

# INFANT BEHAVIORAL ASSESSMENT (IBA) TRAINING MANUAL<sup>®</sup>



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## **Primary Audience**

The material for this manual has been written for special educators, physical and occupational therapists, communication disorder specialists, nurses, pediatricians, social workers, and infant developmental specialists. Experience with neonates or young infants and knowledge of neonatal medicine, infant development, and standardized testing is required of potential examiners who wish to become certified in the administration and clinical use of the Infant Behavioral Assessment (IBA<sup>®</sup>). Training in the administration of the IBA<sup>®</sup> is most well-suited for clinicians who are already skilled in their own pediatric specialty and whose current practice includes intervention with high-risk, medically fragile, or disabled infants and their families. This manual is intended for use by those individuals who have been certified in the administration of the IBA<sup>®</sup> or who are currently receiving instruction in the implementation of this neurobehavioral assessment.

## **Acknowledgements**

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# **NEUROBEHAVIORAL ASSESSMENT AND INTERVENTION**

## NEUROBEHAVIORAL ASSESSMENT AND INTERVENTION

### **Rethinking Traditional Early Intervention**

Early intervention professionals need additional training to support the infant's neuro-behavioral and physiological capacity within the context of developmental assessment and intervention. This means training early intervention professionals and paraprofessionals to learn to: 1) recognize and interpret the unpredictable behavioral cues expressed by these infants; 2) facilitate and validate parental perceptions of the behavioral cues of their infant; 3) present and modulate stimulation in response to the infant's physiologic status; 4) provide the infant with appropriate neurobehavioral support during an assessment, intervention, or care giving session; and 5) translate the infant's behavioral communication system into the development of a neurobehaviorally supportive assessment, intervention, and care giving plan (Hedlund,1998; Hedlund & Notari-Syverson,1997).

New assessment/intervention approaches for infants born with very low/extremely low birth weight or disabilities should incorporate the new directions in service content and delivery that have been called for by those who have been developing and studying direct services over the past years (Brazelton & Greenspan, 2000; Dunst & Trivett, 1996; Hofer, 1987, 1995; Gilkerson & Als, 1995; Neisworth , Bagnato, & Salvia, 1995). These researchers have refocused our attention upon:

#### **1. A Neurobehavioral Perspective**

The core theoretical foundation upon which the Infant Behavioral Assessment<sup>®</sup> is based is the Synactive Model of Newborn Behavioral Organization and Development (Als, 1982). Als' model is formulated upon several principles discerned from various disciplines of development. These include (from Als, 1982, pp.37-42):

- a. The Principle of Phylogenetic and Ontogenetic Adaptedness.** As described by Blurton Jones (1972, 1974, 1976), the organism is seen at any stage in its development as having evolved to competency at that stage, rather than as an imperfect precursor model of later stages. Als (1982, p.39) "sees the human newborn emerging as a biological social partner in a feedback system with the care giver, eliciting and seeking the physiological, motoric,

state, and attentional interaction from the environment that is needed to progress on the course of self-actualization.”

- b. The Principle of Continuous Organism-Environment Interaction.** The key characteristic of the central nervous system, as Palay (1979) has discussed, is the differentiation and development of the CNS that is achieved through interaction with the environment. This begins at the unicellular stage and continues thereafter.
  
- c. Principle of Orthogenesis and Syncretis..** Wherever development occurs, it proceeds from a state of relative globality to a state of increasing differentiation, articulation, and integration. These principles applied to the human newborn has led Sander (1964) to identify the interplay of various subsystems of functioning within the organism. He sees the main task of the newborn as the synchronization of these systems. This then frees the infant up to interact with his environment.
  
- d. Principle of Dual Antagonist Integration** postulates that infants always strive for smoothness of integration, and that underlying this striving is a tension between two basically antagonistic physiological types of responses, the exploratory or reaching out response, and the avoiding or withdrawing response. These responses are differentially called upon depending on the current regulation and stimulation threshold of the child (Denny-Brown, 1962). If stimulation is currently appropriate for the infant in terms of complexity, intensity and timing, it is thought that the infant has strategies available to him to actively move towards that stimulation, take it in, and make use of it for his own development. If stimulation, on the other hand, is currently inappropriate for the infant, the infant is thought to employ strategies to actively avoid, move away from, and defend himself against that stimulation.



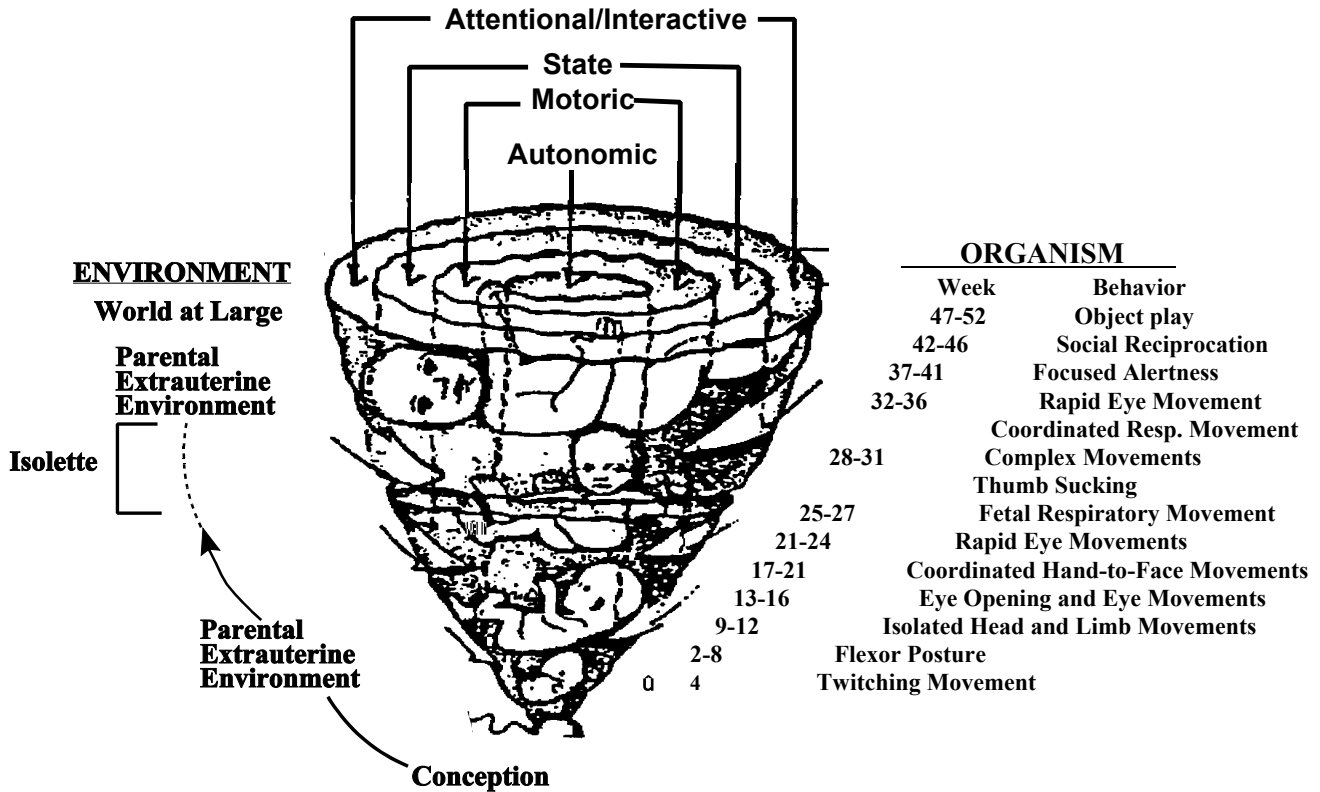
A synthesis of these four principles of development results in the principle of Synaction as conceived and developed by Als (1982, 1986). The principle of Synaction “proposes that development proceeds through the continuous balancing of approach and avoidance behaviors, yielding a spiral potentiation of continuous intraorganism subsystem interaction and differentiation and organism-environment interaction, aimed at bringing about the realization of hierarchically ordered species-unique developmental agenda” (Als, 1982, p. 129).

The synactive model focuses upon the infant's intraorganism subsystems and their continuous interaction with each other and with the environment across time (Figure 1). These three subsystems include the:

- i **Autonomic Subsystem**, expressed in the pattern of respiration, color changes and visceral signals;
- i **Motor Subsystem**, which is expressed through changes in tone, posture and movement; and
- i **State and Attention/Interaction Subsystem**, expressed via the range of states available to the infant, the clarity of any state, and patterns of transition from one state to another. Within the state continuum (i.e., deep sleep, light sleep, drowsy, alert, active alert, hyperalert, and cry) the attention/interaction system emerges. This system is utilized by the infant during an alert state to process cognitive and social information from the environment.

“These subsystems are continuously interacting with one another. Each system influences and supports the other, and/or infringes on the relative stability of the other. The subsystems are at all times interactive with the current environment. The infant actively shapes his own environment by selecting information and by initiating and eliciting action in others. The environment, in turn, constantly provides opportunities and challenges either to be taken or avoided. If the level of input and information is currently appropriate for the infant--so that he maintains balanced and well-regulated behavioral modulation--the infant may effectively take in the information and make it useful for his next developmental step. If, on the other hand, the level and/or intensity of the environmental input is currently inappropriate or poorly timed, the infant has strategies available to defend himself against such input” (Als, 1982, p. 129).

**Figure 1.**  
**Model of the Synactive Organization of Behavioral Development**



*Model of the synactive organization of behavioral development [from Als, H. 1982: with permission].*

Within each of the subsystems is a continuum of behaviors from signs of organization and self-regulatory efforts, to signs of stress and disorganization. Als (1982/1992) has identified specific behaviors utilized by the infant to assist him to move away from or protect himself from stimuli that may be inappropriate for him with respect to complexity, intensity, and/or timing (see Table 2). The infant is also seen to have behavioral strategies that will assist him in his efforts to maintain himself in smooth, well regulated balance, and internal synchronization of subsystems of functioning (see Table 3).

