Tongue extension | (3) Sounds |
| (2) Hand on face | (4) Hand clasp |

	(5) Foot clasp
	(6) Finger fold
	(7) Tuck
BNBAS equivalent	(8) Body movement
BNBAS equivalent	(9) Hand to mouth
	(10) Grasping
	(11) Leg/foot brace
BNBAS equivalent	(12) Mouthing
	(13) Suck search
BNBAS equivalent	(14) Sucking
	(15) Hand holding
	(16) "Ooh" face
BNBAS equivalent	(17) Locking visually and/or auditorily
	(18) Cooing
	(19) Frowning

QUIETING

Two measures of the infant's quieting ability are considered: first, his ability for self-quieting, and second, his ability to use graded input from the examiner to become consoled, i.e., consolability with intervention.

Self-quieting

This is a measure of the activity the infant initiates when in an aroused state in an observable effort to quiet or control himself. The activities which are observed in these efforts are scored in a separate catalogue of self-regulating maneuvers. Some of these are also scored on the BNBAS; this will be indicated. Their success can be of varying degrees of quieting and control which the infant can achieve on his own. The range is based directly on the BNBAS. The arousal level of the infant has to be kept in mind in assessing these effects. Infants who can achieve solid state 6 or 5 behavior with real crying are obviously different infants from those who come to either a state 6A or 5A or to motoric arousal in state 3. States 6A and 5A are characterized by motoric arousal without clear fussing; 5B always has clear fussing; state 3 may or may not have one or the other. Self-quieting from these two types of arousal is scored separately. If the infant does not achieve state 6B or 5B, the respective scale is scored N. The infant may use for his self-quieting efforts any behaviors listed in the catalogue, including use of the examiner's face and voice. Once the examiner has to intervene actively either by presenting his face or by talking to the infant or by the use of tactile manipulations to help the infant, this no longer qualifies as self-quieting. This applies also to Package I. Should the examiner need to facilitate in Package I, no self quieting credit is given for any successes in Package I.

Self-quieting from State 6B or 5B (BNBAS Equivalent)

SCORING

- (1) Cannot quiet self, makes no attempt, and intervention is always necessary
- (2) A brief attempt to quiet self but with no success (less than 5 seconds)
- (3) Several attempts to quiet self, but with no success (less than 5 seconds)
- (4) One brief success in quieting self for period of 5 seconds or more
- (5) Several brief successes in quieting self
- (6) An attempt to quiet self which results in a sustained successful quieting with the infant returning to state 4 or below
- (7) One sustained and several brief successes in quieting self
- (8) At least 2 sustained successes in quieting self
- (9) Consistently quiets self for sustained periods

Self-Quieting from Motoric Arousal (States 3, 5A, 6A)**SCORING**

- (1) Cannot quiet self, makes no attempt, and intervention is always necessary
- (2) A brief attempt to quiet self but with no success (less than 5 seconds)
- (3) Several attempts to quiet self, but with no success (less than 5 seconds)
- (4) One brief success in quieting self for a period of 5 seconds or more
- (5) Several brief successes in quieting self
- (6) An attempt to quiet self which results in a sustained successful quieting
- (7) One sustained and several brief successes in quieting self
- (8) At least 2 sustained successes in quieting self
- (9) Consistently quiets self for sustained periods

Consolability with Intervention

If the infant does not bring himself out of either states 6B or 5B or out of state 6A or 5A or state 3 in 15 seconds, the examiner then begins to intervene in a graded series of maneuvers. Some babies will quiet when they are being talked to softly; others need to be talked to very firmly and for prolonged periods, while still others need their arm and leg movements restrained, their hands and/or feet held, their bodies tucked, they need to be picked up, need to be rocked gently or even vigorously or they need to be allowed to suck in order to be consoled. Consoling is demonstrated when the infant quiets for at least 5 seconds. The BNBAS equivalent scales require a starting point of state 6B. If the infant does not achieve such a state, this scale is scored N. Only minor revisions of the original BNBAS scale are proposed here, as indicated.

