



Hi, you.

I'm so happy you're here. Someone gave me Dr. Staso's books (enclosed) before I had my first baby, and it changed everything for me as a parent. I felt truly connected to my baby and what was going on with his development. I discovered what he needed at each stage and learned specific things I could do to help.

I've been nerding out on key child development research including Dr. Staso's books for years. I'm so grateful for his insightful findings because they helped inspire our philosophy and products—along with the best research in neuroscience, pediatric occupational therapy, and speech and language pathology. Children can play to learn, and become their best selves, with the right stage-based playthings and activities.

I'm excited to share Dr. Staso's books with you. While some of the language in these books may feel a little dated, the child development information is not. We've carefully cross-checked the books with multiple experts, and they all agree that Dr. Staso's advice is grounded in the right fundamentals to promote healthy brain development.

I hope you find them as interesting and helpful as I did.

Happy reading,

Jessica Rolph
CEO & Cofounder
@jessicarolph

Neural Foundations

**What Stimulation Your Baby Needs To Become
Smart**

**by
William H. Staso, PhD**

Second edition, completely revised
Great Beginnings Press

**A Program of Ideas Based on Current Research
Findings on the Neurological Development of Infants**

Volume One: Birth Through 7 Months

Neural Foundations: What Stimulation Your Baby Needs to Become Smart :
Birth Through 7 Months by William H. Staso, PhD

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From the Original 1999 Preface

In the past 4 years since the publication of the first edition of this book, the number of research studies, conferences, and media articles devoted to early brain development has greatly increased. This swell of interest has been driven by an expansion of knowledge about the importance of early life experiences. Indeed, if the case for understanding and using appropriate stimulation practices with infants was strong in 1995, it is compelling now. This book represents an update and reorganization of ideas that can make a difference in the life of your child. It incorporates recent findings in several fields of study, including biology, medicine, cognitive science, psychology, and child development.

Environment clearly has lasting physical, emotional, and psychological effects on infants. What is provided on a routine basis will impact adaptability, thinking skills, and ability to focus and concentrate. These qualities form a large component of what is generally considered to be smartness. This publication addresses the foundation for smartness, one in which you can play a direct and influential part.

Chapter One provides an overview of the domains of focus that are addressed in each of the age groupings. Chapter Two offers information about brain development and recent research in several fields of study related to infants. Chapters Three through Six offer specific ideas for appropriate stimulation practices, beginning at birth and continuing through seven months. In Chapter Seven, several special issues are addressed, including questions about computer use and foreign languages. Appendices A-E present ideas for visual presentations and mobiles, and an assessment guide.

Thanks to those parents who e-mailed me and communicated the value of the practices recommended in the first edition of *What Stimulation Your Baby Needs To Become Smart*. Stories of success are very encouraging.

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GENERAL COMMENTS: NEWBORN TO 8 MONTHS

This book is written to simplify and make useful a database of diverse and relatively complex research and academic articles related to early intellectual development. It should be noted, however, that intellectual development does not occur in isolation from social, emotional, physical, and sensory development. All these types of development are interrelated in the early years, particularly in the first 12 months. Thus you will find suggestions for stimulating not just intellectual aptitude but other faculties as well. The most successful approach to maximizing competency undoubtedly must consider brain structure and development *per se* and not isolated aspects of functioning.

Keep in mind that infants are learning all the time, whether specific experiences are provided or not. Every baby has a curriculum because every baby has an environment. For many years it has been assumed that this informal curriculum did not really matter, that nature provided a natural unfolding of skills. Given this belief, that all a parent really needs to do is provide physical and loving care to raise a capable child, there has been correspondingly little attention paid to the varied effects of differences in stimulation practices. Recent discoveries indicate that infants are actively seeking information, a process under the control of genetic predispositions. The information the infants obtains assists the brain to develop in specified ways and to create a neurological architecture for adaptation to the environment. This book will help you to be sensitive to what information your baby is seeking, what skills she¹ is attempting to develop, and what factors in the environment tend to facilitate or inhibit such skill or knowledge acquisition. The more you are aware of what it is that does or does not

¹Throughout this book, the feminine pronoun is used generically to refer to babies; please be assured that this procedure is for the sake of convenience only, and it is realized that you may have a male baby. The comments made hold for boys as well as girls.

promote your child's development, the more likely that what you do will be of optimal help to her.

Although the book divides suggestions for stimulation into chronological age sections, it should be noted that these are the ages at which the described abilities/skills are *typically* seen to develop. You should periodically make an assessment of your infant's skills and abilities. The purpose of each assessment is to determine her level of functioning and what the most appropriate type of stimulation is for her. If your infant acquires a skill in one area (such as a visual skill) at an earlier age than listed, you should not alter the quality of your stimulation until she has attained the same developmental skill level in all areas (see enclosed ASSESSMENT CHART in Appendix E). Coordination of similarly developed senses and muscles is needed to acquire higher-order skills (such as visually-directed reaching). Moreover, it is more important for an infant to become well skilled in an area than to quickly progress. By practicing newly learned skills or using newly acquired knowledge, the infant can "fine tune" and elaborate those abilities in more sophisticated ways. Trying to push your baby to advance rapidly will likely result in a less capable child than if you concentrate on her getting the type and quality of stimulation she needs.

Throughout the text there are "case history examples" in which anecdotal stories of parents and their children are highlighted. These vignettes generally attempt to illustrate points in the more concrete context of day-to-day living. The parent-child groups you will meet include Shirley and son Eric, Mark and daughter Sara, James & Mary and son Brian, and Janice and her son Jason.

If you have stories of interest to add to future revisions, please send them to the author via the e-mail address, WStaso@aol.com.

YOUR BELIEFS ARE IMPORTANT

The literature suggests that parents who raise intelligent, competent children have a number of beliefs in common. These beliefs are important because they result in having the parents act in typical, moment-to-moment ways that benefit their infants. If you do not already share these beliefs, you are encouraged to consider them, as your routine actions will have significant impact on your baby's developing competence. Here are some of the beliefs:

(1) Infants should be spoken to as if they understood every word you were saying. In the beginning months your baby will not understand the words you say--but there is much about your intonation patterns and the word sounds that you make that is important. Good foundations of language begin shortly after birth.

(2) Infants should have freedom to move and explore, and as they get older, they should be offered choices in their activities. Restrictiveness of movement, space, or experiences will result in the development of a less capable child. Acting on this belief may require you to rearrange your living space and to oversee your baby's actions more.

(3) There is no need to punish or control an infant. Infants cannot be spoiled. Babies should be given what they want and be responded to quickly when they are distressed.



You may have heard the expression “let him/her cry it out”. This advice is not good advice for a parent of a baby in the age range covered by this book. Your baby needs to have the sense that someone will meet her needs on a consistent, predictable manner.

(4) Children's feelings of self-value begin in infancy through the treatment accorded to them. Make your baby feel important and capable. The beginnings of positive self-esteem originate with the type of attitude that you are engaging in exciting activities with your baby, not just doing things to her.



Chapter One

Domains of Focus in the First 7 Months

The infant's brain, particularly during the first 7 months of life, compels her to investigate sensory data and to practice motor skills; it directs her to seek information on how the world is structured and works; and it motivates her to learn how ideas and concepts are represented. Let's look at these areas a little closer.

SENSORY AND MOTOR SKILLS

It is clear that all the senses of the infant function at birth. Sensory information is not interpreted the same by the newborn's brain as by that of even a 3 month old, however, so adjustments in the type and intensity of stimulation are necessary. This book will provide you with pertinent information about these differences and how to proceed, with your infant's best interests in mind.

The infant's motor skills progress rapidly during the first 7 months of life. It should be emphasized, however, that this growth in control skills comes about by the coordinated interplay between the muscles and the brain. Control of the body proceeds from the head to the toes and from the middle area of the body outward. Thus, control of the movement of the eyes occurs before motor control of the arms or legs. Similarly, control of the shoulders develops before control is developed over the hands. As the parent, you should notice which body parts your baby seems to

DOMAINS OF FOCUS

have control over and allow for experiences that help her to develop those muscle systems that are "next-in-line".

Recent research suggests that fine motor skill development is important in determining the extent to which an infant will understand and mentally organize the input which she receives from her surroundings. Thus, provision of opportunities to utilize fine motor skills is continually stressed in the suggestions of this book.

KNOWLEDGE

What knowledge does the newborn possess and what knowledge does she need to gain in the course of the first 7 months? Well, studies conducted over the last decade indicate that newborns are very selective as to what they attend to in their environment. They orient to certain sounds and sights as they attempt to organize information. This selection process has a predetermined schedule and bias. That is, depending on their developmental level, infants will focus on one type of sensory stimulation or another.. For awhile it seemed as if newborns had a built-in sense of basic mathematics and physics. While debate continues on the extent to which “innate” capabilities might exist, a set of studies have indicated how surprisingly quick babies do learn. Their brains are ready and capable of sensing many types of patterns and relationships. By 3 months babies show expectancies about the properties of objects and their groupings. Thus another area addressed in this book is how to help your baby expand on this “expectancy” understanding in a way that makes sense and is useful to her.

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In translating research findings into practical application, it seems clear that what babies need is exposure to experiences that convey the physical reality of what the world is like. Some of these experiences require that the baby be physically involved in the interaction; others only require visual exposure. In brief, the



a self-object experience

following "experienced-based" opportunities are recommended through the programming ideas of this workbook:

1. *Cause-Effect Events*: the infant needs to experience, both by observing and also by personally causing the action, events in which one occurrence is followed consistently and naturally by another occurrence. For instance, dropping an object will cause it to fall, putting one's hands in water results in getting wet, and using certain muscles allows one to crawl.

2. *Means-end actions*: the infant also profits intellectually by watching and creating actions wherein a strategy is employed to secure a desired outcome. For instance, opening a cabinet door allows one to get a box of cereal stored within and turning a faucet handle will produce flowing water.

3. *Self-object experiences*: the infant learns a lot about the world and how it operates by direct experiences with objects, exploring their individual properties.

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Anything is an object to an infant, even her own body. Some objects are flexible, others are not; some are firm, others not; some are solid, others liquid; some heavy, others light; and so forth.

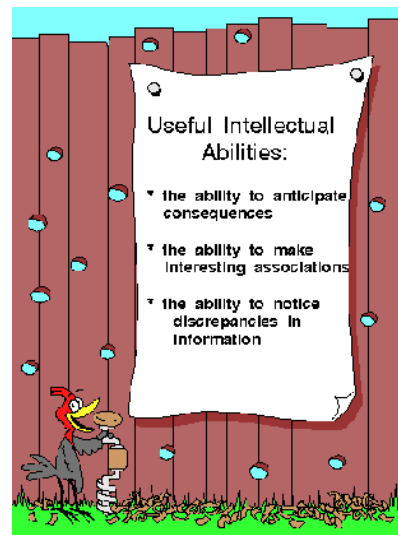
4. Object-Object Experiences: the infant also learns considerable valuable information when exploring how objects relate to one another. For instance, a shelf supports objects, cream can be rubbed onto one's face, and a cup holds liquid.



An infant and toddler who has opportunities to be exposed to such experiences cited above will acquire many highly useful intellectual abilities. These include

- the ability to anticipate and/or to predict consequences
- the ability to make interesting associations
- the ability to notice discrepancies in information.

It is just as vital that your baby not be confused or customarily given irrelevant or worthless information. Having set routines helps. During the early months, basic pathways of associating and processing information are laid down; it makes sense that what the infant experiences should be as relevant as possible to understanding and interacting with the physical realities of time, space, and matter. For instance, only through experience can an infant learn about the physics of light



versus shadow, the differences between solids and liquids, the movement of objects and

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their differing trajectories, and the sequential nature of time. The specific experiences suggested as valuable for your baby at each age grouping are discussed under the heading "Knowledge Needs" in the workbook.

COMMUNICATION AND LANGUAGE

Ideas and concepts can be related through both verbal and nonverbal means of communication. In the first 6 months, communication is best achieved through a close, concerned relationship between parent and infant. When you respond quickly and appropriately to your baby's cries, you will reduce the frequency of later crying, encourage feelings of trust and positive self-worth, and increase the likelihood that she will explore her environment more independently as a toddler.

Your baby's receptive understanding of what you are trying to convey is important to her intellectual development. Though emotional caring is indeed imparted by your responses, it is receptive language skills that are the primary focus in this book. The singularly best approach to assisting your infant to develop receptive language skills is to talk directly to her. Talk about what you are doing, talk about what she is doing, talk about any variety of subjects. Initially, your infant needs to hear how the language sounds in a general sense: intonation (the rise and fall in pitch of the human voice), lilt (the rhythm), stress, vowel-consonant combinations--all the patterns and elements that go into making the language unique.

From time to time you will want to expose your baby to other environmental sounds. Such stimulation allows her to begin differentiating between those that are familiar and

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those that are not. Remember that you should try to reduce or eliminate competing noises, high contrast images in her field of vision, touching or moving her, etc. if you want her to be able to focus on these new sounds.