**Table 2**  
**Stress/Disorganization Behaviors**

1. Autonomic and Visceral Disorganization Signals
  - a. Seizures
  - b. Respiratory pauses, irregular respirations, tachypneic bursts
  - c. Gasping
  - d. Color changes to mottled, webbed, pale, cyanotic, dusky, or grey
  - e. Gagging, choking
  - f. Spitting Up
  - g. Hiccoughing
  - h. Straining as if or actually producing a bowel movement
  - i. Gas passing, urinating, defecating
  - j. Twitching
  - k. Tremoring and startling
  - l. Coughing
  - m. Sneezing
  - n. Yawning
  - o. Sighing
2. Motoric Disorganization Signals
  - a. Motoric flaccidity, or "tuning out"
    - 1) Trunkal flaccidity
    - 2) Extremity flaccidity
    - 3) Facial flaccidity
    - 4) Gaping mouth; tongue protrusion
  - b. Motoric hypertonicity
    - 1) With hyperextensions of:
      - Legs and feet: sitting on air, leg bracing, leg extensions, toe splaying
      - Arms and hands: airplaning, saluting, finger splaying
      - Trunk and head: arching opisthotonus, head extension
      - Face: facial grimacing, tongue extensions
    - 2) With hyperflexions of:
      - Trunk and extremities: fetal tuck, fisting, high-guard arm position
  - c. Frantic, diffuse activity, squirming, flailing
  - d. Motoric drowning-like struggles (stretch drown: trunkal extend-flex alternations)
3. State-Related Disorganization Signals
  - a. Diffuse sleep, awake or aroused states with whimper-like sounds, facial twitches and discharge smiling
  - b. Floating and roving or darting eye movements
  - c. Strained fussing or crying; silent crying
  - d. Staring
  - e. Active averting
  - f. Panicked or worried alertness; hyperalertness
  - g. Glassy-eyed, strained alertness; lidded, diffuse alertness
  - h. Rapid state oscillations; frequent abrupt buildup to arousal
  - i. Irritability and prolonged diffuse arousal and shift to diffuse sleep
  - j. Crying
  - k. Frenzy and inconsolability
  - l. Sleeplessness and restlessness

**Table 3**  
**Approach and Self-Regulatory Behaviors**

1. Autonomic Stability
  - a. Smooth respiration
  - b. Pink, stable color
  - c. Stable viscera
  
2. Motoric Stability
  - a. Smooth, well-modulated posture
  - b. Well regulated tone throughout trunk, extremities and face
  - c. Synchronous, smooth movements with efficient modulated motoric strategies, such as hand clasping, foot clasping, finger folding, hand-to-mouth maneuvers, grasping, holding on, searching to suck and suckling, hand holding, and tucking together
  
3. State Stability and Attentional Regulation
  - a. Clear, robust sleep states
  - b. Rhythmical robust crying
  - c. Effective self-quieting
  - d. Reliable consolability
  - e. Robust, focused, shiny-eyed alertness with modulatedly intent and/or animated facial expression: frowning, cheek softening, mouth pursing to ooh-face, cooing, smiling

Als, 1992

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“Approach and self-regulatory behaviors may shift and become stress behaviors; the same behaviors, when successful in reducing stress, may serve as self-regulatory strategies. For example, a hand on the face and mouthing may represent stability for the very young infant, yet if overly frequent, these behaviors may indicate stress or disorganization. As a general rule, extension behaviors are thought to reflect stress, and flexion behaviors are thought to reflect self-regulatory competence. Diffuse behaviors are thought to reflect stress and effort, and well-defined behaviors are thought to reflect regulatory balance and restfulness. Self-regulatory balance is reflected by the presence of regular respiration, pink color, a stable visceral system, smooth movements, modulated tone, softly flexed posture, and steady sleep and awake states” (Als,1999, p. 59).

## **2. A Brain-Environment Interaction Perspective**

The White House Conference on Early Childhood Development and Learning: What New Research on the Brain Tells us About Our Youngest Children (1997) has dramatically underscored the results of recent brain research. This research has demonstrated the critical role that early experience plays in the organization and growth of the evolving brain (Shore, 1997). Early interactions have a decisive impact on the architecture of the brain, the nature and extent of adult capacities, and directly effects the formation of dendritic-axonal interconnections (i.e., synapses) that develop over the course of the child's first three years of life (Chugani, 1997; Rakic , Bourgeois, & Goldman-Rakic, 1994). Support for infants with very low/extremely low birth weight or disabilities must combine knowledge of the evolving dynamic brain with knowledge of neurobehavioral developmental progression (Als, 1997a, 1999; Duffy, Jones, McAnulty, & Albert, 1995).

## **3. A Parent-Infant Interaction Perspective**

The formation of an enduring attachment relationship (Bowlby, 1969) between parent and infant appears to be directly affected by the mutual social regulation between partners in the dyad (Brazelton & Greenspan, 2000; Bretherton, 1991, Stern, 1995). Lyons-Ruth and Zeanah, Jr. (1993, p.20) state that “the infant’s sense of security may result from adequate homeostatic regulation within the care giving relationship, with the earliest form of “security of attachment” encoded physiologically in the experience of non-disruptive and need-satisfying neurobehavioral regulation of early states.”

## **4. A Child-Responsive Intervention Perspective**

Infants are seen as continuously and actively self-constructing (Fischer & Rose, 1994). The task of assessment and intervention then becomes one of collaboration and child-direction (McLean & Odom, 1993). By accurately interpreting the infant's behavior, one can construct an appropriate environment for assessment and intervention (Als, 1999; Campbell, 1991; Neisworth, Bagnato, & Salvia, 1995).

**5. A Social-Interactionist Perspective (Vygotsky, 1930/1960/1978).** The notion of dynamic assessment and intervention is based upon Vygotsky's (1934/1986) conceptualization of the "zone of proximal development." Through the process of dynamic assessment and intervention the task of the professional is to identify how the infant independently attempts to achieve mastery on a task, and how the infant's performance can best be facilitated through the use of "scaffolding" techniques to support the self-regulatory efforts and competence of the child (Wood, Bruner, & Ross, 1976).

### **Goals of Neurobehavioral Intervention**

Neurobehavioral intervention as advocated by Als (1997a/b, 1999) and our past and present work (Hedlund, 1998; Hedlund & Notari-Syverson, 1997; Hedlund & Tatarka, 1988) addresses the needs of growing numbers of infants, newborn through six months developmental age, who are born with very low birth weight or at risk for poor long-term neurodevelopmental outcomes. The main goals of this approach are to:

- 1. Support early intervention professionals to read and interpret the infant's behavioral story.** This is accomplished through training in the administration of the Infant Behavioral Assessment (IBA<sup>®</sup>). Through these clinical observations the infant's neurobehavioral organization and self-regulatory competence is evaluated. A decision can then be made with respect to the degree and quantity of neurobehavioral support that the infant is seeking (Vygotsky, 1930/1960/1978; 1934/1986).
- 2. Translate the infant's behavioral story into appropriate neurobehavioral and developmental facilitation** by selecting and implementing the neurobehavioral facilitation strategies (see Neurobehavioral Curriculum for Early Intervention) that best support the infant during an assessment/intervention session (Hedlund, 1988). These strategies assist professionals to conduct developmental assessments and implement therapeutic, educational, and care giving intervention that supports the neurophysiological/state organizational system of the child. Through this process the infant is individually supported in his efforts to engage in, and be engaged by the environment, thus enhancing the child's growth and development.

**3. Validate and support parental perceptions of their growing developing infant.** The approach offered in  Holding Parents Holding Their Baby<sup>®</sup> (Hedlund & Notari-Syverson, 1997) significantly differs from the current “train the parent model” implemented in many traditional early intervention programs today. Drawing upon the work of Winnicott (1964/1987; 1965/1994; 1966/1987), the materials included in this manual reflect a philosophy guided by the recognition of, and a respect for, what comes naturally to parents as they love and care for their baby. It serves to support parents as they continue to explore ways to adjust and adapt themselves to the neurobehavioral organization and self-regulatory competence of their child.

**4. Bring about a shift from** a protocol-based approach (i.e., curriculum bound) to process thinking (i.e., how to facilitate learning and social interaction), and from an agenda oriented perspective (i.e., mastery of developmental milestones) to relationship-based developmental intervention (Als & Gilkerson, 1997; Gilkerson & Als, 1995, Hedlund, 1998).

# **THE INFANT BEHAVIORAL ASSESSMENT (IBA<sup>®</sup>)**





## THE INFANT BEHAVIORAL ASSESSMENT (IBA<sup>©</sup>)

### The Avenues of Communication and Categories of Behavior

Drawing upon Als' (1984, 1986) conceptualization of the Synactive Model, Hedlund and Tatarka (1988) have further articulated this theoretical construct. The Infant Behavioral Assessment (IBA<sup>©</sup>) identifies four intraorganism subsystems. These include the autonomic, motor, state, and attention/interaction subsystems. These subsystems are seen as "avenues of communication." The infant utilizes behaviors within each of the four subsystems to: 1) engage in the exploration and processing of cognitive and social-emotional information; 2) stabilize himself during this process of engagement, or defend himself by momentarily breaking the intensity of the interaction; or 3) remove himself from environmental/social stimuli by terminating the interaction. Three categories of communicative behaviors have been identified. These include:

- i **Approach** behaviors. These may be interpreted to indicate that the sensory input that is being received by the infant matches his readiness to process and to make sense of the information. The infant is saying "I am actively engaged and enjoying this interaction."
  
- i **Self-Regulatory** behaviors. These may be interpreted to be those strategies that the infant uses to maintain a balanced, relatively stable state across and among all four subsystems or to return to such a state of balance. The infant uses self-regulatory behaviors as a means to:
  - a) Concentrate, process, and learn from the stimuli that is offered to him. For example, if the infant is presented with a toy in midline to visually explore, the infant may call upon a self-regulatory behavior (e.g., Hand to Mouth, or Bracing, or Holding On) to assist him to concentrate on and process the information (the toy) that is being presented to him.

b) Cope, “hold on,” or contend with a presented stimulus or developmental task. Self-regulation, utilized as a coping strategy, will assist the infant to continue to maintain a balanced, relatively stable state across and among all four subsystems while simultaneously attending to a presented task. Drawing from the example above, the infant is now asked to visually track the toy as it is moved from side to side, across his horizontal visual field (a more challenging and demanding task). The infant may now simultaneously call upon several self-regulatory strategies within his behavioral repertoire (e.g., he may need to bring his Hand to Mouth to suck on, Brace with his feet into a supporting surface, and Hold On to his own clothing with his other hand) and/or seek additional co-regulatory support from the adult (e.g., a change in position, or assistance in maintaining his Hand to Mouth) in an attempt to cope or contend with the increased difficulty of the task. This should suggest to the interventionist that the task at hand may be challenging for the infant and any increased demands (e.g., initiation of vertical/diagonal visual tracking) or input offered to him (e.g., speaking to the infant during the task) may cause the infant to become upset.

c) Console himself, if pushed beyond his input threshold, in an attempt to regain a state of neurophysiological subsystem balance. Again using the scenario provided above, the interventionists now speaks to the infant, encouraging him as he is tracking the object across his horizontal visual field. Though this audio input may be meant as a support to assist or encourage the infant to continue with the task, the interventionist’s voice may be too much for the infant to process simultaneously and thus lead to the expression of stress behaviors. The infant may now use self-regulatory strategies (e.g., Hand to Mouth) as a means of consoling or comforting himself, in attempt to bring himself down from an agitated state of fussing or crying.