BNBAS EQUIVALENT	SCORING (State 6B)
-(1)	(1) Not consolable
-(2)	(2) Picking up and rocking vigorously or Picking up and sucking, in addition to dressing, holding, and rocking
-(3)	(3) Picking up, dressing, swaddling, and sucking, or dressing, holding in arms and rocking softly
-(4)	(4) Picking up and holding, dressing and swaddling or holding and rocking
-(5)	(5) Picking up and holding
-(6)	(6) Restraining of arms and legs or hand on belly and restraining one or both arms
-(7)	(7) Restraining of arms or legs or placing hand on belly steadily, or against soles of feet
-(8)	(8) Examiner's face and voice firmly or persistently
-(9)	(9) Examiner's voice very softly or examiner's face alone

Consolability with Intervention from Motoric Arousal (States 3, 5A, 5B, or 6A)

~~SCORING. Same as above. See next page 126a~~

PEAK OF EXCITEMENT (BNBAS EQUIVALENT)

This is a measure of the overall amount of motor and crying activity observed by the examiner during the course of the whole examination and is scored similarly to the BNBAS. The examiner sees peaks of excitement and notes how the infant's behavior brings him back to a more responsive state. The kind of intense reactions which some infants demonstrate when they reach their peak of excitement makes them unavailable to the outside world and must be scored high. Others are hardly able to be joggled to respond at all, and their peak is very low. An optimal response would fall in the moderate, reachable range, in which the infant could be brought to respond to stimuli in spite of a high degree of upset or excitement, but then returns to a more moderate state.

PART III: BEHAVIORAL SUMMARY SCALES

SPECIFIC SELF-REGULATORY PARAMETERS: CONSOLABILITY

**CONSOLABILITY WITH INTERVENTION FROM MOTORIC AROUSAL:
STATES 3, 5A, 5B, OR 6A**

**BNBAS
EQUIVALENT**

SCORING

- | | |
|-----|--|
| (1) | (1) Not consolable |
| (2) | (2) Picking up and rocking vigorously or Picking up and sucking, in addition to dressing, holding, and rocking; <u>or</u> whole body containment, which needs to be maintained for long periods. |
| (3) | (3) Picking up and dressing, swaddling, and sucking, or dressing, holding in arms and rocking softly; <u>or</u> whole body containment for moderate periods |
| (4) | (4) Picking up and holding, dressing and swaddling, or holding and rocking softly; <u>or</u> extremity containment with sucking or mouth inhibition for prolonged periods. |
| (5) | (5) Picking up and holding; <u>or</u> extremity containment with sucking or mouth inhibition. |
| (6) | (6) Containing of arms and legs, <u>or</u> hand on belly and containing one or both arms |
| (7) | (7) Containing of arms or legs, <u>or</u> placing hand on belly steadily, <u>or</u> against soles of feet |
| (8) | (8) Examiner's face and voice firmly <u>or</u> persistently |
| (9) | (9) Examiner's voice very softly <u>or</u> examiner's face alone |

SCORING

- (1) Low level of arousal to all stimuli. Never above state 2, does not awaken fully
- (2) Same arousal to stimulation – can be awakened to state 3
- (3) Infant reaches either state 4 briefly, but is predominantly in state 3 or lower
- (4) Infant reaches either state 5 or 6A, but is predominantly in state 4 or lower; or is in a state of 5A or 6A frequently, yet does not reach state 6B
- (5) Infant reaches state 6B after stimulation once or twice, but predominantly is in state 5 or lower
- (6) Infant reaches state 6B after stimulation but returns to lower states spontaneously
- (7) Infant reaches state 6B in response to stimuli but with consoling is easily brought back to lower states
- (8) Infant screams (state 6B) in response to stimulation, although some quieting can occur with consoling, with difficulty
- (9) Infant achieves insulated crying state. Unable to be quieted or soothed

RAPIDITY OF BUILDUP

This is a measure of use of states from quiet to agitated state. It measures the timing and the number of stimuli which are used before the infant changes from his initially quiet state to a more agitated one. Since this implies that we start with an initially quiet infant, it measures the period of “control” which he can maintain in the face of increasingly demanding stimuli as well as the additive effect of these stimuli in changing his initially quiet state.