Before infants relate meaning to words, they connect mood or emotional tone to them. Thus, you should not miss appropriate opportunities to express mood, temperament, and emotional feeling. Naming objects for your baby in order to increase her receptive vocabulary is not as useful in the early months as providing sentences for her that reflect the structure and use of the language. Infants do not regard words as specific meaningful units until they develop certain intellectual understandings regarding matter and its continuity in time and space. Such understandings in the average developing infant are seen after the 6th---7th month of life.

By the time your baby is 7--8 months old, you can expect that she will have a genuine sense of the feelings that you convey with your speech. She will also begin to comprehend the meanings associated with the words you use. These advancements in language comprehension are critical for the development of verbal concepts and later the ability to reason abstractly. A very useful measure of the value of your method of interacting with your baby to promote superior language skills is age in which she begins to understand what you say to her.

If you are a loving, caring parent, it is highly likely that at the end of 7 months your infant will have reached all her developmental milestones at a "normal" age--even

without any special knowledge on your part. But you want more for your child-you wouldn't have purchased this publication if you were not interested in maximizing your child's potential. Moreover, what you do with your baby during the first 7 months sets the foundation for the next, and very important, developmental period: 8-17 months. It is during that time that providing what stimulation your infant/toddler needs is critical to superior development.

Chapter Two

BRAIN DEVELOPMENT

This chapter provides information about the brain, how it develops, and what directions current research is taking. The later chapters utilize these findings to suggest specific behavioral practices. You do not need to read this section to take advantage of its implications; but for the purpose of clarity and as a basis for the recommendations, this section is included for your reference.

Windows on the Mind

In the 1990's science began to make investigative use of powerful, new brain imaging technology. PET scans offer the means to know where in the brain activity is taking place on a moment-to-moment basis. MRI machines give photographic-like images of the live brain, and using an entirely different technology, also can provide details on what parts of the brain are active for different tasks.

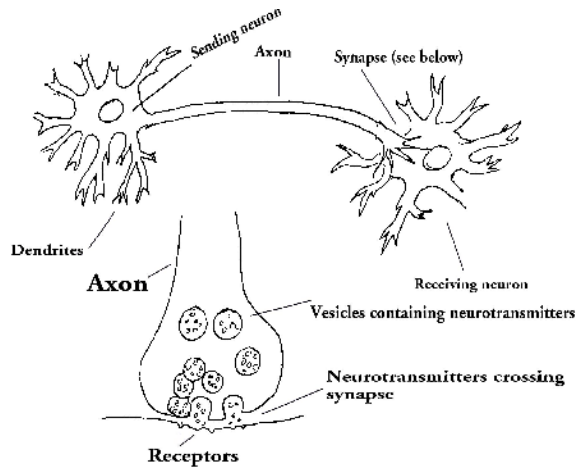
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vent of this technology has allowed us to indeed peer into our minds, enabling discoveries that before were unattainable. We clearly have entered a new frontier in our level and range of understanding about early development.

Data from the imaging studies are being analyzed by professionals from a wide array of disciplines, including not only neurology but psychology, genetics, medicine, anthropology, education, and even computer science. The data are clearly of use to researchers in early childhood development, as images depict the growth of brain structures and the relative effect of various experiences. Some of these findings have been reported in magazines, including Time's special report on "How A Child's Brain Develops" (1997) and Newsweek's special spring edition (1997). These articles have emphasized the powerful and lasting impact of environment on a host of developing abilities, including language, math and logic, music, vocabulary, and even emotional control. If infants are acquiring so much so fast, it would be expected that PET scans would show the brain at a high constant level of activity—and that is exactly what is seen. Many neuroscientists have noted that in the first 2 years of life, the brains of infants and toddlers metabolize glucose at a higher average rate than any other time in life.

There is wide consensus that the human brain contains some 100 billion nerve cells, or neurons, and that these nerve cells are all present at birth. However, at birth there are few linkages among the cells, particularly in the cortex, where thinking occurs. The brain grows, not by increasing its number of nerve cells, but through the development

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and elaboration of communication networks among the cells. Fibers, called dendrites and axons, grow and "reach out" to connect with other cells. The dendrites receive information from other nerve cells, and the axons send information. Experiences serve to link the cells together. And experiences may well greatly affect the balance of

neurotransmitters, the chemicals that enable or inhibit the cells from communicating.

One set of reviewers provide some specifics as to how environment alters brain physiology::

“It is now clear that experience produces multiple, dissociable changes in the brain, including increases in dendritic length, increases (or decreases) in spine density, synaptic formation, increased glial activity, and altered metabolic activity.”
(Kolb and Whishaw, 1998)

This finding, that experiences play a formative role in how the brain physically structures itself, has tremendous implications. It means that the differences among infants in the types and intensities of stimulation they receive will have a life-long impact on how their brain will be structured to handle information. Take for instance how well a child can focus on one task. If the infant lives in an environment that is highly changeable and dynamic, full of comings and goings and intense sounds and sights, he (in this case) might well develop a type of brain structure that minimizes internal activity so as to be able to attend to so much going on the environment. Such

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neurological alteration is an adaptive adjustment to a busy world, keeping the brain from being overstimulated. But if that child later is placed into an environment where far less activity is occurring and he is asked to attend to one feature of that environment, particularly one that is not very stimulating, he will have difficulty attending. His brain's balance for optimal stimulation relies on lots of external input, and he will find himself "drumming up" stimulation to reestablish the balance he needs. In a public classroom, students who squirm, talk aloud, or in other ways cause commotion to occur may simply be trying to normalize their environments to be in harmony with their brain's chemical and structural levels.

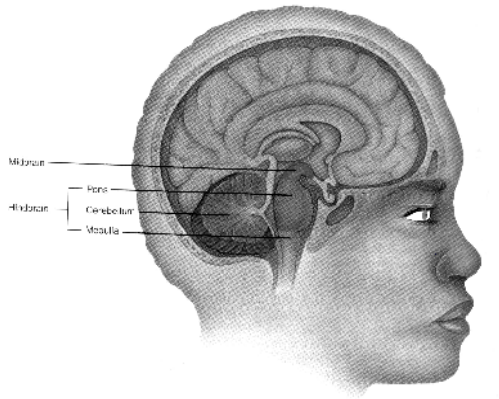
When the body's sense detectors send information to the brain, that information is processed by assigned nerve cells, which relay signals for interpretation to associative networks. Through these networks, the cells establish an electro-chemical means of representing patterns of understanding, thinking, and memory. They communicate with one another in synchronously orchestrated firings. Some scientists believe that neurons may connect up with as many as 20,000 other neurons, creating a virtual forest of "wiring". One team of researchers (Coveney and Highfield, 1995) estimate that placed end-to-end, the length of neural wiring may exceed 62,000 miles!!

There are several phases of growth and development in the brain during the first year of life. These changes are reflected in different behavior and capabilities, usually described as "milestones". In the first two months of life, infant behavior is primarily controlled by what are referred to as subcortical structures in the brain. Neurons in

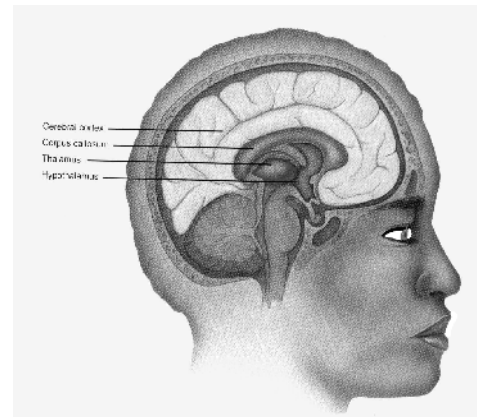
these areas are preprogrammed by genes to assist in survival. The subcortical

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structures control all our reflexes and other involuntary actions (such as breathing, blood pressure, and swallowing). Newborns do not have to think or reason about their surroundings in order to survive. Most of the body's systems are attempting to adapt to the new environment, and additional outside stimulation is not really desired. There is a need for considerable internal adjustment. For instance, just coordinating swallowing and breathing is a big task, inasmuch as such was unnecessary in the



Subcortical structures of the Brain



Cortical structures of the Brain

womb. As the subcortical structures mature in conjunction with input from the environment and practice with the reflexes, a coordination among body systems does develop. Cortical structures, those that allow for learned responses, begin to show dominance over the reflexive subcortical structures by the 3rd month of life. Whether this maturation is due to some particular time frame of experiences or is related to the quality of life experiences is still debatable. However, there is ample reason to believe that the cortex does receive and utilize valuable information from the subcortices during these first three months.

One line of research has shown that there are numerous "reciprocal pathways" between the cortical and subcortical structures. The presence of this linkage suggests that use and refinement of reflexive systems may well impact the initial ability to make

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organized sense of sensory information. The authors of this study go on to suggest that appropriate sensory stimulation during the first 3 months both maintains and enhances the connective communicative network among the nerve cells and may even sponsor new neurological growth, particularly growth that allows for more association of information.

Another type of bridge between the orienting and somewhat compulsory reaction control exerted by the subcortical structures and the flexible system allowed by the cortex is discussed in a study of the visual preferences of infants by Quinn, Brown, and Streppa (1997). Using subjects 3-4 months old, their analysis suggested that

“infants begin the world with visual systems that are biologically constrained to follow certain spontaneous preferences and gestalt organizational principles...”

But they go on to note that these “preferences and principles” may play a “START HERE” type of role which once engaged initiates the deployment of other more sophisticated selectivity and grouping mechanisms. In a separate study Quinn and Bhatt (1998) investigated what types of specific features of objects allowed them to be represented. Their list of fundamental features included curvature, line ends, movement, brightness, closed areas, and contrast. They found 3-4 month olds to be very interested in discriminating tilted and vertical lines. One implication of this suggestion is that showing your baby parts of designs that illustrate basic patterns may

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assist her in organizing her visual skills. Indeed, one study of 20 preterm infants (Lickliter, Marshall-Baker, and Cooper, 1998) who were exposed to visual patterns “experienced fewer state changes and stronger visual skills than infants in incubators without displays”.

Actually, the chronology of findings in studies on visual development parallels the findings in studies on brain development in an assortment of ways. Certainly the history provides insight into the researchers and their interests. As the more recent data are used to make recommendations for visual stimulation in this book, a brief review of the last few decades of research is included here.

Frantz (1961) is widely regarded as sparking many of the present popular notions about infants’ visual interest in faces and black/white images. With his equipment he additionally found that infants prefer to look at patterned rather than plain stimuli. Later, researchers discovered that as infants get older, they prefer more complex patterns. For example, 3 week old infants look longest at black and white checkerboards with few large squares, whereas 8 and 14 week olds prefer boards with many squares (Brennen, Ames, and Moore, 1966). Researchers Banks and Salapatek contributed considerable information about infants’ visual preferences from their extensive work in the early 1970's and 80's. In one study (1981) they discussed a general principle that characterized early visual interest, called contrast sensitivity. Such refers to the amount of light between adjacent regions in a pattern. The more contrast, the more interest. Salapatek (1975) also studied the scanning practices of young infants. He found that one month olds tend to look at the borders of drawings and stared at single, high contrast elements. By two months they begin to examine the

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internal features of a drawing, moving their eyes quickly around the figure, pausing briefly to look at each part. [In a later section of this chapter, more recent studies on scanning tendencies are examined.] Once babies can detect all parts of a stimulus, they start to organize the features into patterns. By 6-7 months they are quite good at applying organizational principles, such as distance cues and closure (Bertenthal, Campos, and Haith, 1980). Albert Yonas and his associates studied infants' reactions to various visual displays. They concluded that infants become sensitive to different spatial cues at different ages. From a limited capacity to judge size constancy at birth, babies extract spatial information from kinetic cues between one and three months of age, binocular cues at three to five months, and monocular (pictorial) cues by 6-7 months.

During this same time frame of research, professionals in the neurosciences were also conducting investigations as to how the brain actually encodes visual data.

In the 1960's and 70's, Torsten Wiesel and David Hubel carried out a series of studies on how the visual cortex maps images. They in fact received the Nobel Prize for their efforts in 1981. Using cats as their subjects, Hubel and Wiesel placed a microelectrode in a single cell in the animal's visual cortex. They then flashed different patterns of lines on a screen within the cat's field of vision. They observed that the neurons appeared to be highly specialized, firing only in response to a particular pattern of lines. Hubel and Wiesel moved the tiny electrode carefully and precisely from cell to cell in order to map the visual responses over a sizable area of the cat's visual cortex. They found numbers of single neurons that responded only to lines and angles. One neuron, for example, would only fire when the cat saw a vertical line, while another neuron

would respond only to a horizontal line. Some neurons were sensitive to length. All these neurons were labeled *feature detectors*, and are now regarded as being coded at birth to make their unique responses. These kinds of neurons respond not only to specific lines and angles but to several other features as well, including movement, texture, and color (Carlson, 1994) and even brightness (Rossi, et al, 1996). The feature detectors are not randomly placed. They are grouped in columns according to their response orientations, and the columns extend into the deeper visual cortex.

Hubel and Wiesel found that images transmitted by the eyes are mapped as edges and contours on the visual cortex, an interesting parallel to the findings of Frantz and others cited above as to what types of visual displays infants stare at in the early months.