- i **Stress** behaviors. These behaviors indicate that the sensory input the child is receiving is too intense, too frequent, too long, or too complex. The infant is saying “I need some time out from this interaction,” or “I’m not ready for this level of information right now.”

These three categories of behavioral cues reflect both the infant's response to sensory input and the integrity of the four subsystems. Although behaviors are categorized as approach, self-regulatory or stress, their interpretation may vary depending upon the manner in which the infant utilizes them. Each behavior may be viewed as part of a continuum. "Approach and self-regulatory behaviors can shift over and become stress behaviors, and some stress behaviors are successful in reducing stress and therewith become self-regulatory strategies" (Als, 1997a, p.59). For example: what commonly may be interpreted as a stress behavior (e.g., Shoulder Retraction) may be used as a self-regulatory strategy by some infants; while other infants may persistently utilize a self-regulatory behavior (e.g., Foot Bracing) in an increasingly ineffective, frantic manner and thus it would be interpreted as an indicator of stress and disorganization.

In general, the greater the degree of the infant's self-regulatory capacity, the more likely one is to observe approach behaviors. Infants who are neurophysiologically disorganized often make weak or unsuccessful attempts at self-regulation; or they may be more apt to display stress behaviors in an attempt to terminate an interaction that may be infringing upon their neurophysiological integrity and self-regulatory competence. The behaviors have been classified by the authors into categories (i.e., approach, self-regulatory, stress) across each of the four subsystems or "avenues of communication" (i.e., autonomic, motor, state, attention/interaction). Table 4 summarizes this a priori classification.

**Table 4**  
**INFANT COMMUNICATION BEHAVIORS**

<b>APPROACH</b>		<b>SELF-REGULATORY</b>	<b>STRESS</b>
<b>I. <u>AUTONOMIC/VISCERAL</u></b>			
<b>Color:</b>	Pink		Mottled Pale Red Dusky
<b>Respiration:</b>	Stable	Yawn Sigh Irregular Sneeze Cough	Hiccough Gasp Pause
<b>Visceral:</b>	Stable	Burp	Spit-up BM Grunt Gag Elimination Vomit
<b>Neurophysiological:</b>	Stable		Tremor Twitch Startle Seizure
<b>II. <u>MOTOR</u></b>			
<b>Head:</b>	Orients	Lowering Headshake	Maximal Head Turn
<b>Trunk/Extremities:</b>	Well-Regulated Tone Stilling	Tuck Immobility	Squirm Pull Away Flaccid Arching
<b>Arms:</b>	Reach Well-Regulated Tone Smooth Movement	Arm over Face ATNR	Stop Bow Airplane Flaccid Straighten w/ Tension Shoulder Retraction
<b>Hands:</b>	Grasp Resting	Holding On Hand to Midline Hand to Mouth Groping Hand on Stomach Self-Clasp Hand on Head	Finger Extension Finger Splay Fisting

	<b>APPROACH</b>	<b>SELF-REGULATORY</b>	<b>STRESS</b>
<b>Legs:</b>	Well-Regulated Tone Smooth Movement	Bracing Toe Grasp Foot Clasp	Toe Splay Flaccid Sitting on Air Straighten w/Tension
<b>III. <u>STATE</u></b>	Interactive Alert	Drowsy Diffuse Alert Alert	Deep Sleep Light Sleep Active Alert Hyperalert Cry
<b>IV. <u>ATTENTION/INTERACTION</u></b>			
<b>Eyes:</b>	Facing Gaze Directed Gaze Brow Raising	Animate Locking Inanimate Locking Hand Gaze Gaze Aversion Brow Lowering Blink	Clench Upward Gaze
<b>Expression:</b>	Smile Ooh Face Facial Brightening	Sober Lip Compression Wary Frown Pout	Grimace Ugh Face Gape Face Cry Face
<b>Oral:</b>	Neutral	Sucking Mouthing Tongue Show Suck Search	Drooling Tongue Extension Jaw Extension
<b>Vocal:</b>	Pleasurable	Undifferentiated	Protest

## **Description of the Infant Behavioral Assessment (IBA<sup>®</sup>)**

The Infant Behavioral Assessment (Appendix A) is a time sampling of infant communicative behaviors that is intended primarily for clinical use. It includes behaviors from the Naturalistic Observation of Newborn Behaviors (Als, 1984) and the Manual for the Assessment of Preterm Infants' Behavior (Als, Lester, Tronick, Brazelton, 1982) as well as more mature behaviors that have been described by Barnard (1978a, 1978b, 1978c, 1979) and Brazelton (1984). Behaviors observed by the authors in their work with high risk, developmentally delayed and drug- /alcohol-exposed infants are also included. One hundred and thirteen discrete behaviors are operationally defined. The behaviors are categorized according to the four subsystems: 26 autonomic/visceral cues, 44 motor responses, 9 state categories, and 34 attention/interaction cues.

Within each of the four subsystems, the behaviors array along a continuum of responses from engagement (approach) to disengagement (stress). Positioned between approach and stress behaviors are the self-regulatory behaviors. The infant may utilize self-regulatory behaviors to: 1) sustain attention and maintain an interaction (e.g., concentration); or 2) to “hold on” or utilize self-regulatory strategies to “cope” with a more challenging interaction; or 3) return to subsystem stability (e.g., console). The presence of these behaviors have implications for both assessment and intervention. Approach and self-regulatory behaviors indicate that the infant is tolerating input from the environment and is able to learn from these experiences. A predominance of stress behaviors, on the other hand, signals the examiner that the infant's tolerance has been exceeded, and alerts the interventionist to alter the intensity of the input. Self-regulatory behaviors may guide the interventionist in specific techniques of co-regulatory support (e.g., facilitation of the infant's foot bracing or hand groping efforts).

Following the observation of a brief “live” or videotaped sample of an infant's behavioral repertoire, the rater scores the IBA<sup>®</sup> by noting the occurrence of the three categories of behaviors emanating from the autonomic, motor, state, and attention/interaction subsystems. In this way the interventionist may systematically identify the infant's behavioral responses to assessment or intervention sessions, social interactions, or care giving events. Based upon the observation, the interventionist develops guidelines and strategies to minimize the infant's stress, to facilitate

attention and interaction, and to support the infant's attempts at self-regulation. Moreover, the rater gains an understanding of the infant's unique behavioral repertoire and the infant's capacity to tolerate and respond to the environment.

## **Purposes and Uses**

### ***Populations***

Instruction in the administration of the IBA<sup>®</sup> and training in the application of appropriate intervention strategies enable interventionists and care givers to adapt their own interactional styles in response to the neurophysiologic and organizational needs of the infant as he or she matures over time. The role of the care giver or interventionist gradually changes as the infant matures. Initially, appropriate forms of stimuli are introduced and phased into the infant's ongoing cycles of behavior. As the infant matures however, he may assume a more equal and reciprocal role in the interactions, and may be able to initiate and maintain interactive episodes (Mahoney, 1983).

The IBA<sup>®</sup> may be used to observe infants from birth through 6 months of age who are medically fragile, high risk, developmentally delayed, neurologically impaired, or drug-/alcohol- exposed. In the case of infants who were born prematurely, the observation is based upon the infant's corrected or adjusted age. The IBA<sup>®</sup> may also be useful with older infants whose neurological impairment or developmental delay suggest associated CNS functioning within the birth-to-six month range (Guess & Horner, 1978), due to the mediating influence of the central nervous system in human behavioral responses (Lipsitt, 1986).

### ***Clinical Uses***

The IBA<sup>®</sup> focuses upon the behavioral or communicative repertoire of the infant by identifying specific approach, stress, and self-regulatory behaviors observed during the course of an interaction. For all clinical applications, it is recommended that the IBA<sup>®</sup> be administered over successive sessions to partially control for the variability of infant behavioral responses and the possible effect of external factors. Three major clinical uses of the IBA<sup>®</sup> have been identified:

- 1. To provide an objective measure of an infant's neurobehavioral organization to:**
  - a. Monitor the infant's neurobehavioral maturation.
  - b. Quantify his/her increasing tolerance for interaction or intervention.
  - c. Ascertain the effectiveness of strategies for supporting the infant's organizational capacities.
  - d. Highlight the maturation of underlying subsystems that precede and support an infant's ability to later attain typical developmental milestones.
  
- 2. To increase the interventionist's awareness of an infant's communicative behaviors to:**
  - a. Analyze the effect of his/her own actions upon the infant's neurobehavioral organization.
  - b. Guide in the choice of interventions to support the infant's organization.
  - c. Grade the duration, timing, frequency and intensity of her interactions with an infant.
  - d. Plan family goals and objectives that will ensure parental success when interacting with the child.
  
- 3. To provide a framework for parent support to:**
  - a. Assist parents to recognize and appreciate the communication avenues and behaviors available to their baby.
  - b. Foster the parents' appreciation and facilitation of the approach and self-regulatory capacity of the baby.
  - c. Enhance the quality of parent-infant interactions by highlighting and building upon the strengths of each partner in the dyad.

## **Interpretation of Results**

### ***The Behavior Narrative***

Once the observation has been completed, a descriptive narrative of the observational episode is written (Appendix B contains an example of an IBA<sup>®</sup> Behavioral Narrative). While the observation itself will yield discrete information, other information known about the infant or care giver from past or present incidental observations, previous IBAs, or parent report should be utilized in formulating recommendations. New examiners are cautioned against over-interpreting individual behaviors or isolated observations. Repeated observations improve the validity of the IBA<sup>®</sup> as a measure of an infant's competence. The goal of the behavioral narrative is to build upon the strengths of both the care giver and the infant. In contrast to a deficit model of reporting, every effort is made to keep the tone of the behavioral narrative positive.