Since many infants do not achieve a full blown crying state, build-up to an upset state as evidenced by motor discharge or fussing should be scored separately, applying the same criteria to buildup from state 1 or 2 to state 5A, 5B, or 6A, or a motor arousal 3. ~~N is scored on the rapidity of build up to state 6 scale, which is equivalent to the BNBAS.~~

Rapidity of Buildup to State 6B

BNBAS

EQUIVALENT SCORING

- | | |
|-----|--|
| (1) | (1) No upset to state 6B at all |
| (2) | (2) Not until TNR, Moro, prone placement, and defensive reaction |
| (3) | (3) Not until TNR, Moro, prone placement, or defensive reactions |
| (4) | (4) Not until undressed |
| (5) | (5) Not until pulled to sit |
| (6) | (6) Not until low tactile maneuvers |
| (7) | (7) Not until uncovering him and placing him supine |
| (8) | (8) At first auditory and light stimuli |
| (9) | (9) Never was quiet enough to score this |

Rapidity of Buildup to Motor Arousal

SCORING

- (1) No motor arousal at all
- (2) Not until TNR, Moro, prone placement, and defensive reactions
- (3) Not until TNR, Moro, prone placement, or defensive reactions
- (4) Not until undressed
- (5) Not until pulled to sit
- (6) Not until low tactile maneuvers
- (7) Not until uncovering him and placing him supine
- (8) At first auditory and light stimuli
- (9) Never was quiet enough to score this; was motorically aroused at beginning of examination

IRRITABILITY

This measures the frequency and threshold with which the infant gets upset. Irritability in the sense of the BNBAS, i.e., audible fussing to specific stimuli listed, is scored on the BNBAS irritability scale. Some infants show irritability either motorically or with pained expression or also with fussing and to almost any stimulation presented, while others will only be irritable to the more massively aversive maneuvers. In the additional irritability scale, any degree of upset and discomfort is counted. It may be evidenced by grimace or cry faces or other signs of clear irritation often accompanied by motor upset or fussing or active crying.

Irritability (BNBAS)***Aversive Stimuli Considered***

uncover	pinprick passive movements
undress	TNR
pull to sit	Moro
prone	defensive maneuvers

SCORING

- (1) No irritable crying to any of the above stimuli
- (2) Irritable crying to one of the stimuli
- (3) Irritable crying to two of the stimuli
- (4) Irritable crying to three of the stimuli
- (5) Irritable crying to four of the stimuli
- (6) Irritable crying to five of the stimuli
- (7) Irritable crying to six of the stimuli
- (8) Irritable crying to seven of the stimuli
- (9) Irritable crying to all of the stimuli administered

Irritability (A)**SCORING**

- (1) The infant does not react irritably to any of the stimulation presented.
- (2) The infant reacts irritably only to the high tactile and vestibular maneuvers, but not otherwise.
- (3) The infant reacts irritably only to some of the medium tactile maneuvers, but not all of them, and not to the low tactile ones, or the distal ones in sleep or awake state.
- (4) The infant reacts irritably to most or all of the medium tactile maneuvers, but not to the low tactile ones or the distal ones in sleep or awake states.
- (5) The infant reacts irritably to some of the low tactile maneuvers, to all or most of the stronger tactile maneuvers, but not to distal stimuli in sleep or awake states.
- (6) The infant reacts irritably to most or all of the low tactile maneuvers and to most all other tactile maneuvers, but not to distal stimulation in sleep or awake states.
- (7) The infant reacts irritably to being uncovered and put into supine position and to any other tactile stimulation, but not to distal stimulation in sleep or in awake states.
- (8) The infant reacts irritably to social stimulation or to object presentation and to any other tactile stimulation, except distal stimulation in sleep.
- (9) The infant reacts irritably to distal stimulation in sleep and to any other stimulation or is already irritable at the beginning of the examination.

ROBUSTNESS AND ENDURANCE

Many young infants have only limited energy resources available and need intermittent times out to refuel themselves. Exhaustion may be evidenced by increasing lethargy, passive unavailability,

and low-keyedness, or at times by hyperarousal. Some infants “come into their own” in the course of the examination and focus and mobilize their energy resources by the interaction provided through the examination. They are robust and have much endurance. The ease with which the examiner can proceed in the course of the examination can be an index of this robustness.