Stimulation of the Cortex

Once your baby stops responding reflexively to stimulation it is likely that stimulation is then being processed by a different set of neurons---those in the cortex. Your infant's increasing interest in novelty continues to be driven by genetic predispositions, but it can be drastically affected by environmental input.

One productive way to look at the value of stimulation in shaping the brain is to divide experiences in the way that Dr. William Greenough and his associates do at the University of Illinois. In their article "Experience and Brain Development" (1987), they note that our brains expect that certain experiences will be available to each of us (for instance, seeing light-dark contrasts or hearing differing sounds). Parts of the brain are so pre-ready for such stimulation that few exposures are necessary for the data to be adequately utilized. Greenough, [et.al.](#) label these established connections as

"experience expectant". Only when there is great sensory deprivation would these

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understandings/structures/ abilities not develop. It is perhaps because during the first 4-5 months the infant is so helpless and unable to modulate her own level of stimulation, that nature has constructed these brain structures to develop with such a minimal amount of appropriate stimulation/experiences.

There are other experiences that are available in widely varying degrees, however, separate from these universals. What differentiates the more capable thinker involves the ability to elaborate and refine those experiences that enrich one's sense of meaning, knowledge, and communicative skills. These more complex/sophisticated nerve cell connections are labeled by Greenough, [et.al.](#), as "experience dependent". Each individual's unique experiences contribute to not only his/her individuality but to varying intellectual abilities as well. There are literally millions upon millions of circuits ready to be established in the brain. The adaptive and cognitive usefulness of that circuitry depends wholly on the experiences provided to the infant's senses. It is in this context of understanding that the activities in this book focus on promoting an awareness of natural/logical cause-effect occurrences, meaningful object relationships, and linguistic relevance. By following the suggested program of ideas, you are making sure that these valuable, and even critically timed experiences are not left to chance.

How skilled your infant becomes linguistically during the first 7 months depends primarily on many of the "experience expectant" stimuli. For instance, even deaf babies will babble, meaning that the basis for such vocalization comes from a pre-set maturational process. However, the foundations of language competency (understanding, conceptualizing, reasoning, articulating) begin with the newborn

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hearing clearly and often the sounds of the language she will be expected to learn and use. The extent to which the caretakers use language to label, explain, and reason about experiences will provide the basis for capable development in the months to follow. With respect to expressive language, research consistently indicates that at 2 months infants will repeat sounds made by an adult if those sounds are already in the infant's "vocabulary" fund. By about 3-4 months the infant may initiate vocal play. Also, during this time it is common to hear some quite unusual sounds coming from the baby. It is as if nature has provided language networks that allow babies to be able to hear (and subsequently produce) any possible human sound. From 4-7 months the sounds produced by infants more and more approximate what they hear around them. In this case, only those nerve connections that serve to help hear and produce the heard language will survive. Others are eliminated. From a series of experiments by Janet Werker (1989) and in later replications, it is clear that 6 month olds can perceive sound differences from any language, but by 12 months they cannot.

Actually, the tendency for the brain to form more circuits than it needs and to eliminate those that subsequently are not needed is a process that occurs in all parts of the cortex. Not knowing (as with language) which bits of information will be important to later adaptation, the infant takes in everything initially and varying neural circuits are developed representing the knowledge. Dr. John Mazziotta, UCLA neurologist, suggests that "repeated experience or practice with information reduces the total brain area needed to process that information, 'freeing up' space to devote to other tasks (cited in Psychology Today, 1992). So not only does practice/experience help develop specific skills knowledge, it also makes the brain more efficient. Conclusions drawn in the article "Mapping the Brain" (Newsweek, 1992) make a similar point:

"Intelligence may be a matter of neuronal efficiency, not effort...when a less smart

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brain thinks, lots of extraneous or inefficient neural circuits crackle".

If indeed certain neural pathways are strengthened and others eliminated simply as a function of experience, then the information that is made available to the infant should be as important and vital for adaptation as possible. Such a premise certainly brings into question the value of exposing babies to endless stuffed toys, pictures of cutesy animals, or recitations of most nursery rhymes. Inasmuch as infants are interested in coding the features of important shapes in the first year of life, showing them the geometry of the alphabet seems more appropriate, for example. Glen Doman and his associates at the Better Baby Institute in Philadelphia have gone one step further, and as described in the publication How To Teach Your Baby To Read, actually recommend the presentation of words. A few years ago I had the opportunity to interview some parents who dedicatedly provided such experiences to their infants. At the time, their children were about 5 years of age. Interestingly, the children were not able to read a book aloud, but they could explain the story they had read. From this and other information it seemed as if these children had developed a language proficiency in the usual non-language processing right hemisphere. They knew what they had read, as they could answer comprehension questions; but they were unable to read the print directly word by word.

New Insights About Genes

Geneticists have made great strides in the last decade in uncovering the genes that control or otherwise influence many physical –and even psychological–human characteristics. The more that is learned, in fact, the more convincing is the argument that virtually everything human is to some degree affected directly or indirectly by genes.

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Genes, known by most people as those “built-in” instructions that define our physical attributes, such as eye color and height, have more recently found to be linked to personality, differences in risk taking, tendencies toward alcoholism, and even general interests. Some genes specify identical actions for all humans, such as in the reflexive behaviors of infants. These reflexes, such as sucking and withdrawal from a source of pain, are considered “survival” reflexes that do not have to be learned: they come pre-programmed by codes within our DNA, as noted above. Less obvious infant behaviors that are under gene control include the behaviors of orienting to the sound of the human voice and visually engaging light-dark patterns. And even less obvious are dispositions toward certain patterns of perceptual organization.

Given that there are at present estimate some 100,000 genes and the connections among the neurons measure in the trillions, it is apparent that genes cannot program all reactions. There do exist many creatures on this planet whose behaviors are totally dictated by genes. Those organisms are able to adapt well only in specific locations, under specific types of conditions. For a species to have maximum adaptability, there should be a mix between programmed reactions and flexible, environmentally adjusted reactions. That is just what nature has provided us. We organize sensory information into specified groupings according to “gestalt” principles, we alert to changes and movement, we associate events in time, all in ways programmed by our genes. Yet we have the freedom to alter our responses, to make all types of associations, and to learn most anything.

One of the many surprising scientific findings in this past decade is that experience can change genetic predispositions. Some researchers are even of the opinion that genes cannot be regarded as independent factors in understanding human behavior. Elman and his colleagues (1996) write:

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“Earlier theories of genes as static blueprints for body plans have given way to a radically different picture, in which genes move around, combine with other genes at different points in development, give rise to products which bind directly to other genes and so regulate their expression), and may even promote beneficial mutation.” (p. 2)

At another point in their book, *Rethinking Innateness*, the authors write: “...the term ‘innate’ has dropped from use in genetics. Since it has become evident that genes interact with their environment at all levels, including the molecular, there is virtually no interesting aspect of development that is strictly ‘genetic’.” (p. 20) So nothing is purely genetic and nothing is purely environmental. Each affects and is affected by the other. Elman, et. al. make many interesting comments about genes. A final one to be presented here is this quote: “It is more useful to view genes as catalysts rather than codes or programs In isolation, a catalyst does nothing. Its information content is zero. But in its functioning context, a catalyst can make things happen which would not happen on their own.” (p. 351)

But how is it that the environment can modify genetic dispositions? Kolb and Whishaw (1998), whose literature review supports the same observations as Elman, [et.al.](#), address this question. They write:

“the most likely mechanism for increased gene activity is neuronal

activity, which is stimulated by behavior and experience. Activity initiated by experience or behavior could therefore increase the activity of genetic mechanisms responsible for dendritic and synaptic growth, and ultimately, behavioral change.”

Thus, there is some basis for believing that a stimulation program which provides accurate and useful data about objects and their associations could affect not only physiological changes in the structure and growth patterns of neurons and their communicating networks, but their genetic foundations as well.

Research Directions in Developmental Psychology

Researchers in developmental psychology over the last decade have turned their attention to two interesting questions: (1) how is it that infants acquire information, and (2) what types of differences exist in perception and learning styles that persist over time.

In this first area of interest, studies are probing such topics as joint attention, concept formation, language development, cross modal integration, and the formation of expectancies, among other concerns.

The study of joint attention has a notable history in the field. For a while it seemed that the extent to which an infant would look at what a caretaker was attending to provided an index to early assessment of intelligence. Many researchers continue to believe that such behavior is important, but they regard the basis for its absence or presence as relating to a more global issue. Moore, Angelopoulos, and Bennett (1997), for instance, suggest that this joint visual attention might be a reflection of the child's ability to

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understand gestures in general, not just head turns. “Infants,” they point out, “acquire the understanding that adult movements can be used to predict the direction of interesting events.”

In the 1990's professional literature, there is much discussion about the development of conceptual understanding in the first year of life. Jean Mandler, in her article, "How to Build a Baby II: Conceptual Primitives" (1992) reflects on the "image-schema" proposed by Johnson and Lakoff, two psycholinguists. The question she addresses is whether or not infants conceptualize as a result of object manipulation or do so just as a matter of visually interpreting what they see. She is of the opinion that it is perceptual analysis that allows the infant to conceptualize. She writes: "Perceptual analysis involves the active recoding of a subset of incoming perceptual information into meaning that forms the basis of accessible concepts". The types of experiences that she sees as affording productive perceptual analysis include

- (1) observing the path, or trajectory, that different objects make
- (2) learning which objects are animate and of those, their movement properties
- (3) noting the contingent motion among objects (when, for example, when 2 objects are dependent or constrained by one another)
- (4) observing causation (infants may start to understand causality [knowing that they are responsible for an event happening] when they have seen enough physical examples)
- (5) seeing objects that contain others: such provides for an awareness of 3 structural elements--interior, boundary, and exterior

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(6) seeing objects that support others: research suggests that at 3 months infants expect objects to be supported if they are in full contact with a surface, and otherwise they expect objects to fall. By 5 months they expect an object to be supported if any part of the object rests on the surface. By 6 months they can discriminate between adequate/partial and inadequate support.

There is the additional contention that when an infant sees objects in a container and then out, a sense of "either-or" logic develops as well as a sense of set theory (example: if a toothbrush is in a cup, and toothpaste is on the toothbrush, then the toothpaste is in the cup). This "if-then" inferential thinking is a by-product of the seen linkages.

Researchers in psycholinguistics note that in order for babies to understand language, they need both to be able to perceive and differentiate sound patterns and to thereafter associate those patterns meaningfully. Inasmuch as the average infant understands the meaning of at least a few words by one year of age, an innate tendency to sift through and organize sounds must be present. Jusczyk and Hohne (1997) point out that this process must involve (1) the distinguishing of a wide range of speech contrasts, (2) the ability to compensate for differences in voices, (3) the ability to compensate for differences in speaking rates, (4) the recognizing of particular phonetic, rhythm, and intonation characteristics of the native language, and (5) by seven months being able to "segment fluent speech into word sized units". This capacity to hear word boundaries within a continuous stream of speech is, as Johnson, et. al. (1998) note, one of the earliest challenges faced by infants acquiring their first language. They suggest that word segmentation in part may be facilitated by tracking the transitional probabilities between syllables in fluent speech. The work of psychologist James

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Morgan at Brown University (cited by Sutton, 1998) addresses this particular point. He found that during 6-9 months “babies whose native language is English seem to develop a particular rhythmic bias as they listen to people talk”. While this bias is likely different for different languages, English hearing babies attend to words common to English, wherein the first syllable gets the stronger emphasis, such as “pencil” or “telephone” versus words like “repair” or “asparagus”. Psychologist Paula Tallal has developed a computer generated speech program to help youngsters identified as having language based learning disabilities. This program slows speech and more distinctly establishes acoustic boundaries among the words the child hears. As successful as this program has been reported to be, the ability to hear these boundaries must be critical to linguistic competency.

Studies on cross modal integration (defined as the recognition of identity or similarity between information gained by different sensory systems) have suggested that strong infant capabilities across senses forecast spatial ability in later childhood (see Rose and Feldman, 1998). It was Eleanor Gibson (1969) who proposed that infants have a pre-programmed capacity to notice when something seen and something heard arise from the same object (notions of synchrony and co-location). As information about the “multimedia” characteristics of an object is perceived by the various senses, a redundancy occurs, leading to a sense of holism. This theory has been supported in recent research (Morrongiello , Fenwick, and Natley, 1998; Lewkowicz, 1994). If, in order for infants to adequately develop cross modal integration, they must be able to experience all sources of information about an object, then multi-sensory experiences must be made abundantly available throughout the middle months of the first year.

Researchers and theorists are also very much involved in understanding those aspects

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of development that persist from infancy through childhood. They have abandoned the focuses on most motor and perceptual skills that traditionally had been measures of infant intelligence. Now, given computers and more sophisticated means of measurement, they are ingeniously devising experiments to gauge much more subtle and apparently differential characteristics. These behavioral characteristics include reaction time, fixation duration, visual recognition memory, cross modal transfer, various measurements of attention, and novelty preference.