# **APPENDIX A**

## **The Infant Behavioral Assessment<sup>©</sup>**

# Infant Behavioral Assessment (IBA)

Observer: \_\_\_\_\_

Child: \_\_\_\_\_

Birthdate: \_\_\_\_\_

Gestational Age: \_\_\_\_\_

Observation #: 1 2 3 4

Dates: \_\_\_\_\_

AUTONOMIC / VISCERAL						MOTOR				STATE							
<b>Color</b>	Pink					<b>Arms</b>	Reach						Active Alert				
	Mottled						Well-Regulated Tone						Hyperalert				
	Pale						Smooth Movement						Cry				
	Red						Arm Over Face					<b>ATTENTION / INTERACTION</b>					
	Dusky						ATNR					<b>Eyes</b>	Facing Gaze				
<b>Respiration</b>	*Stable					Stop					Directed Gaze						
	Yawn					Bow					Brow Raising						
	Sigh					Airplane					Animate Locking						
	Irregular					Flaccid					Inanimate Locking						
	Sneeze					Straighten w/Tension					Hand Gaze						
	Cough					Shoulder Retraction					Gaze Aversion						
	Hiccough					<b>Hands</b>	Grasp						Brow Lowering				
	Gasp						Resting						Blink				
Pause					Holding On						Clench						
<b>Visceral</b>	*Stable						Hand to Midline					Upward Gaze					
	Burp					Hand to Mouth					<b>Expression</b>	Smile					
	Spit Up					Groping						Ooh Face					
	BM Grunt					Hand on Stomach						Facial Brightening					
	Gag					Self-Clasp						Sober					
	Elimination					Hand on Head						Lip Compression					
	Vomit					Finger Extension						Wary					
<b>Neurophysiological</b>	*Stable					Finger Splay						Frown					
	Tremor					Fisting					Pout						
	Twitch					<b>Legs</b>	Well-Regulated Tone					Grimace					
	Startle						Smooth Movement					Ugh Face					
	Seizure						Bracing					Gape Face					
<b>MOTOR</b>	<b>Head</b>	Orients						Toe Grasp					Cry Face				
		Lowering						Foot Clasp					<b>Oral</b>	*Neutral			
		Headshake					Toe Splay					Sucking					
		Maximal Head Turn					Flaccid					Mouthing					
		<b>Trunk/Extremities</b>	Well-Regulated Tone					Sitting on Air						Tongue Show			
Stilling						Straighten w/Tension					Suck Search						
Tuck						<b>STATE</b>				Dropoling							
Immobility						Deep Sleep					Tongue Extension						
Squirm						Light Sleep					Jaw Extension						
Pull Away					Drowsy					<b>Vocal</b>	Pleasurable						
Flaccid					Diffuse Alert						Undifferentiated						
Arching					Alert						Protest						
					Interactive Alert												

# **APPENDIX B**

## **IBA<sup>®</sup> Behavioral Narrative Example**

# **IBA<sup>®</sup> Behavioral Narrative Example**

## **Jonathan's Behavioral Story**

**Child's Name:** Jonathan Smith**Date:** September 30, 2002

### **Introduction**

Jonathan was observed in his home today as part of a scheduled developmental visit. This observation was conducted to support Jonathan's continuing development and to meet the requirements of the training provided by the Infant Behavioral and Assessment and Intervention Program (IBAIP<sup>®</sup>). The observation took place on September 30, 2002 between approximately 10:30-11:30 AM, while Michelle Jones, an infant developmental specialist, engaged Jonathan in several social and toy games. Mrs. Smith, and Mary Darcy, a physical therapist, were present during the observation.

### **The Observation**

#### **Background Information**

Jonathan was born on June 22, 2002 at approximately 25 weeks of pregnancy to his 22 year old mother. He has one sister, Beth, who is now four years of age. Mr. and Mrs. Smith live in Yakima, Washington. Jonathan's expected birth date was October 1, 2002. Four weeks prior to delivery Mrs. Smith reported intermittent spotting and cramping. Approximately one week prior to delivery Jonathan's mother reported premature contractions. She was given a drug (Brethine) to help stop preterm labor and this appeared to be effective. On June 21, 2002 Mrs. Smith reported increased bleeding and severe cramping. Upon vaginal exam at Yakima County Hospital, Mrs. Smith was completely dilated and delivery was imminent. Once Jonathan was born, the family was advised that he would not live and resuscitation efforts were not attempted. Approximately four and one-half hours later Jonathan was still breathing and moving. His parents insisted that he be transferred to Children's Hospital in Seattle for further evaluation and care. Jonathan was transferred via mediflight to Children's Hospital. He was placed under a plastic dome shaped hood (oxygen hood) and received 30% oxygen as well as antibiotics (Gentamicin, Ampicillin), to treat the possibility of a general infection in his blood (Sepsis). After a few hours, pauses in his breathing (apnea) were observed. Additional oxygen was delivered to him through clear plastic tubes (nasal cannula) that were positioned within his nostrils and held in place with soft plastic tape. A drug (Caffeine) was also given to Jonathan to assist him in his breathing efforts and heart rate. A small plastic tube was inserted into a vein in Jonathan's naval (umbilical venous catheter). This tube delivered nourishment and medication to Jonathan. He was also placed under special bright lights (bili lights) to treat jaundice, a liver condition that causes the skin to have yellowish tinge.

Jonathan's APGAR scores, a measure of infant well being at birth, were 3 at one minute, 3 at five minutes, and 4 at ten minutes; out of a possible score of 10. At birth Jonathan weighed approximately one pound and five ounces (582 grams); he was about 13 inches tall (32 centimeters); and his head measured about eight inches around (21 centimeters). This means that for every 100 infants born at 25 weeks of pregnancy, Jonathan weighed more than 9 of them (at about the 10<sup>th</sup> percentile) was taller than 48 of them (just under the 50<sup>th</sup> percentile); and his head was smaller than all of them (under the 3<sup>rd</sup> percentile).

Jonathan was discharged from the hospital on September 2, 2002. Prior to going home a special x-ray (head ultrasound) showed that some blood had seeped into his brain (grade III IVH). An eye exam on August 29 revealed that Jonathan has Stage I, Retinopathy of Prematurity (ROP), in both of his eyes. This is a disease that affects the retinas of the eyes and involves the rapid and irregular growth of blood vessels in the retina. Jonathan is enrolled in a special ROP study at Children's Hospital and will be assessed on a regular basis by his doctor in Yakima. Jonathan and his family were referred to the Yakima Valley Birth to Three Early Intervention Program just prior to his discharge home. He began receiving services from this program two weeks after his arrival home.

Jonathan is now 14 weeks and two days old, which is 39 weeks, 2 days of pregnancy. At his last visit with the pediatrician on Thursday, September 27, 2002, Jonathan weighed five pounds and four ounces which is less than the 3<sup>rd</sup> percentile of growth. This means that for every 100 babies born at approximately 39 weeks, he currently weighs less than all of them. Mrs. Smith reports that Jonathan's breathing monitor alarmed two times during the past day. Jonathan receives two medicines to help with his digestion (reglan and bethanichol). A recent eye exam revealed that Jonathan's eye disease (ROP) has remained stable and may be improving. Mrs. Smith reports that she is becoming more comfortable with Jonathan's care and nightly feedings. Mr. Smith is participating in some of the night feedings. Mrs. Smith says that her husband is very good at helping Jonathan return to sleep after these early morning feedings, as he often sings and gently rocks Jonathan in his arms. This appears to help Jonathan drift back down into sleep. According to his mother, Jonathan has several periods of wakefulness during the day. Usually after his feedings he likes to engage in brief social interactions (i.e., looking up into his mothers face as she softly speaks to him) and appears to be interested in looking around at all the people and things in the room. Mrs. Smith has expressed some concern over Beth's adjustment to Jonathan's recent appearance within the home. Mrs. Smith reports that she and her husband are working on ways to help Beth have her own "special time" with her mother and father.

## **The Environment**

Jonathan's home is located in a quiet neighborhood, shaded by large maple trees. Mrs. Smith greeted us at the door, inviting us to come in. From the entryway we entered the living room, a rectangular room comfortably furnished with a couch, large overstuffed chairs, and tables at each end of the couch. The coffee table in front of the couch held some of Jonathan's toys and medicine. The house was quiet when we entered, with soft music coming from the radio in the kitchen. Occasionally the barking of a neighborhood dog could be heard outside in the distance. Mr. Smith and Beth had gone to the store. The living room was softly lit, with two small table lamps and indirect lighting streaming in from a window at the far end of the living room. The room was comfortably heated and the smell of the morning's breakfast lingered in the air.

Jonathan's soft comfortable day-bed was positioned at one end of the couch. Jonathan was sleeping comfortably on his back. A small blanket roll was positioned at the foot of his bed. Mrs. Smith reports that Jonathan actively pushes up against this with his feet. This appears to support Jonathan's efforts to help him transition down into sleep. Jonathan wore a hat and one piece outfit. A soft blanket rested upon him. Two soft discs on his chest were attached to two wires that led to a machine next to his bed. This machine monitors Jonathan's breathing and heart rate.

### **Before the Observation**

Mrs. Smith said that Jonathan had been sleeping for the last three hours. She indicated that it was time to wake him up so that we could play with him, and then it would be time for his bottle. She gently lifted Jonathan out of his bed as she softly spoke to him. Jonathan began to awaken as he yawned and began to briefly peek out at his mother from underneath his semi-closed eye lids. He then began to squirm and stretched his arms and legs out away from his body as Mrs. Smith positioned him within the warm comfort of her arms. Mrs. Smith continued to softly speak to Jonathan as he became increasingly awake, looking up into his mother's face and then, at times, briefly looking away. Jonathan stretched his legs out away from his body and Mrs. Smith quite intuitively readjusted her cradling position so that he could push his feet in to the inside portion of her arm (Jonathan's mother reports that he often searches for support to brace his feet against). Jonathan, now awake, made some mouthing movements and his mother quite naturally offered him a pacifier, which he immediately accepted. Mrs. Smith sat down on the couch with Michelle who had spread a soft blanket out upon her lap, and had arranged several infant toys next to her. Jonathan's mother then gently laid Jonathan down on his back in Michelle's lap. Jonathan's cheeks were slightly pale and a purplish-blue tinge appeared around his mouth and eyes as Jonathan gave a big sigh. Michelle loosely swaddled the blanket around Jonathan with his arms and hands free. Jonathan began to stretch his arms out away from his body. Michelle gently contained Jonathan's hands within one of her own and positioned them down upon his chest. Jonathan began groping onto his clothing with his hands and then finally held on to his one-piece outfit. Michelle then repositioned Jonathan so that he could push his feet against her upper body. He effectively made use of this support. Jonathan made a few soft grunting sounds and then looked up into Michelle's face. Michelle smiled at him. Jonathan briefly looked away and then returned her gaze. His breathing alternated between a slow to moderate rate.