SCORING

- (1) The infant has no energy at all, or appears very fragile and the examination is inappropriate.
- (2) The infant’s energies are very limited, the infant is quite fragile and long “periods out” are necessary; the examination has to be shortened and the examiner has to be very gingerly or very carefully paced.
- (3) The infant shows considerable exhaustion and fragility or hyperarousability, yet with prolonged periods out and slowed timing the examination can be completed.
- (4) The infant repeatedly shows some exhaustion; he is moderately fragile or arousable but with times out, the examination can be completed fairly well.
- (5) The infant repeatedly shows some exhaustion or is somewhat fragile or arousable, but with brief times out he can recover himself each time and finishes quite well.
- (6) The infant starts out quite robustly, yet half way into the examination he needs some times out; he then can recover himself to some extent.
- (7) The infant is fairly robust and energetic throughout the examination and needs only minimal time out because of diminishing energy resources, or the infant starts out somewhat fragile but becomes more energetic and robust as he goes along.
- (8) The infant may have brief periods of mild exhaustion or of minimal fragility, but is generally quite energetic and robust throughout.
- (9) The infant is robust and has good energy resources throughout the examination.

CONTROL OVER INPUT

The infant’s ability to control environmental input varies with his organizational maturity. Often the inability to control stimulation has behavioral physiological manifestations such as hiccoughing, urinating, or bowel movement straining. Sometimes the control mechanisms for cutting down on stimulation are subtle, such as in sneezing and yawning. Some infants cannot control environmental input at all and deal with stimulation by gross autonomic responses such as gagging, apnea, tachypnea, or seizing. Soft and brief talking or brief presentations of soft inanimate objects are considered as mild stimuli, as are very gentle movements of the infant. More prolonged and complex social or inanimate object presentation as well as more firm tactile manipulation of the infant are considered as moderate stimulation. The more vigorous tactile maneuvers, such as passive movements and the items in packages IV and V are considered stimulation unless they are administered in a very attenuated and abbreviated fashion. An overall assessment of the level of the infant’s control should be made which summarizes the self-regulatory capacities throughout the examination.

SCORING

- (1) The infant has no control over any input and always reacts with ~~apnea~~ significant respiratory pauses or periods of severely rapid breathing ~~tachypnea~~, seizures, or severe tremulousness, or desaturations, or complete flaccidity.
- (2) The infant has minimal control over any mild stimulation; he shows eye-rolling, eye-floating, facial-twitching, mild apnea, considerable tremulousness, or spitting up quite easily, or color change or frantic diffuse activity, or flaccidity, or abrupt state changes, and needs to be interacted with very carefully.
- (3) The infant has some control over mild stimulation, may show hiccoughing, color change, motor activity increase, rapid and repeated state change, considerable bowel movement straining and/or urination, or some respiratory unevenness.

- (4) The infant has moderate control over mild stimulation; he may show some hiccoughing, some gaze aversion, some bowel movement straining, or considerable motor increase, or repeated state change.
- (5) The infant has some control over moderate stimulation; he may show some respiratory unevenness, some hiccoughing and gaze aversion, mild bowel movement straining, and some motor increase or mild state change.
- (6) The infant has moderate control over moderate stimulation; he may show slight respiratory unevenness, maybe some hiccoughing, or gaze aversion, only occasional bowel movement straining, and some motor increase or state change up.
- (7) The infant has good control over moderate and possibly even some strong stimulation; he may show considerable sneezing and yawning, mild color change, mild motor arousal or state change, but in general he stays well together.
- (8) The infant has considerable control even over strong stimulation; he may show some transient motor increase or state change but stays well together.
- (9) The infant has good control over all stimulation presented; his adaptations are effective, and he is "on top" of the interaction and maneuvers presented.

NEED FOR FACILITATION AND USE OF STIMULATION

This is a measure of the infant's need for facilitation and ability to make use of the examiner's stimulation to enhance his own organization. Some infants are so fragile that any kind of stimulation is too taxing for them, and they need to be left alone. Other infants can deal with very mild stimulation for short periods, while others, given the appropriate, sensitive facilitation, can improve in organization considerably, even if not for long periods. Some infants are quite well organized on their own, and social interaction brings out the beginnings of real social competence.