Dr. John Columbo, researcher at the University of Kansas, has been for nearly 15 years investigating issues related to differences in the manner in which young infants visually inspect displays. His research indicates that compared to those at 4-6 months, infants at 2-3 months tend to look at edges, vertices, or other specific elements of designs. They tend to look at the same parts until they tire of looking (called “habituation”) and do not take in the entirety of the designs. Older infants spend less time looking but are more thorough and do not repeat what they focus on as much. In short, they are more efficient “scanners”.



pattern of scanning for younger infants



pattern of scanning for older infants

But while there are differences across ages, there are differences among infants of the same age. That is, some infants are regarded to be “short lookers” and others as “long

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lookers”. Those who take more time also encode less (see also Krinsky-McHale and Hainline, 1998). Followed over time, these infants scored in a lower range on later tests of intelligence. The “short lookers” took in more information in a shorter time and were found to do better on the same tests of intelligence (Columbo, 1993). What makes the difference? One speculation is that experience with varying visual displays at an earlier age provides a data base against which other visual information can be compared. Another possibility, suggested by Columbo (1995), is that differences may reflect general differences in central nervous system (CNS) processing. There are many components related to CNS processing. One that has been investigated involves the neural attentional systems which control one’s ability to disengage, or inhibit, visual fixation. Among other studies, Frick, Columbo, and Saxon (1996) found that infants with long fixation durations were slower to disengage their visual attention.

Whether the differences lie in the central nervous system or in relative experiences, you as a caretaker might be able to have an impact. You will find suggested in this publication various types of activities for visual stimulation, all taking into account your infant’s level of neurological development and interest in complexity. It also may be possible to alter your baby’s scanning methods to help him be more efficient. Ideas relating to this possibility are discussed in Chapters 4 and 5.

In a more general sense, this efficiency of brain functioning may well relate to the habituation infants show to repeated stimuli, as the rapidity to which infants habituate to a stimulus has also been related to later intelligence. Researcher Rovee-Collier (cited by Bayley, 1993) notes that "the ability to habituate and rate of habituation are believed to reflect the maturation of the central nervous system". But what brings about this maturation? While a "genetic unfolding" over time may be certainly an important

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element, experience seems to play a part as well. For instance, it is reasonable to assume, as others have, that each time the infant sees an object, certain characteristics are noted and coded in the brain. Then when other objects are seen, the infant compares their features when those of objects already coded. If there is a match, the "orienting" response is inhibited and with further presentations, habituation occurs. Such a process would explain why infants prefer, at 3- 5 months of age, patterns that are moderately different from what they have already seen. The "preference" is seen as an orienting response to similar but different coded patterns. To the extent that the infant, by the age of 4 months, has received visual exposure to a wide set of common patterns, habituation would be expected to occur more quickly. Provision of useful visual patterns during the first part of the first year of life would seem to be an integral part of a program to help a child to be perceptive and process visual information efficiently.

As a final point here, it seems logical that memory would be related to habituation. That is, if a visual pattern has been fully recorded, then a quick comparison with a similar pattern should result in likewise quick habituation. Indeed, in one series of studies on differences in memory acquisition among infants (Hayne, McDonald, and Barr, 1997), it was reported that "one hallmark of memory development is an increase in the range of stimuli that can serve as effective retrieval cues for a particular memory". And the time involved in assisting infants does not have to be great. In another investigation led by Hayne (1998), the conclusion was reached that "numerous

studies with infants have shown that forgotten memories can be retrieved by reminders as short as 3 minutes per week”.

Contributions from the Field of Cognitive Science

A group of scientists who are also contributing to our understanding of brain development and functioning include those aiming to design artificial intelligence. Working with various mathematical algorithms, they are helping to answer questions about the nature of learning from a heretofore unknown perspective.

Drs. Paul Churchland and Jeff Elman of the University of California at San Diego are among a increasing number of professionals in this area of study. Churchland, in his book *The Engine of Reason, the Seat of the Soul* (1996), describes various sophisticated computer programs that can emulate the capabilities of the human brain, at least in limited ways on specific tasks. These programs, known as networks, use what Churchland refers to as parallel distributed processing to adjust to various types of transformations in vector space. This type of computer programming has been accelerating since the beginning of the 1990's. Elman, whose book was cited earlier, maintains that experience alone can allow networks to learn to read by just being exposed to “very large amounts of data” and that “biologically plausible network models” have been constructed “that show cells in the visual cortex do not have to be ‘pre-specified’ but emerge from cells initially uncommitted”.

It can be said, then, that the human infant is born with a set of genetic predispositions and biases that are a part of the makeup of our species. These biases orient the infant toward information in the environment and experiences which themselves act as

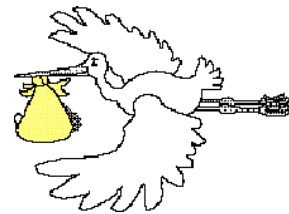
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catalysts for more expansive development along a series of adaptation-focused pathways. If we are clear as to what type of adaptive skills we want our children to develop, the time for first intervention is during this “information seeking” phase, a time when the brain is physically adjusting its thermometer and wiring to maximally adapt to the surroundings.

Any program to assist infants to develop their intellectual potential has to emphasize the importance of the involvement and active participation of an adult caretaker. Infants rely to a great extent on the guidance and direction of adults in the first 2 years of life. Ideally, that adult is the parent. Note some quotes from two representative studies: "For infants who had high exposure to appropriate play materials, social and hearing-speech development was optimal with higher maternal involvement" (Parks and Bradley, 1991); and "Two major dimensions of maternal behavior, non restrictiveness and verbal stimulation, were significant predictors of children's later cognitive competence" (Olson, [et.al](#), 1992). It is the environmental engineering and direct input from the parent that helps shape the neurological connections of those infants who are later seen as smart, capable, and competent.

Chapter Three

Stimulating Ideas for Infants Newborn to 4 Weeks



General Information: From all indications, human infants were not originally intended to be born at their present gestation age. There are widespread and consistent observations that the infant during the first 4 week period after birth

- does not seek outside stimulation,
- is far more comfortable under conditions that closely resemble the womb (such as low light, muffled and/or rhythmic noises, and restriction of limb movements), and
- continues to display most of the mannerisms and reflexes displayed prior to birth.

So why doesn't the fetus just stay inside for another 4 weeks, you might ask? Looking at our species anthropologically, it is clear that the size of the cranium has increased in size more rapidly than the birth canal over the years. Thus, if the fetus were to wait another month of development before being "ready" for birth, her head would be so large that exit would not be possible without surgery. As it is, the cranium has to fold

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over itself sometimes to be small enough. The conclusion to be drawn from this knowledge is that the newborn still needs both physical and psychological shelter during this 4 week period, particularly protection from possible over-stimulation.

That is not to say that all stimulation is nonproductive for the newborn in the first few weeks. What it means is that in order for stimulation that is valuable to have an impact, other stimulation has to be controlled or negated. Many physiological changes are occurring to the newborn as she makes the transition from a uterine environment to an open-air environment. Her perceptual system does not screen out anything that her eyes see, her ears hear, or her skin feels. With stimulation from inside her body and unfiltered sensory stimulation, it is no wonder that the newborn so often seeks sleep to escape all the sensations. The typical newborn is only alert [not sleeping, drowsy, fussy, or crying] cumulatively about one hour per every 24 hours. Most observers note she will likely be alert near feeding time (about every 3 to 4 hours) and for 5 to 10 minutes at a session. Inasmuch as over-stimulation will cause her to be alert less often, you should be aware of strategies you can employ to insure (a) she is not becoming overly stimulated and (b) that she is receiving the quality of stimulation she needs for optimal growth. These strategies include all the items below:

■ Protect her from excessive, unhelpful noises. Any noise that isn't a human voice or calmly rhythmic is unhelpful at this age. Any noise that is loud is counterproductive as well. Mixed noises (such as a combination of traffic sounds, music playing, several people talking, etc.) will cause her to try to ignore everything. Remember that all stimulation is additive and cumulative, meaning that the intensity and duration of lights

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and sound and movement all have to be considered. For adults this is hard to understand, as we are able to filter out or disregard stimulation. Newborns cannot.

Case History: Shirley, mother of Eric, tells the story of taking her young son to a busy restaurant late one afternoon when he was 2 weeks of age. He slept soundly through the entire dinner, showing no reaction to any noise--even when a waiter dropped a glass. Yet, a few days later while in a rare quiet moment at a post office, someone dropped a pen on the floor and Eric startled and woke up. Here, two points are illustrated: (1) the practice of newborns to close down all input systems when overstimulated and (2) the degree to which newborns continue to be sensitive to sounds even when sleeping.

┐ Dim the lights in every location she enters. Newborns have resided in a low-light environment for many months and their eyes take a few weeks to adjust physiologically to more intense light. Contrary to older humans, they do not see better with additional light and in fact will close their eyes when they are exposed to excessive light. In dim light (such as with a 15-40 watt bulb), newborns have been shown to scan the environment.

┐ Handle her in a gentle fashion. Don't bounce, jiggle, or toss her about. Also, don't physically excite her when you are providing auditory or visual stimulation. Tactile stimulation is valuable, but should be carried out in a specific way (See later sections on massaging techniques).

┐ Respond quickly to her crying or demonstrations of distress. A crying baby stimulates herself, and after a short period can become distraught and difficult to calm.

After the first month, allowing your baby to cry a little longer can be constructive for

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her, as she needs to develop the means by which she can calm herself. But newborns should be quickly aided.

It should be noted that trying to judge your infant's responsiveness to external stimulation is very difficult at first. Many of her facial expressions and bodily positions relate to events going on inside her, and she does not discriminate where the stimulation is coming from. In the first few weeks of life, infants lack the neurological sophistication to "parcel out" individual sources of stimulation. So when multiple sources of sensory input are present, they are likely to respond protectively and stop everything from entering consciousness. Another reason for concern is that overstimulation at any age is a form of stress. Studies (see Psychology Today, 1992) show that when stressed our bodies will produce chemicals--glucocorticoids -- that divert glucose (the brain's and body's primary energy source) away from the brain to the muscles, effectively disrupting the activity of brain cells. In the newborn, such disruption on a routine basis may well impede or impair optimal neurological development. Thus, there is good reason to attend promptly to the young infant's needs and to avoid multiple, intense stimulation. Pay close attention to how your baby responds to the level of stimulation you provide. Let her reactions guide you. Be conservative, and error, if you will, in the direction of under-stimulation for the first 2-3 weeks.

Sensory Motor Development

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Your baby has many "reflexive" behaviors that she is born with or develops in the first few weeks of life. These reflexive behaviors are those that, when stimulated, result in a predetermined, specific, consistent response. Providing the experiences that assist these reflexes to develop and be useful is important and provides the groundwork for more mature growth.



I. *Vision*-At birth and for several weeks thereafter, the infant's vision is poor. The lens of the eyeball is large (compared to the other structures), the optical nerve is immature, and the central part of the retina (where sharpness and color are seen) is under-developed. This condition results in the infant struggling to focus her vision, fixate on objects, and coordinate her eyes. One investigator conjectures that this "unsharp vision" actually helps the infant because it limits excessive visual stimulation.

Over the course of the first year there will be two components of vision that are developing: the eyeball and its accompanying parts, and the neurons in the brain responsible for coding what the eyeball transmits. In the first month, you can assist development in the physiological functioning of the eyeball. The first visual areas that develop as a matter of interaction with the environment are the pupillary reflex and synchronization.

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Prior to being able to use her eyes effectively to discriminate, the baby's iris must be able to constrict or enlarge appropriately to differing intensities of light. Then each of her eyes must coordinate with the other to be able to attend to an object. During these first four weeks this "pupillary reflex" develops and improves, as does the coordination, or synchronization, between the two eyes. Such development is necessary

before your baby can see with binocular vision— vision that lets her see three-dimensionally.

A. PUPILLARY RESPONSE

©©© **Assessment**©©: Observe whether the pupils of your baby's eyes constrict when a lamp is turned on near her in a darkened room. Try this several times to gauge how quickly the constriction occurs.

Case History: *Mark used a pen light with daughter Sara at this age (if you use such a light, make sure you direct it on her forehead, not her eyes); he noticed that at times the two pupils of her eyes didn't constrict the same amount and wondered if it had to do with the light. (Actually, the pupils should constrict the same even if only one eye is receiving light; it is one more type of maturational change that occurs in the eyes during these early few weeks in response to light experiences).*

* WHAT YOU CAN DO *

If you do not notice such a pupillary response (or if the constriction is sluggish), you can, in the baby's second week of life, give her brain "environmental information" by offering varying, but not sudden, levels of light intensity (remembering to avoid strong lights, such as direct sunlight). A dimmer switch will work well for this process in her room. Try offering these differing light levels each time the baby is alert during the day.

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If you have multilayered curtains, you can also effectively vary the light in the room during the daylight hours. This procedure is akin to "tuning" the light meter of your baby's visual system.

Record your stimulation efforts and your weekly observations: how quickly do the pupils of her eyes adjust to varying light levels? Use stronger lighting (but not direct sunlight) as her reflex improves.