### **During the Observation**

Michelle began to smile and softly speak to Jonathan. He at first, gazed up into Michelle's face, and seemed to be focusing his attention upon her mouth, as she spoke to him. Jonathan then looked up into Michelle's eyes. He raised his eyebrows and a small fleeting smile appeared across his mouth. Jonathan then looked away, but after a brief moment, returned her gaze as she continued to speak to him. Michelle reported that she could feel Jonathan pushing with his feet against her body. Jonathan then turned his head to the side and stretched both of his arms up into the air. His breathing rate seemed to increase as he began to squirm. He pulled his arms back with his hands coming to rest up near his head. Jonathan became increasingly red as he grimaced and made low grunting sounds of protest. Mrs. Smith indicated that Jonathan sometimes had difficulty making transitions from one position to the next. Michelle placed a blanket roll at Jonathan's feet to provide a firmer bracing support. She then brought his hands down to his chest and gently maintained them there with her hand. Jonathan, began to settle, and again returned his gaze to

Michelle's face. Michelle, without speaking, slowly moved her head and face from the center of Jonathan's body to his left side. Jonathan followed her face with his eyes, briefly looking away, but then visually recapturing her face. Michelle then moved her face to Jonathan's right side and he again briefly followed it with his eyes. As Michelle returned her face to the midline of his body, Jonathan again began to squirm and arch his back; his breathing rate increased; and his face became increasingly pale. Michelle picked Jonathan up and cradled him in her arms. Jonathan began to settle and nuzzle into the support offered by this cradled position. Mrs. Smith commented that this was Jonathan's favorite position: "It seems to offer him more of sense of security, to have the boundaries provided by your arms and body." As Michelle continued to support Jonathan in this manner she asked Mrs. Smith to show Jonathan a rattle. Jonathan looked up at the rattle as his mother softly shook it, he then looked at his mother, and then returned his gaze to the rattle. His hands were open with his fingers slightly flexed. Jonathan appeared at times to make attempts to grasp onto the blanket that he was swaddled in. Michelle placed one of the blanket edges into his hands and Jonathan held on. Jonathan continued to look between the rattle and his mother. Mrs. Smith began to gently shake and move the rattle from one side to the next as Jonathan attempted to briefly follow these excursions. Mrs. Smith set the rattle down and softly spoke to Jonathan. Jonathan looked up into his mother's face and made soft sounds of pleasure. Both he and his mother appeared to be enjoying this time together. As Mrs. Smith continued to smile and speak to Jonathan he seemed to become more animated. As he raised his eyebrows and cheeks, two brief smiles appeared across his mouth. He then began to make mouthing movements and his mother offered him his pacifier. Jonathan began to suck on it. It then fell from his mouth. This seemed to upset him as he began to squirm, arch his back, and firmly push with his feet into the inner part of Michelle's arm. Mrs. Smith commented that she thought he may be hungry and left the room to prepare his bottle. Michelle offered Jonathan the pacifier and gently held it at his mouth. Jonathan latched on to it and began to suck vigorously. Jonathan then grasped onto Michelle's hand, and held on. He breathed more regularly and appeared to relax as a more pinkish color returned to his cheeks. Michelle held Jonathan quietly in her arms, as his mother returned with his bottle.

### **After the Observation**

Michelle gently placed Jonathan into Mrs. Smith's arms. Mrs. Smith sat down on the couch, removed the pacifier from Jonathan's mouth and offered him the nipple of the bottle. Jonathan latched on to the nipple and began to suck. He closed his eyes as if he were concentrating on the task of drinking from his bottle. His cheeks became somewhat pale and a bluish tinge appeared around his eyes and mouth. He appeared to breathe unevenly at times, sometimes fast and at other times slow. After a few minutes Mrs. Smith removed the bottle from his mouth, softly dabbed his mouth with a soft cloth, and then positioned Jonathan over her shoulder to burp him. Jonathan made some soft grunting sounds, squirmed, and then brought his hand up to his face, as he expelled an audible burp. Mrs. Smith gently rubbed his back and commented on the fact that he was, for the most part, "a pretty good eater." Towards the end of the feeding, lasting approximately 20 minutes, Jonathan's forehead and cheeks were pale and he continued to make soft grunting sounds. His arms lay at his sides with little energy as he drifted down into sleep.

### **Behavioral Summary Statement and Identified Goals**

From this behavioral observation, Jonathan appears to be quite comfortable in his new home environment and is well supported by the natural, intuitive care that is provided by his mother and father. He makes many efforts to support himself during social and care giving interactions, including: bracing with his feet into a supportive surface; sucking upon his pacifier;

grasping and holding on to his blanket and or a proffered hand/finger. He is very much interested in engaging in brief social and toy interactions. At times these may become somewhat challenging for him. His sensitivity is expressed in: the paling of his cheeks/forehead and the appearance of a purplish-blue tinge around his eyes and/or mouth; his breathing pattern, as at times, it becomes somewhat uneven (at times fast, at other times slow); the stretching of his arms and legs out away from his body; and the occasional arching of his back. Feeding seems to continue to require much of Jonathan's energy, as observed by his pale face and lack of energy in his arms at the conclusion of his feeding. Jonathan appears to be working toward more robust and steady breathing; conserving and maintaining energy for the duration of feeding; graded social and toy play; and increasingly effective use of self-comforting/consoling behaviors (i.e., bringing his hands to his chest/tummy, grasping, holding on, foot bracing efforts, sucking, and occasional efforts to bring his hands to his mouth). Mrs. Smith quite naturally provides Jonathan with the support that he requests through the expression of his own special "body language." Both mother and child appear to be completely attuned to each other and enjoy their daily interactions.

### **Recommendations**

The following recommendations are made to continue to support Jonathan development and behavioral organization:

1. Continue to provide a quiet area for Jonathan to rest. This may help to support his efforts to conserve energy.
2. Continue to provide Jonathan with a deep, softly made bed. The blanket rolls placed at the end of his bed appear to support his foot bracing attempts and help him settle into sleep.
3. Continue to dress Jonathan in soft comfortable clothing.
4. Continue to support Jonathan's desire to hold on to an object (i.e., the blanket he may be swaddled in; his own clothing) or a hand/finger that is offered to him. He appears to use this to "organize around," or self-comfort/console.
5. Continue to be aware of Jonathan's cues that signal that he may need a break or "time-out" from a social/toy interaction or care giving event (i.e., the stretching of his arms/legs out away from his body; color changes to pale; the arching of his back; or squirming).
6. During feeding time, continue cradling Jonathan in your arms, up close to your body. This may assist him to maintain energy and support his efforts to engage you in social/toy play.
7. Continue to speak softly to Jonathan and introduce one form of social input at a time (i.e., your face, or voice, or a toy). Little by little Jonathan will be able to take in, or process more, from the great, big world around him. At this time, however, it appears that he depends upon you to gradually introduce things to him at his own pace. Continue to read his "body language" to guide you in your interactions with him.



8. Continue to offer Jonathan a pacifier or consider supporting his hands to his mouth to suck on. This appears to assist him to self-console and/or comfort himself.

If you should have any questions or concerns with regards to this behavioral report please do not hesitate to contact us at (526) 487-9787 or at our email addresses listed below.

Sincerely,

*Michelle Jones*

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Infant Educator  
Yakima Valley Early Intervention Program  
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*Mary Darcy*

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Physical Therapist  
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## **Plan**

1. Share the above report with Mr. and Mrs. Smith.
2. Inquire how their plan to provide Beth with her own “special time” is working out.
3. Continue to support Mrs. Smith’s natural interaction style and intuitive consoling responses to Jonathan’s signs of distress.
4. Re-assess with the IBA<sup>®</sup> in two weeks to monitor Jonathan’s neurobehavioral organization and self-regulatory competence; and to evaluate the effectiveness of the co-regulatory strategies suggested under the Recommendations of 9/30/2002.
5. Share the parent materials from  Holding Parents Holding Their Baby <sup>®</sup> with Mr. and Mrs. Smith (i.e., Holding Your Baby in Different Positions, Talking With Your Baby, Sucking).

# Infant Behavioral Assessment (IBA)

Observer: Mary Darcy

Child: Jonathan Smith

Birthdate: 6/22/02

Gestational Age: 25 week; currently 39 weeks, 2 days

Observation #: 1 2 3 4

Dates: 9/30/02

AUTONOMIC / VISCERAL						MOTOR				STATE							
<b>Color</b>	Pink	X				<b>Arms</b>	Reach					Active Alert	X				
	Mottled						Well-Regulated Tone						Hyperalert				
	Pale	X					Smooth Movement						Cry				
	Red	X					Arm Over Face					<b>ATTENTION / INTERACTION</b>					
	Dusky						ATNR					<b>Eyes</b>	Facing Gaze	X			
<b>Respiration</b>	*Stable					Stop	X				Directed Gaze		X				
	Yawn	X				Bow					Brow Raising		X				
	Sigh	X				Airplane					Animate Locking						
	Irregular	X				Flaccid					Inanimate Locking						
	Sneeze					Straighten w/Tension					Hand Gaze						
	Cough					Shoulder Retraction	X				Gaze Aversion		X				
	Hiccough					<b>Hands</b>	Grasp				Brow Lowering		X				
	Gasp						Resting	X					Blink				
	Pause						Holding On	X					Clench				
	<b>Visceral</b>	*Stable	X					Hand to Midline	X				Upward Gaze				
Burp							Hand to Mouth				<b>Expression</b>	Fleeting Smile	X				
Spit Up						Groping	X			Ooh Face							
BM Grunt						Hand on Stomach				Facial Brightening		X					
Gag						Self-Clasp				Sober		X					
Elimination					Hand on Head	X			Lip Compression	X							
Vomit					Finger Extension					Wary							
<b>Neurophysiological</b>	*Stable	X				Finger Splay					Frown						
	Tremor					Fisting					Pout						
	Twitch					<b>Legs</b>	Well-Regulated Tone				Grimace	X					
	Startle						Smooth Movement					Ugh Face					
	Seizure						Bracing	X				Gape Face					
<b>MOTOR</b>	<b>Head</b>	Orients	X					Toe Grasp					Cry Face				
		Lowering						Foot Clasp	X			<b>Oral</b>	*Neutral				
		Headshake					Toe Splay				Sucking		X				
		Maximal Head Turn	X				Flaccid				Mouthing		X				
		<b>Trunk/Extremities</b>	Well-Regulated Tone					Sitting on Air	X				Tongue Show				
Stilling	X					Straighten w/Tension	X			Suck Search							
Tuck						<b>STATE</b>					Dropooling						
Immobility						Deep Sleep					Tongue Extension						
Squirm	X					Light Sleep					Jaw Extension						
Pull Away					Drowsy				<b>Vocal</b>	Pleasurable	X						
Flaccid					Diffuse Alert	X				Undifferentiated	X						
Arching	X				Alert	X				Protest	X						
					Interactive Alert	X											