SCORING

- (1) The infant cannot tolerate any kind of handling or stimulation; he appears very fragile even when left alone.
- (2) The infant can only poorly tolerate stimulation, and facilitation appropriately consists of maintaining him quietly at a low level.
- (3) The infant will try to shut out most stimulation, yet at some cost to his regulation; his regulation improves with cessation of stimulation.
- (4) The infant can shut out stimulation quite well; he actively tries to stay in low states and usually is successful; or the infant is very disorganized when aroused and it is barely possible to modulate him.
- (5) The infant comes to arousal states and appears very disorganized when he is in the higher states, yet with careful facilitation he can usually be brought down to a more balanced level.
- (6) The infant appears quite disorganized when he comes to higher states, yet with facilitation he can be brought to a quite well organized, balanced level, ~~either for examination and/or~~ and then he may be available for social interaction, ~~for considerable periods briefly.~~
- (7) The infant appears disorganized when in higher states, yet social stimulation and/or facilitation brings him into his own; he is then available at a behavioral level, either for examination and/or social interaction, for considerable periods.
- (8) The infant is quite well organized most of the time; occasionally some facilitation enhances his organization and makes him more actively available to respond to social and inanimate object stimulation to perform in a balanced fashion during other manipulations.
- (9) The infant is well organized; he actively seeks out stimulation to fuel himself and facilitation is not necessary.

Overall Summary Parameter

ATTRACTIVENESS

This is a measure of the infant's overall ~~social~~ behavioral organization referred to as attractiveness. The examiner rates how appealing the infant is to work and interact with. His physical appearance obviously is only a small part of this dimension. More critical is how well organized and integrated the infant stayed during the examination, but also how differentiated, subtle, and engaging he was in his behaviors, and how much positive feedback he gave to the examiner. The examiner needs to reflect on his own reactions to arrive at a rating.

How hard did he have to work to get this infant's best performance? How much did the infant come through for him? Or did the infant, in fact, bring out and enhance the examiner's interactive repertoire? This score, then, reflects a composite of robustness, differentiation, and social engaging.

SCORING

- (1) The infant was very stressed and did not permit any handling or interaction.
- (2) The infant had brief periods of potential availability and organization but on the whole was unavailable for ~~relaxed~~ interaction and was quite stressed much of the time.
- (3) The infant showed some periods of organization and stability, although there was no or only very brief opportunity for relaxed social interaction with much work on the examiner's part.
- (4) The infant showed repeated, although brief, periods of organization and stability, and there may have been some opportunity for social interaction with moderate amount of work on the examiner's part.
- (5) The infant is quite well organized, even if not available for social interaction, or he can be brought to some degree of relaxed social interaction with the examiner's help.
- (6) The infant has good self-organization and/or is appealing when in interaction, yet the examiner has to do much of the stage-setting and facilitating.
- (7) The infant is usually well organized and can be quite engaging in interaction, at least for some periods.
- (8) The infant is well organized, and is generally engaging in social interaction; he can maintain himself for quite some time.
- (9) The infant is always well organized, stable, and modulated; he is always engaging in social interaction and can maintain himself for prolonged periods.

Interfering Variables

This is a measure of the amount of interference from the environment which detracts from an optimal administration on the examiner's part and an optimal performance on the infant's part. Different examiners may be disturbed to differing degrees by the same interferences. The examiner needs to be aware of his own reactivity and his energy expended in shutting out distractions and noxious events. He should use the ideal circumstance of a quiet, dimly lighted room where he can examine the infant without observers, as baseline for his performance. The degree of interfering variables is rated on the cover of each examination.

SCORING

- (1) There was essentially no interference from the environment which would have detracted from the examiner's relaxed comfortable administration of the examination.
- (2) There was some interference from the environment, such as noise from the street or hallway, some less than optimal lighting circumstance or some space constraints.
- (3) There was moderate interference from the environment such as some noise nearby, difficult lighting conditions, other persons watching, and less than optimal space.

- (4) There was considerable interference from the environment, such as considerable noise, interfering lighting, interruptions through extraneous events, other persons watching, and poor space.
- (5) There was massive interference from the environment, such as very interfering noise, or light, several interruptions due to extraneous circumstances, highly anxious parents or interfering observers, and very cramped quarters, etc.

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