B. SYNCHRONIZATION

©©© **Assessment** ©© Next look at how well your baby's eyes work together. It is common for the eyes of newborns to not coordinate consistently. During the times when the eyes are moving independently, the brain is receiving different images. Some babies synchronize their eyes more quickly and more often. If when you look at your baby when her eyes are open and find that they are not moving together or are misaligned when she stares, realize that she likely will straighten them out by the 3rd month. But you can assist her environmentally too. As noted, eye coordination is necessary to appreciate the dimensions of objects.

Case History: *Mark noted that when Sara opened her eyes at one week of age, sometimes it seemed as if her left eye was directed at the wall; then at other times her eyes seemed to move together in harmony. By 3 weeks her eyes always appeared aligned; and then a week later they were "out of synch" again. (Mark's report is not an uncommon one among parents-there's no worry at this point.)*

If you are doing any record keeping, note the ages you checked how well your baby's eyes focused together. Particularly note if one eye turns inward or outward:

*** WHAT YOU CAN DO ***

When your baby is alert, you can help her direct her gaze by holding her upright and supported on your shoulder. Have a friend or relative speak to her from about 10 inches away in a somewhat higher pitched voice (this voice seems to come naturally when speaking to young infants). If you use a dimmer switch or multilayered curtains, you can assess what light levels optimally sponsor her opening of her eyes to scan the room. This scanning helps promote the coordination of the eyes and the differing light intensities promote proper constriction/dilation of her pupils.

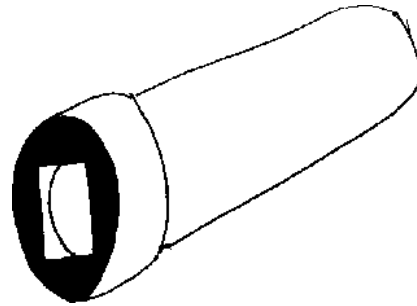
You can also use visual stimulation such as contained in Appendix A and C (these materials are discussed more fully starting on page 37, under the section on ages 4 weeks-12 weeks) to help your baby to coordinate her eyes when she is alert and lying in her bed. Place the drawings no closer than 5" and no further away than 24" from her eyes (and to her right).

Several lines of research suggest that the development of visual acuity may be affected by the development of certain brain cells and mechanisms in the visual system. If so, then appropriate visual stimulation may play an important role in this process, meaning that you can help your baby improve her sharpness of vision through her first year by

giving her the types of stimulation suggested in this book. Here is another activity you can use in a varied way during the next 3-4 months.

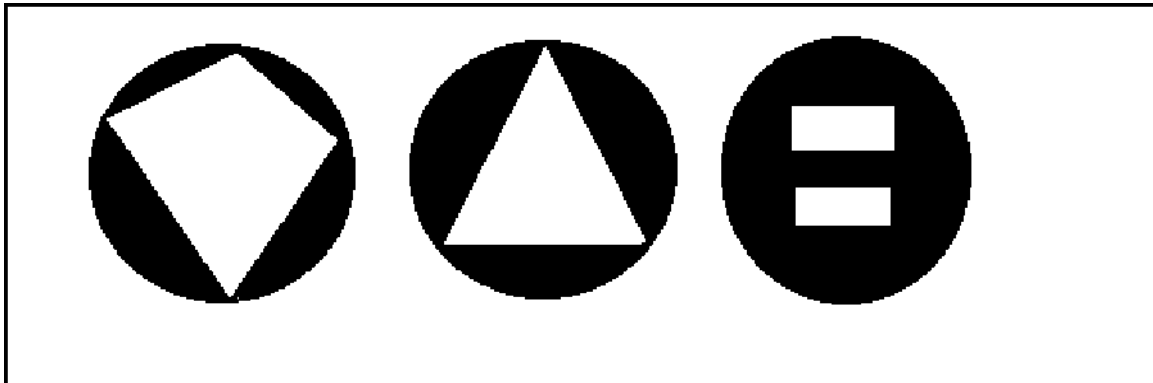
SENSORY-MOTOR DEVELOPMENT: BIRTH TO 4 WEEKS

First, you will need a medium intensity flashlight and a roll of black plastic tape. Put the tape over the front of the flashlight in such a way to form a square, as in the illustration:



Next, you will need a viewing board. A piece of white poster board large enough to place across the crib rails will allow you to provide this stimulation by yourself. Place your infant on her back in her crib. Darken the room. Next position the poster board over the extended crib rails but not more than 24 inches above your infant's eyes. Direct the beam of the flashlight onto the board from underneath (this may require some maneuvering). Move the image slowly left and right and up and down. If you have a smaller piece of board, hold it above your baby's line of vision and have a friend or your spouse move the flashlight. Then you can observe your baby's gaze and can better determine the extent to which she is interested. When she attains good trunk control, you can hold her upright facing a white wall with the tape and flashlight. Here are a few other ideas to get you started:

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***Case History:** Shining the shapes on the board was frustrating, noted Shirley. Eric would appear to catch sight of the lighted shape and then he would look away. If she moved the light a bit he "lost" it. So she waited about 5 days and tried it again. This time he was more interested and appeared to stare at the shapes longer if Shirley "rotated" the flashlight instead of moving it left or right.*

Although “activities” for visual stimulation are presented here, it is worth repeating that the use of general principles will have the greatest impact on your baby’s visual skills, including reduced lighting, slowness of movement, and discrete use of stimulation.

II. Hearing - The sense of hearing is well developed at birth, and infants are noted to have a reflexive tendency to turn their heads in the direction of a human voice. They are more likely to turn if the voice is of a higher pitch and continues for at least several seconds. Sounds are not perceived in the same way by newborns as by adults, however, and several sound sources can easily over-stimulate and confuse a baby, causing her to receptively "shut down" (as Shirley reported earlier about Eric in the restaurant). As

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with visual stimuli, sounds need to be presented in a singular fashion. When the room is quiet, stand near your baby but away from her line of sight; then speak to her for about 30 seconds. How long is it before she turns her head toward you? Does she continue to look? Make your voice high pitched for 10 seconds and then low pitched for the same time period. Do you notice any differences in her reaction?

A note on hearing and sleeping: although it may appear that your baby is asleep, she will hear and be stimulated by sounds nonetheless (a point illustrated in Shirley and Eric's experience in the post office). In fact, there is no difference in young infants' EEG patterns when awake and asleep, suggesting they are in a constant state of neural "consciousness". So be aware of what sounds you are providing her at all times. Don't play the stereo or put the volume on the TV at a level that would be audible to her when she is sleeping unless you want her to be hearing that information.

III. *Motor Skills*- The newborn possesses many motor reflexes. Some developmental psychologists estimate that the newborn has as many as 70 such reflex behaviors. Most of the reflexes can be stimulated easily. Some are related to survival, such as the rooting and sucking reflexes; some, such as the posturings, help the infant to develop good muscle tone and flexibility. These posturings are repeated positions the infant gets into, often involving the entire body. They are involuntary and may last for weeks or even months. One example of such posturing reflex is the "tonic neck reflex", in which the infant, when placed on her back, will extend one arm to the side and rotate her head in the same direction as that arm. The tonic reflex is most commonly seen at two months, and is discussed also under the heading KNOWLEDGE

NEEDS in the next section. Another common posturing is the back arch, seen most frequently in the weeks preceding sitting.

Depending on your reference source, there are over 70 identified reflexes. Most of them disappear by 4 months in full term infants. You might see pediatricians checking these reflexes at routine physicals. Their absence or presence beyond a certain age can be a red flag. Here is a list of the most commonly referenced reflexes:

1) **Rooting reflex**--where the infant attempts to attach her mouth onto a possible source of food

2) **Tonic neck reflex**--mentioned in the book, this position involves an extension of one arm and the head turned in the direction of the extended arm

3) **Crossed-extensor**--apparent when the infant stretches her legs



4) **Doll's eye reflex**--is when the infant "rolls" her eyes much like a doll

when moved from a vertical position to a horizontal position or vice-versa

5) **Stepping reflex**--this reflex generally disappears shortly after birth and

probably represents how the infant was moving her feet in the womb

6) **Hand grasp reflex**--this reflex is one of the last to disappear and may continue normally even through 6 months. Its presence thereafter, however, is an obstacle to voluntary apprehension of objects and may suggest neurological abnormality.

There are also two reflexes that normally appear with increasing cortical maturity and which normally are present in the behavior of 4 month olds:

- 1) Labyrinthine Head Righting reflex----a movement of the head to place it "upright" with respect to the rest of the body, regardless of body positioning
- 2) Landau reflex posturing ---- this involves an arching of the back, a process that strengthens key muscles for body balancing.

As has been mentioned, there is a definite direction of motor skill development, from head to toe and from midline to outer extremities. Sensitivity to touch also follows this same directional pattern. Research shows that touch is extremely important to infants. Thus, a third important area of stimulation (the first two are hearing the sounds of the human voice and having opportunities to visually scan the surroundings) is physical contact.

*** WHAT YOU CAN DO ***

During the first couple of weeks, stroke your baby's skin in the general direction of her motor skill development, emphasizing her face and head, her ears and neck, and then her shoulders and upper chest area. Stroking and massaging may have far different effects than tickling or poking. In a recent study (Pelaez-Nogueras, [et.al](#), 1997), a small group of 2-4 month olds received both stroking and tickling/poking at different times. Close observation revealed that whereas systematic stroking resulted in more eye-to-eye contact and smiling, the tickling and poking caused gazing away, more crying, and other types of protesting.

You may want to swaddle your infant as you stroke her, so that she won't flail her arms and legs, which will add non-productive stimulation and possibly result in a loss of

focus for her. You can stroke the surface of her skin and, somewhat more firmly, the muscle structure below the surface. Note her reactions. If she becomes fussy or shows signs of over-stimulation, stop for a while. If she remains calm and attentive, you may also speak softly to her as you stroke her--remember, a low pitched voice is more comforting, a high pitched voice is more stimulating. If you are anxious, your touch may make your infant anxious too. In a presentation to the White House conference on Early Childhood Development in 1997, Drs. Pribram and Rozman noted their studies showing that "...when one person's touching another or in close proximity to another, the person's cardiac rhythm can become coherent with the other person's cardiac rhythm as measured by EEG".

Case History: Shirley observed that when she gave Eric a bath in his first and second week he would cry. In a more general sense, it seemed to her that Eric was distressed by any changes to his physical state, whether or not the changes were designed to be pleasurable. She herself was more heartened when in the third week Eric seemed to start enjoying the warm water and gentle stroking.

Knowledge Needs

For the infant during the first month of life everything is new. Although she does not have the ability yet to screen out the thousands of sensations coming her way, her brain does attempt to secure information needed to adapt. This information is primarily acquired through reflexive actions, such as those that assist in getting food, developing muscle tone and flexibility, and reacting protectively to harmful environmental stimuli (such as withdrawing from a pin prick). Your baby is more likely to acquire the information she needs if you protect her from useless or excessive stimulation. In many

homes it is very likely that overstimulation actually places obstacles in the way of the infant's learning. By responding quickly and consistently to your baby's needs, you will help her develop a sense of trust, which is an important factor in how readily and often she will explore the environment as an older child.

Language Development

During these early weeks your infant will make a variety of sounds. For the most part these will be heard as cries, fussiness, and the like. The language-type of sound made (researchers say mostly vowels) is controlled by the shape of the mouth and the tongue. Good development of language at this time depends less on getting the infant to vocalize and more on affording her quiet time when she can listen clearly to your language patterns.

*** WHAT YOU CAN DO ***

The human voice is the most interesting sound to the infant, and the stimulation it provides is highly useful in language development. By speaking to your baby, you provide her with the sounds, the rhythm, and the patterning of English. Studies have shown that infants move their limbs in synchrony with human speech beginning almost at birth, exemplifying the close interplay between the various developmental systems. During the first month, talk to your baby at least one hour per day cumulatively--remember, even when she is sleeping she will hear your voice. If you run out of things to say, read a book (or two or three). But don't speak when the surroundings are noisy or in other ways highly stimulating. As with other stimulation, when she is quietly attentive, she will learn most.

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Case History Example: *Janice relates a story about her experience with son Jason when he was age 3 weeks, 4 days. Jason went with his mother on a vacation trip to a mountain cabin. He had not been making many sounds up to that point. But when she lay him down on the cabin's bed he started spitting a storm. She noticed how he was staring at the antique ceiling light fixture ("sound making" can increase under stimulating conditions, and lights have a fascination for the baby starting within this general age range; see the next section for more comments).*

----Chapter Review----

What you want to do in the first month is

1. Respond quickly to her signs of discomfort
2. Keep the lights dim and the noise down
3. Don't place her face directly in sunlight
4. Stimulate one sense at a time
5. Give her gentle massages
6. Speak slowly but otherwise naturally
7. Develop routines

What you want to avoid includes

1. Intense sounds or lots of garbled/mixed noises for periods of time
2. Quick or frequent changes in environmental conditions
3. Tickling and probing
4. Letting her cry

Chapter Four

Neurological Age 4 Weeks Through 12 Weeks

Overview: During the second month of life the infant shows an accelerated interest in humans and their faces. The first real smile appears and visual staring increases notably. The baby is able to differentiate sounds better and will come to recognize your voice among others. By about 8 weeks your baby may begin making cooing sounds.