# **APPENDIX C**

## **References**

## REFERENCES

- Ainsworth, M. D. S., Bell, S., & Stayton, P. (1974). Infant-mother attachment and social development: 'Socialization' as a product of a reciprocal responsiveness to signals. In M. Richards (Ed.), The integration of a child into a social world. London: Cambridge University Press.
- Als, H. (1982). The unfolding of behavioral organization in the face of a biological violation. In E. Z. Tronick (Ed.), Social interchange in infancy: affect, cognition, and communication. Baltimore: University Park Press.
- Als, H. (1984). Manual for the Naturalistic Observation of Newborn Behavior (Preterm and Fullterm Infants). Children's Hospital, Boston, MA 02115.
- Als, H. (1986). A synactive model of neonatal behavioral organization: Framework for the assessment and support of neurobehavioral development of premature infants and their parents in the environment of the NICU. In J.K. Sweeney (Ed.), Physical and Occupational Therapy in Pediatrics, (6), 3/4. New York: Haworth Press.
- Als, H. (1988). Neurobehavioral competence in healthy preterm and fullterm infants: Newborn period to 9 months. Manuscript submitted for publication.
- Als, H. (1992). Individualized, family-focused developmental care for the very low birthweight preterm infant in the NICU. In Freidman and M. Sigman (Eds.), The psychological development of low birthweight children, 341-388. Norwood, NJ: Ablex.
- Als, H. (1997a). Earliest intervention for preterm infants in the newborn intensive care unit. In M. J. Guralnick (Ed.), The effectiveness of early intervention, 47-76. Baltimore: Paul Brooks.
- Als, H. (1997b). Neurobehavioral development of the preterm infant. In A. A. Farnoff & R. J. Martin (Eds.), Neonatal-perinatal medicine, (2), 964-989. St. Louis: Mosby.
- Als, H. (1999). Reading the premature infant. In Goldson E. (Ed.) Developmental interventions in the neonatal intensive care nursery. New York: Oxford University Press. 18-85.
- Als, H., & Brazelton, T. B. (1979a). A new model of assessing the behavioral organization in preterm and fullterm infants: Two case studies. Paper presented at the Meetings of the American Academy of Child Psychiatry, Atlanta, 1979.
- Als, H. & Gilkerson, L. (1997). The role of relationship-based developmentally supportive newborn intensive care in strengthening outcome of preterm infants. Seminars in Perinatology, 21 (3), 178-189.
- Als, H., Lester, B., & Brazelton, T. (1979). Dynamics of the behavioral organization of the premature infant: A theoretical perspective. In T. Field, A. Sostek, S. Goldberg, & H. Shulman (Eds.). Infants born at risk. New York: Spectrum.
- Als, H., Lester, B., Tronick, E.Z., & Brazelton, T. B. (1982). Manual for the assessment of preterm infants' behavior (APIB). In H. E. Fitzgerald, B. M. Lester, & M. W. Yogman (Eds.), Theory and Research in Behavioral Pediatrics, 1, 35-63. New York: Plenum Press.

- Als, H., Duffy, F., McAnulty, G., & Badian, N. (1988). Continuity of neurobehavioral functioning in preterm and fullterm newborns. In M. Bornstein & N. Krasnegor (Eds.), Continuity in development. Hillsdale, NJ: Lawrence Erlbaum.
- Bakeman, R., & Brown, J. V. (1977). Behavioral dialogues: An approach to the assessment of mother-infant interaction. Child Development, 48, 195-203.
- Bakeman, R., & Brown, J. V. (1980a). Analyzing behavioral sequences: Differences between preterm and full term infant-mother dyads during the first month of life. In D. B. Savin, R. C. Hawkin II, L. O. Walker & J. H. Pentraff (Eds.), Exceptional Infant (Vol. 4), Psychological risks in infant-environment transactions. New York: Bruner/Mazel.
- Bakeman, R., & Brown, J. (1980b). Early intervention: Consequences for social and mental development at three years. Child Development, 51, 437-447.
- Barnard, K. (1978a). Nursing child assessment satellite training (NCAST): Learning resource manual. (Available from NCAST, University of Washington, Child Development and Mental Retardation Center, WJ-10, Seattle, WA 98195).
- Barnard, K. (1978b). Nursing child assessment teaching scales. (Available from NCAST. University of Washington, Child Development and Mental Retardation Center, WJ-10, Seattle, WA 98195).
- Barnard, K. (1978c). Nursing child assessment feeding scales. (Available from NCAST, University of Washington, Child Development and Mental Retardation Center, WJ-10, Seattle, WA 98195).
- Barnard, K. (1979). Instrumentation and findings: Infant characteristics. In K. Barnard & S. Eyres (Eds.), Child health assessment, Part 2: The first year of life (pp. 31-51), (DHEW Publication N. HRA 79-25). Washington, D.C.: U.S. Government Printing Office.
- Barnard, K., Hammond, M., Booth, C., Bee, H., Mitchell, S., & Spieker, S. (1986). Measurement and meaning of parent-child interaction. In F. Morrison, C. Lord, & D. Keating (Eds.), Applied developmental psychology, Vol. III. New York: Academic Press.
- Bates, E., O'Connell, B., & Shore, C. (1987). Language and communication in infancy. In J. D. Osofsky (Ed.), Handbook of infant development. New York: John Wiley & Sons.
- Bateson, M. G. (1975). Mother-infant exchanges: The epigenesis of conversational interaction. In D. Aaronson & R. W. Reiber (Eds.), Developmental psycholinguistics and communication disorders, annals of the new york academy of sciences. New York: Academy of Sciences.
- Bayley, N. (1969). The Bayley Scales of Infant Development. The Psychological Corporation: San Antonio, TX.
- Beckman, P. (1983). Influence of selected child characteristics on stress in families of handicapped infants. American Journal of Mental Deficiency, 88, (2), 150-156.
- Beckman, P., Thiele, J., Pokorni, J., & Balzer-Martin, L. (1986). Stability of behavioral characteristics in preterm infants. Topics in Early Childhood Special Education, 6 (2), 57-67.
- Bell, R. Q., & Harper, L. V. (1977). Child effects on adults. Hillsdale, N.J.: Lawrence Erlbaum.

- Belsky, J. (1984). The determinants of parenting: A process model. Child Development, 55, 83-96.
- Belsky, J., & Tolan, W. (1981). Infants as producers of their own development: An ecological analysis. In R. Lerner, & N. Busch-Rossnagel (Eds.), Individuals as producers of their development: A life span perspective. New York: Academic Press.
- Bendell, D., Goldberg, M., Urbano, M., Urbano, R., & Bauer, C. (1987). Differential impact of parenting sick infants. Infant Mental Health Journal, 8, 28-36.
- Bennett, F. C. (1990). Recent advance in developmental intervention for biologically vulnerable infants. Infants and Young Children, 3 (1), 33-40.
- Birdwhistell, R. L. (1970). Kinesics and context. University of Pennsylvania Press, Philadelphia.
- Blurton Jones, N. (1972). Characteristics of ethological studies of human behavior. In N. Blurton Jones (Ed.), Ethological studies of child behavior. Cambridge: Cambridge University Press, 3-37.
- Blurton Jones, N. (1974). Ethology and early socialization. In M. P. Richards (ed.), The integration of a child into a social world. Cambridge: Cambridge University Press, 263-295.
- Blurton Jones, N. (1976). Growing points in human ethology: Another link between ethology and the social sciences? In G. Bateson & R. A. Hinde (Eds.), Growing points in ethology. Cambridge: Cambridge University Press, 427-451.
- Bowlby, J. (1969). Attachment. New York, New York: Basic Books.
- Brazelton, T. B. (1982a). Assessment in early infancy as an intervention. In A. Waldstein, D. Gildermann, S. Taylor-Hershel et al. (Eds.), Issues in neonatal care. Special Education Programs, Washington, D.C.: Department of Education.
- Brazelton, T. B. (1982b). Joint regulation of neonate-parent behavior. In E. Z. Tronick (Ed.), Social interchange in infancy: Affect, cognition, and communication (pp. 7-22). Baltimore: University Park Press.
- Brazelton, T. B. (1984). Neonatal Behavioral Assessment Scale. London: Spastics International Medical Publications.
- Brazelton, T. B. & Greenspan, S. I. (2000). The irreducible needs of children: What every child must have to grow, learn, and flourish. Cambridge, MA.
- Brazelton, T. B., Koslowski, B., & Main, M. (1974). The origin of reciprocity: The early mother-infant interaction. In M. Lewis & L. Rosenblum (Eds.), The effect of the infant on its caregiver. New York: Wiley.
- Brazelton, T. B., O'Brien, M., & Brandt, K. A. (1997). Combining relationships and development: Applying touchpoints to individual and community practices. Infants and Young Children, 10, (1), 74-84.
- Brazelton, T. B., Tronick, E., Adamson, L., Als, H., & Wise, S. (1975). Early mother-infant reciprocity. Ciba Foundation Symposium, 33. Amsterdam: Elsevier.

- Bretherton, I. (1991). Pouring new wine into old bottles: The social self as internal working model. In M. R. Gunnar & L. A. Sroufe (Eds.), Self processes and development. Hillsdale, N.J.: Lawrence Erlbaum, 1-44.
- Bretherton, I., & Walters, E. (Eds.) (1986). Growing points of attachment theory and research. monographs of the society for research in child development, 50 (no. 1-2, Serial No. 209). Chicago: University of Chicago Press.
- Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Cambridge, Mass: Harvard University Press.
- Bronson, M. B. (2000). Supporting self-regulation in infants and toddlers. In M. B. Bronson (Ed.), Self-regulation in early childhood, 167-197. New York: Guilford Press.
- Brown, J. M., & Bakeman, R. (1979). Relationships of human mothers with their infants during the first year of life: Effect of prematurity. In R. W. Bell & W. P. Smotherman (Eds.), Maternal influences and early behavior. New York: Spectrum, 1979.
- Brown, J. V., LaRossa, M. M., Aylward, G. P., Davis, D. J., Rutherford, P. K., & Bakeman, R. (1980). Nursery-based intervention with prematurely born babies and their mothers: Are there effects? Journal of Pediatrics, 97, 487-491.
- Campbell, P. (1989). Dysfunction in posture and movement in individuals with profound disabilities: Issues and practices. In F. Brown and D. Lehr (Eds.), Persons with profound disabilities: Issues and practices. Baltimore: Paul Brookes.
- Chugani, H. T. (1997). Neuroimaging of developmental non-linearity and developmental pathologies. In R. W. Thatcher, G. R. Lyon, J. Rumsey, & N. Krasnegor (Eds.), Developmental neuroimaging: mapping the development of brain and behavior. San Diego: Academic Press, 235-257.
- Cicchetti, D., & Sroufe, A. (1978). An organizational view of affect: Illustration from the study of Down's syndrome infants. In M. Lewis & L. Rosenblum (Eds.). The development of affect. Plenum Publishing Co.
- Cohn, J., & Tronick, E. Z. (1988). Mother-infant face-to-face interaction: Influence is bidirectional and unrelated to periodic cycles in either partner's behavior. Developmental Psychology, 24, 3, 386-392.
- Comfort, M. (1988). Assessing parent-child interaction. In W. Bailey, R. Simeonson (Eds.), Family assessment in early intervention. Columbus: Merrill.
- Condon, W. S. & Sander, L. W. (1974). Synchrony demonstrated between movements of the neonate and adult speech. Child Development, 45, 456-462.
- Crawley, S., & Spiker, D. (1983). Mother-child interaction involving two-year-olds with Down syndrome: A look at individual differences. Child Development, 54, 1312-1323.

- Crnic, K. A., Ragozin, A. S., Greenberg, M. T., Robinson, N. M., & Basham, R. B. (1983). Social interaction and developmental competence of preterm and full-term infants during the first year of life. Child Development, 54, 1199-1210.
- Darwin, C. (1872). The expression of the emotions in man and in animals. Appleton and Co., New York (Reprinted University of Chicago Press, Chicago, 1965).
- DeCasper, A. J., & Fifer, W. P. (1980). Of human bonding: Newborns prefer their mothers' voices. Science, 208, 1174-1176.
- Denny-Brown, D. (1962). The basal ganglia and their relation to disorders of movement. Oxford: Oxford University Press.
- Duffy, F. H., Jones, K. H., McAnulty, G.B., & Albert, M. S. (1995). Spectral coherence in normal adults: Unrestricted principal components analysis—relation of factors to age, gender, and neuropsychologic data. Clinical Electroencephalography, 26 (1), 30-46.
- Dunst, C. J. & Trivette, C. M. (1996). Empowerment, effective helpgiving practices and family-centered care. Pediatric Nursing, 22 (4), 334-343.
- Egeland, B., & Sroufe, L. A. (1981a). Attachment and early maltreatment. Child Development, 52, 44-52.
- Egeland, B., & Sroufe, L. A. (1981b). Developmental sequelae of maltreatment in infancy. In R. Rizley & D. Cicchetti (Eds.), Developmental perspectives in child maltreatment, 77-92. San Francisco: Jossey-Bass.
- Elmer, E., & Gregg, D. (1967). Developmental characteristics of abused children. Pediatrics, 40, 596-602.
- Eriks, J. (1978). Infant "talk." In K. Barnard (Ed.), Nursing Child Assessment Satellite Training (NCAST): Learning Resource Manual (Available from NCAST, University of Washington, Child Development and Mental Retardation Center, WJ-10, Seattle, WA 98195).
- Escalona, S. (1984). Social and other environmental influences on the cognitive and personality development of low birthweight infants. American Journal of Mental Deficiency, 88, 508-512.
- Field, T. M. (1977). Effects of early separation, interactive deficits, and experimental manipulations on infant-mother face-to-face interaction. Child Development, 48, 763-771.
- Field, T. M. (1979a). Games parents play with normal and high-risk infants. Child Psychiatry and Human Development, 10, 41-48.
- Field, T. M. (1979b). Interaction patterns of high-risk and normal infants. In T. Field, A. Sostek, S. Goldberg, & H. H. Shuman (Eds.), Infants born at risk. New York: Spectrum.
- Field, T. M. (1982). Interaction coaching for high-risk infants and their parents. In H. A. Moss, R. Hess, & C. Swift (Eds.), Early intervention programs for infants, 1, 5-24.



- Field, T. M. (1983). High risk infants "have less fun" during early interactions. Topics in Early Childhood Special Education, 3 (1), 77-87.
- Field, T. M., Woodson, T., Greenberg, R., & Cohen, D. (1982). Discrimination and imitation of facial expression by neonates. Science, 218, 179-181.
- Fischer, K. W. & Rose, S. P. (1994). Dynamic development of coordination of components in brain and behavior: a framework for theory and research. In G. Dawson & K. W. Fischer (Eds.), Human behavior and the developing brain. New York: Guilford Press, 3-66.
- Fraiberg, S. (1974). Blind infants and their mothers: An examination of the sign system. In M. Lewis & L. A. Rosenblum (Eds.), The effect of the infant on its caregiver, 215-232. New York: John Wiley & Sons.
- Frodi, A. M., Lamb, M. E., Leavitt, L. A., Donovan, W. I., Neff, C., & Sherry, D. (1978). Fathers and mothers' responses to the faces and cries of normal and premature infants. Developmental Psychology, 14, 490-498.
- Gianino, A., & Tronick, E. (1988). The mutual regulation model: The infant's self and interactive regulation and coping and defensive capacities. In T. Field, P. McCabe & N. Schneider (Eds.), Stress and coping across development. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Goldberg, S., Brachfeld, S., & DeVitto, B. (1980). Feeding, fussing, and playing: Parent-infant interaction in the first year as a function of prematurity and prenatal problems. In T. Field, S. Goldberg, D. Stern & A. Sostek (Eds.), High-risk infants and children: Adult and peer interactions. New York: Academic Press.
- Goren, C. G., Sarty, M., & Wu, P. Y. K. (1975). Visual following and pattern discrimination of face-like stimuli by newborn infants. Paediatrics, 56, 544-549.
- Gorski, P. A. (1984). Experience following premature birth: Stresses and opportunities for infants, parents, and professionals. In J. D. Call, E. Galenson & R. L. Tyson (Eds.), Frontiers of Infant Psychology, 2, 145-151. New York: Basic Books, Inc.
- Gorski, P., Davison, M., & Brazelton, T. (1979). Stages of behavioral organization in the high-risk neonate: Theoretical and clinical considerations. Seminars in Perinatology, 3, 61-73.
- Greenspan, S., & Wieder, S. (1998) Emotion and interaction: Keys to the development of intelligence, sense of self, and social capacities. In S. Greenspan and S. Wieder (Eds), The child with special needs: Encouraging intellectual and emotional growth, 106-119. Teaching, MA: Perseus Books.
- Grossman, K., Grossman, K. E., Spangler, G., Suess, G., & Unzer, L. (1985). Maternal sensitivity and newborns' orientation responses as related to quality of attachment in Northern Germany. In I. Bretherton & E. Waters (Eds.), Growing points of attachment theory and research. Monographs of the society for research in child development, 50.
- Guyer, B., Strobino, D. M., Ventura, S. J., MacDorman, M., & Martin, J. A. (1996). Annual summary of vital statistics—1995. Pediatrics, 98 (6), 1007-1019.

- Hack, M., Taylor, G., Klien, N., Eiben, R., Schatschneider, C., & Mercuri-Minich, N. (1994). School-age outcomes in children with birth weights under 750 g. New England Journal of Medicine, 331, 753-759.
- Hack, M., Taylor, H., Klein, N., & Mercuri-Minich, N. (1999). Functional limitations and special health care needs of 10- to 14-year old children weighing less than 750 grams at birth. Pediatrics, 106 (3), 554-560.
- Harlow, H., Harlow, M. K., & Suomi, S. J. (1971). From thought to therapy: Lessons from a private laboratory. American Scientist, 69, 538-549.
- Hedlund, R. (1989). Fostering positive social interactions between parents and infants. Teaching Exceptional Children, 21 (4), 45-48.
- Hedlund, R. (1998). The neurobehavioral curriculum for early intervention. Publication available from Washington Research Institute, 150 Nickerson Street, Suite 305, Seattle, WA 98104.
- Hedlund, R. & Notari-Syverson, A. (1997). Holding parents holding their baby. Available from Washington Research Institute, Seattle, 98109.
- Hedlund, R. & Tataraka, M. (1988). Infant behavioral assessment. Publication available from Experimental Education Unit, CDMRC, WJ-10, University of Washington, Seattle, WA 98195.
- Heinicke, C. M., Diskin, S. D., Ramsey-Klee, D. M., & Oates, D. S. (1986). Pre- and post-birth antecedents of two-year-old attention, capacity for relationships and verbal expressiveness. Developmental Psychology, 22, 777-787.
- Hofer, M. A. (1987). Early social relationships: a psychobiologist's view. Child Development, 58, 633-647.
- Hofer, M. A. (1995). Hidden regulators: Implications for a new understanding of attachment, separation, and loss. In S. Goldberg, R. Muir & J. Kerr (Eds.), Attachment theory: Social developmental and clinical perspectives. Hillsdale NJ: The Analytic Press.
- Holdgrafer, G., & Dunst, C. (1986). Communicative competence: From research to practice. Topics in Early Childhood Special Education, 6 (3), 1-22.
- Hunt, J. V., Cooper, B. A. B., & Tooley, W. H. (1988). Very low birth weight infants at 8 and 11 years of age: Role of neonatal illness and family status. Pediatrics, 82, 596-603.
- Hunt, J. V., Tooley, W. H., & Cooper, B.A. B. (1992). Further investigations of intellectual status at age 8 years: I. Long-term consequences into adulthood. II. Neonatal predictors. In S. L. Friedman & M. D. Sigman (Eds.), Advances in applied developmental psychology, The psychological development of low birthweight children. Norwood, NJ: Ablex, 6, 315-337.
- Huntington, G. S. (1985). Maternal and infant characteristics associated with maternal involvement during mother-child interaction. Unpublished doctoral dissertation. University of North Carolina at Chapel Hill.

- Kogan, K. (1980). Interaction systems between preschool aged handicapped or developmentally delayed children and their parents. In T. Field, S. Goldberg, D. Stern & A. Sostek (Eds.), High-risk infants and children: Adult and peer interactions. New York: Academic Press.
- Lamb, M. E. (1981). The development of father-infant relationships. In M. E. Lamb (Ed.), The role of the father in child development, 459-488. New York: John Wiley & Sons.
- Lester, B., Hoffman, J., & Brazelton, T. B. (1985). The rhythmic structure of mother-infant interaction in term and preterm infants. Child Development, 56, 15-27.
- Lewis, M., & Rosenblum, L. (1974). The effect of the infant on its caregiver. New York: John Wiley & Sons.
- Lipsitt, L. (1986). Learning in infancy: Cognitive development in babies. Journal of Pediatrics, 109 (1), 172-182.
- Luciana, M., Lindeke, L., Georgieff, M.K., Mills, M.M., & Nelson, C.I.A. (1999). Neurobehavioral evidence for working-memory deficits in school-aged children with histories of prematurity. Developmental Medicine and Child Neurology, 41, 521-533.
- Lyons-Ruth, K. & Zeanah, C. H. (1993). The family context of infant mental health: I. Affective development in the primary caregiving relationship. In C. H. Zeanah, Jr. (Ed.), Handbook of infant mental health. New York: Guilford Press, 14-37.
- Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. In P. H. Mussen (Ed.), Handbook of child psychology, 4, 1-101. New York: John Wiley & Sons.
- McCullum, J., & Stayton, V. (1985). Infant/Parent Interaction: Studies and intervention guidelines based on the SIAI Model. Journal of the Division for Early Childhood, 9, 125-135.
- McLean, M. & Odom, S. (1993). Practices for young children with and without disabilities: A comparison of DEC and NAEYC identified practices. Topics in Early Childhood Special Education, 13, 274-292.
- Mahoney, G. (1983). A developmental analysis of communication between mothers and infants with Down's syndrome. Topics in Early Childhood Special Education, 3 (1), 63-76.
- McCullum, J. (1982). Social Interaction: A procedure for assessment and intervention (SIAI). Unpublished manuscript, University of Illinois, Department of Special Education, Champaign-Urbana.
- McGehee, L. J., & Eckerman, C. O. (1983). The preterm infant as a social partner: Responsive but unreadable. Infant Behavior and Development, 6, 461-470.