A 3 month old “smiler”

Although she is becoming much more of a seeker of stimulation than she was at birth, your infant's actions are still primarily under the control of reflexive systems. Yet, what she is exposed to is registered, processed, and retained in the most basic fabric of her brain.

Sensory Motor Development

I. Vision: Once your infant shows a strong pupillary response and begins to synchronize the movement of her eyes, you will likely notice that she seeks out visual stimulation. Actually, for infants in this age grouping, the word "seeking" is a misnomer. They are actually more “compelled” to look at certain features of the

environment, the brain's attempt to gather information about important visual properties of the world. These images are then coded and stored in those parts of the brain that receive visual input. Until about the fifth month, babies use their eyes as the primary source for information about the world and how it works. For this reason, most activities in this and the next age grouping focus on visual stimulation. There is a sequence in the development of visual skills, and the more you are aware of this sequence and what part of



The compelling nature of black and white contrasts

the sequence your infant is in, the more you can be of assistance. The nerve cells in our brain that respond to visual input from 4 to 14 weeks are particularly sensitive to light-dark areas, differing shapes, and movement. Light-dark contrast areas help define the basic characteristic forms present in our world. In the second month of life your baby's eyes will be attracted to the edge, or border, that separates light from dark images. Her brain will begin to "code" these differing types of edges for later use in recognizing and associating important environmental features.

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These various edges of course are eventually put together to form coherent images. The process of putting them together is one of scanning, a process mentioned in the last chapter. Considerable research in the past decade (see Chapter Two) has indicated that there exists differences among children this age in the efficiency in which they scan. Some repeat areas they have already seen, some look at edges that don't really help them distinguish the form from other forms. These infants also tend to spend more time looking at shapes and designs. In contrast, there are infants who look for shorter periods of time but scan more parts of the images and do not look at the same areas as much. They are basically more efficient in their approach. Can you assist your infant to become a more "efficient" scanner? While there is not currently published research on this question, it seems that the process of presenting information to your infant at a level that matches their readiness level is more apt to augment their skills. The suggested activities in this and the next chapter are tailored with this idea in mind.

*** WHAT YOU CAN DO ***

Activity 1

In Appendix A you will find seven sets of black lines. Start by showing your baby the widest lines for a few seconds about 8 to 10 times a day. If she continues to stare for 3-5 seconds, keep showing the same lines. When she looks away almost immediately for several presentations, introduce the next page. You will notice it contains lines a little thinner and drawn closer together. Repeat the process. You can construct a hanging mobile so that your infant will have useful visual stimulation when lying down (see Appendix B). When she is in your arms, you can prop your pictures upright (you may want to glue the pictures to pieces of poster board--they will hang better too) some

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8-10 inches from her eyes. You can make checkerboard patterns or shapes as well. Research suggests that until about 8 weeks of age most babies do not attend to shape or pattern; but with the use of these activities, your baby may be ready for patterns at an earlier age.

Activity 2

There is some evidence that showing your baby letter shapes (3/4" wide, 5" high, in black) may give her visual centers valuable foundation information beginning at this age also. Curved lines can be very interesting, and the curved, geometric shapes of the letters of the alphabet are not only interesting, they are of later vital importance in learning to read and write. Such stimulation should be



introduced when your infant will stare at the letters for several seconds at a time. See Appendix C for a sample letter size to use. Use 4 letters at a time and rotate them through the day, one by one, for 3 days. Then show 2 different letters along with 2 "old" ones on the 4th day. Continue this process with the remaining letters, always having a mix of "old" and "new" letters. As in the first activity, use your baby's reaction as a guide. The procedure suggested is simply a framework from which to make more individualized presentations.

Activity 3

In addition to lines and letters, there are other shapes of importance that your baby will benefit from seeing and storing as valuable images. Some of these are shown in Appendix D. You should reproduce them in larger sizes, as in Activity 2 above. These

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images include facial outlines, hand outlines, utensil outlines, and many more common objects that the infant will be exposed to later. The numerals 0 to 9 also represent useful visual stimulation—just show them to her from time to time over the next 4 to 5 months.

For even more ideas, look in your own particular environment: what is it that is/will be important to your baby's lifestyle? Just make a 5" black outline of it and show it to her from time to time. For now, these showings allow your baby to code and store the elements of the shapes in memory. This memory storehouse will be of great help in processing information when she is able to manipulate some of these objects with her fingers.

Case History Example: James and Mary are the parents of Brian, at the time of report a lively 3 month old. James enjoys spending time with his computer and Mary's hobby is art. They decided to make outlines of the computer monitor and keyboard, disks, and even the mouse. And they added outlines of paintbrushes, palettes, and an easel. When they show Brian the individual outlines they say the word for each object. They know he doesn't know what they are saying, but he certainly enjoys the interaction, and within a few months he will know.

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Place the drawing of the lines, shapes, or letters at various ranges from 5" to 24" from your baby's eyes, then put yourself in position to look at her eyes. You will more likely be presenting visual information to your baby at the level she most benefits if you chart her reactions. The longer she stares, the more interest she has and the more learning that is taking place. If you find her inattentive or frequently changing her visual focus after

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just a second or two, there is likely too much stimulation or stimulation that is above or below the level of her ability to process.

Activity 4

You may notice that your infant stares at lights. This is another behavior directed by her brain in an effort to gain information about light-dark contrasts. On occasion an object will come between her eyes and the light source she is looking at and **WOW!** there is an interesting silhouette. You can arrange this experience for her by (1) placing her upright on your shoulder and facing a window, and (2) having a friend slowly walk from one direction across her field of vision, between her and the window, stopping briefly about midway. Repeat this procedure 2-3 times a day. Up until 2 months of age, your baby will have better vision looking out the corners of her eyes--so presenting her with visual information from about 30 degrees off center will be the most stimulating. When she scans the lines and shapes you have created for her and she scans from side to side the silhouette of your friend, she is also stimulating the development of nerve cells at the back of her eye. Such stimulation is important to her improved acuity.

Activity 5

There is an added reason why your infant will be visually attracted to the slow walking of your friend in front of that window. As mentioned earlier, certain nerve cells in the brain are dedicated to interpreting movement. So it isn't surprising that researchers consistently find that young babies take particular notice of moving objects. Moreover, it seems apparent that objects seen from different perspectives offer more visual information. So, do expose your little one to objects that move, and slowly rotate them as you move them slowly through space. Exposure to certain objects may even assist

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infants to gain important conceptual (knowledge) information. During the next few months, as your baby becomes increasingly interested in visually searching the environment, you should

A) show her how objects are made up of differing component parts or geometric shapes; for example, take the lampshade off the lamp and put it back on while she is watching; show her a portion of a spoon (by using your hand as a "cover up") and then the rest; rotate a book slowly in space to show the edges, then open it up as she watches. The younger your baby the more slowly you should move and the more often you should repeat the same activity. But if she cannot follow even the slower movements, she isn't yet ready for such presentations.

Case History: Mark really enjoyed this type of interaction with Sara. At 7 weeks he said she finally would look his way for several seconds at a time. He would prop her up her seat and put on his "show". Mark owns many different hats and he would put one on while talking to her about what he was doing. Some hats he pulled down low on his forehead and then "peeked" out at her. Sometimes she would smile. Sara would track his wristwatch as he moved it up and down and left and right---but it wouldn't put her to sleep!

B) show her different types of containers and objects that fit into or fit partially into the containers; show the containers to her from different perspectives or angles and put objects into and remove them from the containers. Such visual experiences introduce her to the notion of object permanence, whole-part relationships, and many other important concepts (see Chapter Two for more information on this subject).

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Realize that there are many different types of containers:



The Many Faces of Containers

C) show her brightly colored balloons that you drop above her line of sight to encourage her to follow an object moving from a higher position in space to a lower position.

D) show her how certain physical events cause other events; for instance, striking a balloon makes it move, blowing on paper makes it ripple, pushing on a chair will make it fall over, etc. Note her visual and body reactions to what you show. Engage in these activities at varying rates of speed, slow motion to normal, and repeat them. There is a lot to be learned about such events, and you will need to repeat these displays for many months.

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E) show your baby the types of movement that living objects make versus the types of movement that non-living objects make. The primary difference here is that the movement of non-living objects is generally affected by the actions of living objects. Seeing such actions helps the infant to begin to distinguish between animate and nonanimate objects, a valuable conceptual scheme.

Ideas related to these perceptual precepts will be discussed in the age sections that follow as well.

Activity 6

You can help your infant to develop those nerve cells at the center of the back of her eyeball between 8 and 12 weeks. It is at this center, or "fovea" that the sharpest vision occurs. For the first couple of months the cells at the fovea are immature, so when babies attempt to focus on a moving target they "lose" the image. These cells at the vision center respond to color. Thus some of the objects (or pictures with lines/shapes) that you move slowly across her field of vision should have highly contrastive and bright colors (this activity should not be carried out with a lit background). Look at your baby's eyes as you move an object (at least 6 inches in diameter) across her line of vision. If she stops looking, "back up" and see if you can get her to locate it again. Move the object slowly again.

Activity 7

Somewhere between 6-8 weeks of age, the majority of infants will first smile at a human face. Research indicates that it is the pattern created by the viewed eyes and nose that "triggers" this reaction. Nonetheless, it is a rewarding experience for the

SENSORY-MOTOR DEVELOPMENT: 4 WEEKS THROUGH 12 WEEKS

parent and hopefully will encourage you in your efforts on your baby's behalf. While your baby is smiling at you, cover your mouth with your hands and look at her. Is there a difference in her smile reaction? Cover your mouth and nose, leaving only the upper part of your face in view. Now is there any difference?

This smile indicates that your baby will begin to notice and appreciate visual patterns. Her interest in checkerboards, geometric shapes, letters, and even words (printed large) begins to heighten. Give her ample opportunity to look at such contrastive patterns/shapes throughout her waking day. Two other important points: show her some patterns over and over--don't give her a steady diet of novel pictures; and do give her time when she can "get away" from them as well--she can still be over-stimulated.

Case History Example: Mark, the showman, made a checkerboard T-Shirt to wear for Sara. He did a singing stage act (maybe a little overboard) , and he reports she was a great audience. James and Mary focused on letter and number shapes with Brian starting at 8 weeks. They noted that he seemed to stare longer and with more interest each week thereafter. Shirley found that Eric still was more interested in (meaning he looked longer at) silhouettes against a lighted background than he was in high contrast pictures on cards during this age period.

II. Hearing: By the 8th week, infants can distinguish different voices, tone qualities, and statements. However, your baby will likely not be as responsive as she was in the first couple of weeks to turning toward sounds. Her initial responses were reflexive; now she can choose whether or not she wants to respond.

* WHAT YOU CAN DO *

Your baby will be more interested in a variety of sounds and patterns by the second month. As before, avoid overlapping sounds. Experiment with high pitched, low pitched, slow paced, lively, jagged, soft and other sounds. Here are some ideas to get you started: tearing or wadding paper, clearing your throat, activating a blow dryer, pouring macaroni into a pan, turning a door knob, and opening/closing the blinds or window. Create these sounds in her field of vision. Record what your baby's reactions are to your demonstrations (these practices of making noises are a normal part of most anyone's



routine, but the point is that your baby is interested in the sounds; thus, you should continue to involve her as much as possible, verbally speaking about what you are doing or she is seeing, even though she will not understand what you are saying).



She will enjoy music more, and you might note which types she alerts to and her differing reactions (such as facial expressions, arm movements, etc.) to different types of music. There has been some attention in the press that certain classical pieces may assist

humans at differing ages to organize their spatial understanding of their surroundings. But the evidence is unrelated to infants hearing music. Nevertheless, infants do show signs of responding to music and you should be the judge as what levels/types of auditory stimulation are advantageous to her. As with other forms of stimulation, be sensitive to her reactions.

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III. Motor Skills: Remember that motor skills develop from top to bottom and from center to periphery on the body. The activities described on the following pages will help you to take particular note of your baby's emerging skills.

* WHAT YOU CAN DO *

Head Control Activities

The first motor area to help the baby develop is head control. Moving objects back and forth (including your whole self) in front of your infant will encourage her to move her head to follow you. Sit her in her chair,

and if she just moves her eyes, then talk to her as you move. Get her to move her head to one side then the other several times a day. Also, place her on her stomach to give her opportunities to lift her chin off the surface. By 4 weeks most babies can chin lift, and by 8 weeks most can lift their chests up.



Shoulder Control

The development of shoulder control occurs in a series of stages. On her own accord, your baby will likely display arm waving (accompanied by leg movement) somewhere between 9 and 11 weeks. These actions can be stimulated by general excitement or through the provision of objects of interest being placed within arms reach. Although your baby is probably most interested in actually touching and manipulating what objects you dangle near her, she lacks the motor development and coordinative ability

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to reach out with any exactitude and grasp an object. This inability results in the hand clasp seen around 3 months of age and the subsequent "swiping" or "batting" of nearby objects a couple of weeks thereafter (see MOTOR section of the 3-5 month age range for more on swiping). The more sophisticated process of reaching out and apprehending objects involves a coordinated effort between the eyes, shoulder, arms, and



hands. The visually directed reach is complex and most infants do show such skill until after the 20th week. But there is evidence to suggest that helping the baby to see/recognize her hand (see KNOWLEDGE NEEDS section, this age group) and to have objects of interest presented daily may hasten this important skill development.

These "objects of interest" can be further defined. Visually, the objects should be of high color contrast or black and white. They should be easily struck by a flailing, poorly controlled arm. There should be some object reaction when struck (such as movement or sound). The older the child, the more the variety and/or change that should be provided in the course of the day.



As an example of such interest-object, consider a balloon. You can either purchase those with high contrast color or you can buy white ones and mark them yourself with designs. Attach a string to the balloon, and when your baby is in her infant seat, let it dangle somewhat less than arm's length in front of her. The balloon will

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move with the slightest touch, and its flight when struck will amaze her (try again using a balloon when she is 3 and 4 months old and see how her reactions change).

Case History: *Shirley found that Eric was most likely to flail with his arms when she had her face next to him. While she did want him to be encouraged to use his arms in a directed way, she had mixed feelings about sacrificing her face as a target! [Maybe she could have used a picture of herself?]*

Hand Control

For most infants, hand control does not emerge until after the 3rd month. There are two primary reasons for this delay: the baby's very strong grasp reflex keeps her from utilizing her fingers in any exploratory manner, and, as discussed further in the KNOWLEDGE NEEDS section, she has no built-in awareness of the existence of her hands.

*WHAT YOU CAN DO *

You can begin assisting your baby to develop more conscious control over her hands beginning at about 8 weeks of age. If you put your finger in between her closed fingers and her palm and lightly press against her palm she will squeeze tightly. This response can also be generated by pulling up with your finger, pressing on the insides of her fingers. Engage her grasp reflex some 20 times daily, using different fingers. You can also use small soft objects which you place in her palm (she may grasp them immediately, without your needing to gently press them into her palm). Try small sponge balls, tissue paper, a small ball of yarn, or the edge of her blanket. You will find that her grasp reflex is very strong. Stroking the back of her palm will encourage

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her to open her hands and release whatever she is grasping. You might also try having her grasp a wash cloth inside which there is a small portion of an ice cube. The progressive cold should, within a few seconds, bring about a reflexive reaction to open her hand and drop the wash cloth. If she does not drop it within 20 seconds, remove the wash cloth. Of course, if she becomes upset at any point, also stop the process.

The more times your infant engages her grasp reflex, the more quickly she will develop conscious control. It should be emphasized, however, that these procedures, like others mentioned in this workbook, will not work in isolation. Your baby is developing as a unit in a prescribed way, and her development of voluntary control of her hands is also normally related to parallel achievements in vision, hearing, and understanding. When you work with your baby, you must consider her totality of skills and developmental needs.

Muscle Strengthening

Through various "reflexive posturings", the muscles of the neck, shoulders, back, and legs receive exercise and strengthening. After the 4th week, do not block your infant's attempt to freely move her limbs by swaddling her or placing her into the same type of support for extended periods of time. Placing her on her stomach is a good idea, as it will not only sponsor head raising, it will also afford her a chance to move her arms and legs against something. This process strengthens muscles and gives important feedback to the brain about the environment (gravity in particular).

<i>Case History:</i> Sara seemed to have an interest in quickly developing motor control right from the start. Of course, father Mark may have had something to do with it too.

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When he placed her stomach-down on a blanket on the floor, he would lie down next to her and encourage her to lift up her head. She would struggle, almost at times as if the whole affair was a big pain; but when she finally did get her head up, he said she seemed to have a look of curiosity in her eyes she didn't show at other times.

A Note About Reflexes

Reflexes become more reliable and efficient from 4 to 8 weeks as they are repeatedly stimulated. However, there is little organization or coordination of these reflexes—they seem to operate independently of one another. By 12 weeks many reflexes will be suppressed in favor of more coordinated, voluntary behavior among the senses. This suppression of reflexive behavior may result in your having the impression that your infant suddenly isn't hearing or reacting appropriately. She may not turn toward your voice or a noisemaker you are holding. As her brain structures develop to form new, vital associations and to allow higher-level thinking, there is often a week or two when she may appear less responsive. Be assured that it is a normal phase and she will thereafter be even more responsive and alert to environmental events.

Knowledge Needs

Inasmuch as during this period the baby is much more interested in her surroundings than she was as a newborn, you should be aware of what information her brain is seeking so that these valuable experiences can become part of her strong foundation of useful knowledge about the world.

Your baby needs to know about the types of objects that exist, particularly those that are important to her survival. What does she need to know about these objects? Well, eventually everything. But initially, during her first 3 months of life, she needs to be exposed to their shape, size, and dimensionality. She needs to see how they move, if

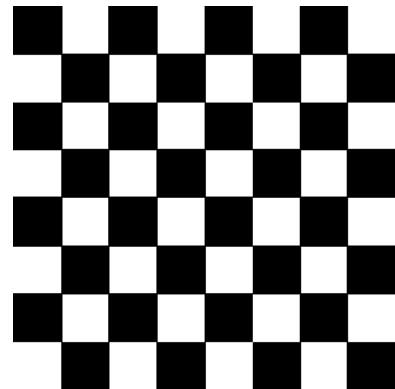
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at all. Somewhat later, she will need to know how she can affect the objects and how her body can physically interact with the objects. She will need a physical, motoric understanding of the objects. She will want to know how objects can be combined with other objects for various purposes. She needs to gain an understanding of the permanence of objects.

Much of the knowledge infants gain in the first few months is based on their visual observations. Thus the emphasis on the activities listed in the "Vision" section of this and the next age period. One of the first objects to regularly catch the attention of young infants is their hand, an obviously very important object for future intellectual development. As babies often lie (when on their backs) with their eyes in the direction of their outstretched hand (this is the tonic neck reflex mentioned earlier), there is continual opportunity to see the occasional wiggling of their fingers. During the period of 8-12 weeks, most infants will begin staring at their hands for longer and longer periods of time. This "hand regard" as it is often called, is important because it signals the beginning of what will eventually become visually directed, intentional reaching behavior. Being able to reach objects of course allows for exploration of those objects. (see KNOWLEDGE NEEDS section of 3-5 month period)

* WHAT YOU CAN DO *

Some researchers have shown that if you cover your infant's hands with black-and-white checkered mittens at about 2 months of age occasionally during the day, she will notice her hands several weeks earlier than she might otherwise. You also might consider, instead of a mitten, a



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piece of cloth with a black-and-white design tied around her palm. During the time you are trying to "set the stage" for her to see her hands/fingers, eliminate other high contrastive pictures or objects in her immediate line of vision (within 3 feet). Plain colored sheets are recommended, as she is rarely in a position to see any designs on them anyway and they can distract her from seeing her hands. If you combine these actions with presenting her with interesting objects to reach for, you may find her reaching for and grasping objects earlier too.

Language Development

After 3-5 weeks, you will likely hear your infant increasingly making cooing sounds. These are primarily open vowel sounds ("ah", "oh"). Actually, the sounds infants make, and the stages they go through during the first 6 months, are universal. This uniformity is primarily due to the maturation of motor control and the particular shape of the mouth. During these first 6 months infants are more likely to coo or babble (adding consonant sounds in an eventual repetitive manner) while another person is speaking to them. Thereafter they will vocalize more often after they have been spoken to and there is a pause.

WHAT YOU CAN DO

Continuing to talk to your infant, particularly when she is cooing, is a practice that has been shown to assist in the development of effective language skills. One type of talk, labeled "motherese" in the literature, has been thought to be of value to infants at this age. This style of communication consists of short, slowly spoken simple sentences in a high pitched voice. Often the sentences are repeated with extended emphasis on key words. You may recognize this style as one that seems to come naturally to you. Its

CHAPTER REVIEW: 4 WEEKS THROUGH 12 WEEKS

ingredients are explained here only to give you more conscious awareness of what is involved.

If you repeat your baby's "cooing" sounds to her, you will find her to be attentive and maybe even wide-eyed in reaction. She may attempt a repeat of the same sounds, but observations show that your vocal reactions will more likely encourage her to make other sounds of which she is capable. Not only does this vocal interaction encourage her to continue involvement with you, it gives her the sense that she is having an impact on events, a very important belief. :

---CHAPTER REVIEW---

There is an order to be considered for stimulation during the 4 weeks to 12 weeks time frame. Broken down by area, the sequences are as follows:

Vision

- develops sense of dark and light edge differences
- notices curved edges
- begins to track moving objects, especially dark against light backgrounds
- tracks lit objects side to side
- notices 3 dimensionality and color of objects
- notices components of objects

SENSORY-MOTOR DEVELOPMENT: 3 MONTHS THROUGH 5 MONTHS

Hearing/Language

- attends to rhythm of language(s) being heard
- differentiates many types of sound patterns -
- coos when someone else talks to her

Motor

- gains considerable head control
- gains shoulder control
- strengthens muscle tone through reflex posturings

Social

- smiles at others
- shows interactive interest -
- attentive to moods of others

Chapter Five

Neurological Age

Three Months to Five Months

Overview: During this age period, the infant begins to coordinate her senses as well as sensory-motor actions more frequently and with greater purpose. Thus, the activities mentioned under the differing headings below assist not only the sense or skill of one area but others as well.

Also, as mentioned in the previous age section, by 3 months babies are not as reflexive in their behavior. They will make more voluntary choices as to what to react to and when to react. What will get their attention does not change a great deal, but what will hold their attention does change.

Sensory Motor Development

I. Vision. There is a trend noted in the research literature that as a baby matures she prefers smaller and smaller objects to look at and objects with more and more elements or parts. If you have been making the black lines smaller and smaller (from Activity 1 in the last age section), then you probably already realize this tendency. Your baby's visual acuity continues to improve monthly throughout the first year, and this improved clarity of sight undoubtedly affects what she is interested in looking at.

WHAT YOU CAN DO

Activity 1: Size of Objects You can assess what size of picture-objects your infant is most interested in by showing her two pictures which differ only by size and then noting which of the two she looks at longest. The pictures you present for this assessment should be simple, singular objects (letters, shapes, or outlines of objects), in contrastive colors or black-and-white. Keep trying different sizes until you find out exactly what size she likes the most. Reassessment may be necessary every week until she can actively reach out and grasp objects, thereby "telling you" what she is looking at. At what age does she prefer what size of picture?



Activity 2: Patterns

You should also know that by three months your young one will be interested in more than just the outlines of forms. Patterns and designs become more intriguing. Thus, rather than simply providing all-black shapes and letters, also introduce some with patterns inside the outlines. Try your hand at some creative patterns. As a springboard, here are some ideas for patterns inside your presented shapes and letters:

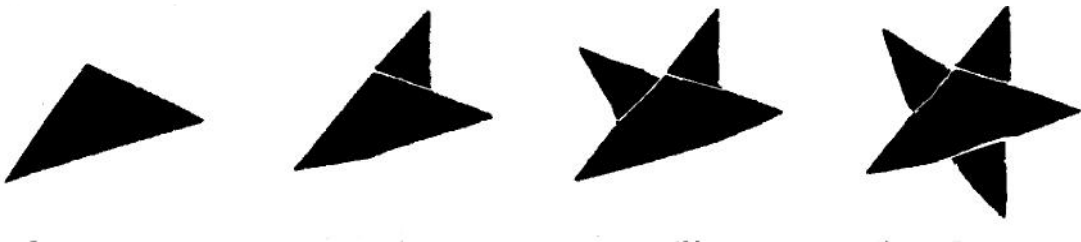


SENSORY-MOTOR DEVELOPMENT: 3 MONTHS THROUGH 5 MONTHS

Rotating the shapes/objects/letters slowly as you present them will provide a different look. You can also consider brightly patterned fabrics to show her, as well as high contrast pictures from magazines.

Activity 3: The Perception of Novelty

In addition to preferring smaller sized figures with more elements, your three month old will show a developing preference for novel instead of familiar objects or pictures. Now is when you need to become even more creative! You will want to present visual images that neither bore (that is, add no new information) nor overwhelm (be unlike anything she has ever seen). This common sense dictum is supported by research showing that infants are most interested in patterns that are moderately different from what they already know. Patterns that are too much alike those already seen are apparently viewed as familiar. Thus, you might consider making a series of geometric designs, each differing from one another by one element in order to gauge her reaction. As a for-instance, here is one example:



Present the most simplistic design 4 or 5 times, then present the next most complex. Note your baby's reaction to the presentations. You may want to place both designs in front of her and observe which of the two she looks at longer.

SENSORY-MOTOR DEVELOPMENT: 3 MONTHS THROUGH 5 MONTHS

While again on the subject of relative time of staring at objects, it should be pointed out that researchers use infants' gaze as a key means of assessing many aspects of their interest in, discrimination of, and learning about objects. Researchers have drawn many conclusions from studies in which an infant's adaptation or "habituation" to a stimulus is used. The underlying premise is that infants will stare at an object that is new to them, but after a while, as the object becomes increasingly familiar, they pay less and less attention to it. In one type of study, the researchers show a object over and over to an infant and then introduce a new object next to the "old" one. If the infant then is regarded as staring longer at the new object, she is assumed to note the difference and to have "habituated" to the old object. This process is of course related to memory, and memory is discussed further in the next activity.