- Meltzoff, A. N., & Moore, M. H. (1977). Imitation of facial and manual gestures by human neonates. Science, 198, 75-78.
- Minde, K., Whitelaw, A., Brown, J., & Fitzhardinge, P. (1983). Effect of neonatal complications in premature infants on early parent-infant interactions. Developmental Medicine and Child Neurology, 25, 763-777.
- Murray, L., & Trevarthen, C. (1985). Emotional regulation of interactions between two-month-olds and their mothers. In T. M. Field & N. A. Fox (Eds.), Social perception in infants. New Jersey: Ablex.
- Neisworth, J. T., Bagnato, S., & Salvia, J. (1995). Neurobehavioral markers for early regulatory disorders. Infants and Young Children, 8 (1), 8-17.
- Office of Technology Assessment, (1987). Neonatal intensive care for low birthweight infants: costs and effectiveness.
- Palay, P.H. (1979). Introduction to the nervous system: Basic neuroanatomy. Lecture delivered at Harvard Medical School. In Als, H., Lester, B.M., Tronick, E.Z, Brazelton, B. (1982), Toward a research instrument for the assessment of preterm infants' behavior. In H. Fitzgerald, B. M. Lester, M. W. Yogman (Eds.), In theory and research in behavioral pediatrics, 1, New York: Plenum, 35-131.
- Paneth, N. S. (1995). The problem of low birth weight. The Future of Children, 5 (1), 19-34.
- Piaget, J. (1952). The origins of intelligence in children. Baltimore: Paul H. Brookes.
- Piaget, J. (1962). Play, dreams and imitation in childhood. Norton, New York.
- Piaget, J., & Inhelder, B. (1969). The psychology of the child. New York: Basic Books.
- Pipp, S., & Harmon, R. J. (1987). Attachment as regulation: A commentary. Child Development 58, 648-652.
- Rakic, P., Bourgeois, J., & Goldman-Rakic, P. S. (1994). Synaptic development of the cerebral cortex: Implications for learning, memory, and mental illness. In J. van Pelt, M. A. Corner, H. B. M. Uylings & P. H. Lopes da Silva (Eds.), The self-organizing brain: From growth cones to functional networks. Elsevier Science BV, 236-268.
- Richard, N. (1986). Interaction between mothers and infants with Down syndrome: Infant characteristics. Topics in Early Childhood Special Education, 6 (3), 54-71.
- Rogers-Warren, A., & Warren, S. (1984). The social basis of language and communication in severely handicapped preschoolers. Topics in Early Childhood Special Education, 4(2), 57-72.
- Sameroff, A. (1982). The environmental context of developmental disabilities. In D. D. Bricker (Ed.), Intervention with at-risk and handicapped infants: From research to application, 141-152. Baltimore: University Park Press.

- Sandall, S. (1985). Turn-taking: Strategies for enhancing adult-child interaction. Unpublished manuscript, University of Washington, Experimental Education Unit, Child Development and Mental Retardation Center, Seattle.
- Sander, L. W. (1962). Issues in early mother-child interaction. Journal of Child Psychiatry, 1, 141-166.
- Sander, L. W. (1964). Adaptive relationships in early mother-child interaction. Journal of the American Academy of Child Psychiatry, 3, 232-264.
- Schaffer, H. R. (1977). Studies in mother-infant interaction. New York: Academic.
- Schaffer, H. R. (1979). Acquiring the concept of dialogue. In M. H. Bornstein & W. Kessen (Eds.), Psychological development from infancy: Image to intention, 279-305. Hillsdale, NJ: Erlbaum.
- Schaffer, H. R. (1984). The child's entry into a social world. London: Academic Press.
- Shonkoff, J. P., & Philips, D. A. (2000a). Promoting healthy development through intervention. In J. P. Shonkoff & D. A. Philips (Eds.), From neurons to neighborhoods: The science of early childhood development, 93-123. Washington D. C.: National Academy Press.
- Shonkoff, J. P., & Philips, D. A. (2000a). Acquiring self-regulation. In J. P. Shonkoff & D. A. Philips (Eds.), From neurons to neighborhoods: The science of early childhood development, 93-123. Washington D. C.: National Academy Press.
- Shore, Rim (1997). Rethinking the brain: New insights into early development. Families and Work Institute.
- Simeonsson, R. J., Bailey, D. B., Huntington, G. S., & Comfort, M. (1986). Testing the concept of goodness of fit in early intervention. Infant Mental Health Journal, 7, 81-94.
- Spence, M. H., & DeCasper, A. J. (1982, March). Human fetuses perceive maternal speech. Paper presented at the International Conference on Infant Studies, Austin, TX.
- Spitz, R. (1945). Hospitalism: An inquiry into the genesis of psychiatric conditions in early childhood. Psychoanalytic Study of the Child, 1, 53-74.
- Sroufe, L. A., & Waters, E. (1977). Heart rate as a convergent measure in clinical and developmental research. Merrill-Palmer Quarterly, 12 (1), 3-27.
- Stern, D. (1974). The goal and structure of mother-infant play. Journal of American Academy of Child Psychiatry, 13, 402-421.
- Stern, D. (1977). The first relationship. Cambridge, MA: Harvard University Press.
- Stern, D. (1995). The motherhood constellation: A unified view of parent-infant psychotherapy. New York: Basic Books.

- Stern, M., & Hildebrandt, K. (1984). A prematurity stereotype: The effects of labeling on adults' perceptions of infants. Developmental Psychology, 20, 360-362.
- Sykes, D. H., Hoy, E. A. Bill, J. M., McClure, B. G., Halliday, H.L., & Reid, M.M. (1997). Behavioral adjustment in school of very low birthweight children. Journal of Child Psychology and Psychiatry, 38 (3), 315-325.
- Tatarka, M. (1990a). Training interventionists to respond to infant behavioral cues. Unpublished master's thesis. University of Washington, Seattle.
- Tatarka, M. (1990b). (Inter-observer agreement on the IBA research edition). Unpublished raw data.
- Tatarka, M. & Hedlund, R. (1991). (Neurobehavioral characteristics of infants exposed to cocaine in utero.) Unpublished raw data.
- Thomas, A., & Chess, S. (1977). Temperament and development. New York: Brunner/Mazel.
- Trevarthan, C. (1977). Descriptive analyses of infant communicative behavior. In H. R. Schaffer (Ed.), Studies in mother-infant interaction. London: Academic Press.
- Trevarthen, C. (1979). Communication and cooperation in early infancy. A description of primary intersubjectivity. In M. Bullowa (Ed.), Before speech: The beginnings of human communication. Cambridge: Cambridge University Press.
- Tronick, E. (1980). On the primacy of social skills. In D. B. Sawin, L. O. Walker & J. H. Penticuff (Eds.), The exceptional infant, Vol. 4: Psychosocial risks in infant-environmental transactions. New York: Bruner/Mazel.
- Tronick, E. (1982). Social interchange in infancy: Affect, cognition, and communication. Baltimore, MD: University Park Press.
- Tronick, E., & Cohn, J. (1989). Infant-mother face-to-face interaction: Age and gender differences in coordination and the occurrence of miscoordination. Child Development, 60, 85-92.
- Tronick, E. Z., & Gianino, A. (1986a). Interactive mismatch and repair: Challenges to the coping infant. Zero to Three, 6 (3), 1-6.
- Tronick, E. Z., & Gianino, A. (1986b). The transmission of maternal disturbance to the infant. In E. Z. Tronick & T. Field (Eds.), Maternal depression and infant disturbance, 34, 31-47. San Francisco: Jossey-Bass.
- Tronick, E. Z., Krafchuk, E., Ricks, M., Cohn, J., & Winn, S. (1985). Mother-infant face-to-face interaction at 3, 6, and 9 months: Content and matching. Manuscript submitted for publication.
- Uzgiris, I., & Hunt, J. McV. (1975). Assessment in infancy: Ordinal scales of psychological development. Urbana, IL: University of Illinois Press.

- Vandell, D. L., & Wilson, K. S. (1987). Infants' interactions with mother, sibling, and peer: Contrasts and relations between interaction systems. Child Development, 58, 176-186.
- Vygotsky, L. (1930/1960/1978). Mind in society: The development of higher, psychological processes. Cambridge, MA: Harvard University Press.
- Vygotsky, L. (1934/1986). Thought and language. (A. Kosulin, Ed. and Trans.) Cambridge: MIT Press.
- Waber, D. P., McCormick, M. C., & Workman-Daniels, K. (1992). Neurobehavioral outcomes in very low birthweight, low birthweight, and normal birthweight children with and without medical complications. Abstract presented at the International Neuropsychological Society 21<sup>st</sup> Annual Meeting, Galveston, Texas.
- Waters, E., Wippman, J., & Sroufe, L. A. (1979). Attachment, positive affect and competence in the peer group: Two studies in construct validation. Child Development, 50, 821-829.
- Widmer, C. (1979). Posutures et mouvements: Discrimination des personnes chez le bébé de 0 à 6 mois. Ph.D. thesis, University of Geneva. In Williamson, G. (1988). Motor control as a resource for adaptive coping. Zero to Three: Bulletin of National Center for Clinical Infant Programs, 9 (1), 1-18.
- Winnicott, D. W. (1964/1987). The child, the family, and the outside world. New York: Addison-Wesley.
- Winnicott, D. W. (1965/1994). The maturational processes and the facilitating environment. Connecticut: International Universities Press.
- Winnicott, D. W. (1966/1987). The ordinary devoted mother. In C. Winnicott, R. Shepherd, & M. Davis (Eds.), Babies and their mothers, 3-14. New York: Addison-Wesley.
- Wolff, P. H. (1963). Observations of the early development of smiling. In B. M. Foss (Ed.), Determinants of infant behavior (Vol. II). London: Methuen.
- Wood, D., Brunner, J., & Ross, G. (1976). The role of tutoring in problem solving. Journal of Child Psychology and Psychiatry, 17, 89-100.
- Yarrow, L. J., Pedersen, F. A., & Rubenstein, J. (1977). Mother-infant interaction and development in infancy. In R. H. Leiderman, S. R. Tulkin, & A. Rosenfeld (Eds.), Culture and infancy: variations in the human experience. New York: Academic Press.