Activity 4: Memory

For the past several weeks you have been presenting many important visual images to your baby . Having a variety of images from which to compare or contrast new sights is helpful in establishing and maintaining interest; moreover, such a storehouse of images may help develop a useful, vibrant memory system.

Some researchers believe that one reliable index to early intelligence is the extent to which a baby's memory is functional. In fact, it is generally agreed that beginning at or slightly before this age period, memory images play an increasing role in determining what an infant will stare at.

Case History: When Brian was 4 1/2 months old, James and Mary knew that his memory was developing well, as when he would see one or the other of them after a period of time he would "let out a little squeal". That sure delighted them!

KNOWLEDGE NEEDS: 3 MONTHS THROUGH 5 MONTHS

You might check on your baby's memory ability by using the habituation method noted earlier. Show her a design for 30 seconds 5 times during one morning. Then show her a new design for 30 seconds. Then take out the design she saw that morning 5 times and place it side-by-side the one she saw only once. Does she stare longer at the one she saw only once?

Activity 5: Dimensionality

By three months of age, infants become more interested in the dimensionality of objects, as there occurs during the 3-4 month period the development of binocular vision. Thus, the type of mobile you create for her should change to a 3-dimensional model. Infants become progressively interested in how objects change when they look at them from differing perspectives, in part because of maturing structures in their brain that now interpret depth, width, and height. A number of psychologists point to how an infant of this age will enjoy looking at herself in a mirror. Place the mirror between 7-12 inches from her eyes. She will not only be able to see the dimensionality of her own face (though she does not recognize it is herself), she will also have ample time to stare longer at the individual features of the human face. When she coos and you are not there, she will see another face also appearing to talk to her.

II. *Hearing*: By four months, babies are able to locate and track the source of a sound with considerable quickness and accuracy. This coordination between their eyes,

ears, and neck muscles is a hallmark of this age period and represents a new level of sophistication. You will notice that your baby is even more intrigued by objects that both make noise and move. She is now able to "pick out" a sound when other sounds are also present, a feat that was impossible for her two months earlier. Thus, she will recognize her mother's voice from a background of other voices or music or environmental sounds. She will show continuing interest in different sounds and sound patterns. Note that even though by 4-5 months of age your baby can handle considerably more stimulation than she could during her first 4 weeks of age, she can

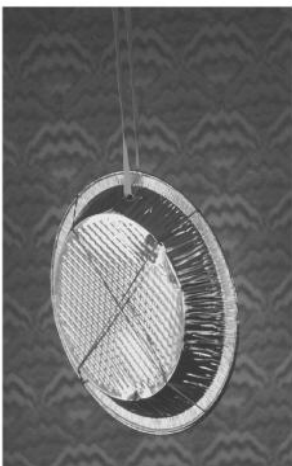
KNOWLEDGE NEEDS: 3 MONTHS THROUGH 5 MONTHS

still be overstimulated. Do not place her frequently in situations where she is bombarded simultaneously by visual, auditory, and motor stimulation for several hours at a time. No psychological or other type of damage will occur to her; she just will be so distracted and/or potentially overwhelmed that opportunities to focus on events and object qualities may be missed.

III. *Motor Skills:* Your little one should have ample opportunities to

practice her quickly emerging motor skills. Her large muscles in her arms and legs are stronger and she will want to exercise them almost constantly. Remember that the process of becoming more intelligent involves the ability to gain information readily

and richly not only from visual and auditory data but from motor and sensory-motor activities and feedback as well. There is a reciprocal relationship between the brain and the musculature, and each aids the other to develop. Thus, as you encourage the development of your baby's motor and sensory-motor abilities, you are assisting her brain to develop as well.



Suspended Pie Plate

GROSS MOTOR: During this age period of 3-5 months, most babies will not only show a recognition that their arms, torso, and legs belong to them, they will begin to maneuver each of these parts with increasing intentional control.

Arm Control

As discussed in the last age section, "swiping" behavior is generally first seen during the 3-4 month period. Due to its lack of refinement, this behavior is considered, at this point, as a gross motor activity. But it offers possibilities for intellectual growth as well.

Your baby's interest in the batting process gives you the opportunity to arrange cause-effect situations. A wide range of objects can be suspended within her reach that are visually attractive, large enough to hit with minimal accuracy, and make a noise when

KNOWLEDGE NEEDS: 3 MONTHS THROUGH 5 MONTHS

struck. An aluminum pie-tin offers many possibilities. Shiny and of good size, it makes an easily-hit target. By using another pie-tin, you can construct a 3-dimensional noise maker. Put some pieces of macaroni inside and glue the two halves together (to insure they don't come apart, you can use two rubber bands, extended in an "x" pattern across the diameter of the plates); then attach the pie plates to a thick piece of elastic. The elastic itself can be attached to a dowel that you can place and secure across the top of her crib.

Other items can be suspended as well to encourage swiping behaviors. Mobiles are fine if the objects involved are firmly attached and respond to your baby's striking them with some type of action or noise. Spending time creating these learning toys is very worthwhile.

All babies, once they are able to swipe at objects, will also enjoy striking at an opened newspaper. Again, place your baby in her infant seat. Then, while facing her, stretch the newspaper out its full size in front of her. Peek your face over the top of the newspaper and say hello to her, then disappear again behind the paper. If she becomes confused or does not reach out to the newspaper, repeat the "peekaboo" action. If she strikes the paper hard enough, not only will she cause a real noise reaction, she will then get to see you. At the right age, babies will delight in this game. As they get older, towards 5-7 months, your surprised expression and tone will even cause laughter.

Your baby will start rolling from her back to her stomach and vice-versa near the end of this age period, and she will delight in doing so. She will be able to sit controlled in an infant seat and by 5 months may even be sitting with minor support on the floor (if she is already sitting at 5 months independently or doesn't sit controlled until 8 months, be assured that both ages are definitely in the normal range and furthermore, such motor milestones are, on the whole, unrelated to intellectual development).

*** WHAT YOU CAN DO ***

At this age your infant will show a great interest in extending her legs and pushing against something. You can of course give her support to allow her to "bounce" up and down on the floor or push your hands against the bottoms of her feet. Much safer, and

KNOWLEDGE NEEDS: 3 MONTHS THROUGH 5 MONTHS

more enjoyable for your baby, however, is a kick toy. You can install such in her crib. By using a shoe box, oatmeal box, or similarly constructed object, you can make a toy that will respond to her actions with noise and movements. Place inside the box small bells or other items that will make noise when jostled. Attach elastic to the ends of the box and then secure the lid with heavy tape. Tie the elastic to the sides of the crib bars

and align the height of the arrangement with where your baby's legs are when she is on her back. Place her into position and watch the action! Not only does she get exercise, she gains the sense of being able to effect changes in her environment.

FINE MOTOR: When your baby is able to relax her fingers she will be able to grasp objects voluntarily. The grasp reflex lasts longer than most of the other reflexes (as noted earlier, the normal range extends through the 6th month). But once she can use her fingers to explore, she will learn about textures, shapes, and other qualities of objects in ways that supplement her visual understandings. Some researchers go as far as to say that object manipulation with the hands is critical to intellectual development, and that the infant really does not know the properties of the objects and cannot "think" about those objects until she has had opportunity to fully explore them with her fingers and other body parts.

* WHAT YOU CAN DO *

Using Clutch Toys

Once your baby is looking at her hands and exploring them in various ways, you will want to provide safe objects for her to feel and grasp. There are many so-called "clutch" toys on the market. Find one that she can get her fingers into and is okay for her to bring to her mouth (bringing items [initially the hand] to the mouth is a greatly enjoyed and practiced activity beginning at about 3-5 months). When babies first begin to be successful grasping objects, they do not have control of their individual fingers. In fact, the first grasping attempts will likely involve her trapping an object between her

KNOWLEDGE NEEDS: 3 MONTHS THROUGH 5 MONTHS

palm and fingers; with practice and maturity, she will manage to involve more and more of her fingers in the act. Thus not all "grasps" are equally sophisticated. [By 9 months most babies will use their thumbs in an oppositional way against the fingers to pick up and explore small items].

The Crib Gym

When your infant is able to reach out toward objects, to open her fingers, and to grab hold of eyed objects, a crib gym is in order. The average age for such skilled behavior is about 5 1/2 months, but if you have been following the recommendations in this publication from your child's birth, you may find that she is reaching out with outstretched hands well before this "average" age. Thus, the crib gym will be explained at this juncture. There are many crib gyms on the market. What you should look for, in addition to being well constructed and safe, are "gym" items that are relatively easily apprehended and cause some reaction when manipulated.

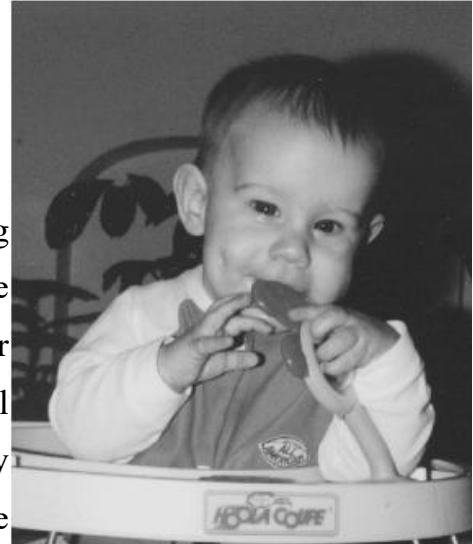
The most important educational opportunities afforded by the crib gym are those that give the infant the distinct impression that when she grasps, holds, or in other ways manipulates an object in a certain manner, there is a resultant observable reaction. As an example, the crib gym may have the bulb of a small horn suspended so that if the baby grabs and squeezes it, a noise is created. Consider what the gym offers and what the particular skills of your infant are at the time.

On the Subject of Objects in the Mouth Realize that once your infant is able to reach out and secure an object, she will often bring it to her mouth if she can do so. Some psychologists believe that the "mouthing" of objects allows the infant to gain information about the physical qualities of those objects. Note that mouthing can only be done with objects larger than her mouth. She will gag on or swallow items that she can get fully inside her mouth. Chewing on objects also is seen as feeling good to infants who might have teeth erupting during this age period. In any case, there is no reason to deprive your baby of the opportunity to bring objects to her mouth if you follow some basic guidelines:

KNOWLEDGE NEEDS: 3 MONTHS THROUGH 5 MONTHS

1. When she is first consistently bringing her hand, and then objects to her mouth, her aim is not always good and she sometimes uses the wrong amount of force. Thus, allowing her to secure a hard object (such as a small block), is not a good idea. Offer her items to reach and bring to her mouth that are softer and can be gummed without deteriorating.

2. When she becomes more skilled at bringing objects to her mouth and she begins to rotate them as she gums them, you can offer her other types of textures or levels of hardness. At 5 months of age, many infants will enjoy the hard crackers that are widely sold in the grocery stores. And, if she is teething, there are products that can be partially frozen that will make her gums feel better.



3. From 5 months onward, your infant's ability to reach out and grab objects will improve dramatically. The quickness with which she will be able to secure an item and bring it to her mouth will amaze you. As she begins to roll around (and then crawl) on the floor, you will have to watch her more closely and be more conscious of what objects are on your floor or else she will be ingesting progressively smaller bits of material.

4. A special note on pacifiers: Don't limit your baby's use of a pacifier if she wants to suck, if she is easily upset or over-stimulated, or if she seems to have some internal discomfort. The use of a pacifier will help her to focus and concentrate on what you show her and/or to deal with upsets/distractions. In addition, and as will be noted in the next section, if your baby has a pacifier in her mouth, she is less likely to put small, dangerous objects in her mouth during the 6-10 month highly oral phase.

Knowledge Needs

This is the neurological age in which your baby will begin profiting from your demonstrating cause-effect events in the environment. Once she is able to swipe at objects and cause them to move or make sounds, she will begin to learn from her own actions about sequencing of events and what causes what to occur. But since she is still limited in what she herself can cause to happen, you will need to demonstrate other such events for her. Changing her viewing position from time to time will afford her different perspectives and keep her from being unnecessarily bored. And those trips in the stroller become increasingly fun.



Infants at Five Months are visually alert to their environment

Case History: Janice observes that during this age Jason began opening his mouth before the spoon with the food reached his lips--- a good illustration of how infants now have an awareness of cause-effect events and time sequencing.

* WHAT YOU CAN DO *

Here are some ideas for demonstrations to show your baby when she is alert and observant (you should be holding her during these times in such a way that you can orient her to what you are doing/showing her). Give the demonstrations over and over periodically for several weeks.

KNOWLEDGE NEEDS: 3 MONTHS THROUGH 5 MONTHS

I. Socially or Intentionally Constructed Events/Situations

a knocking on the door, followed by going to the door, opening it,
and finding someone there (at least we hope so!!)

the handle of a faucet being turned, followed by running water
the telephone ringing, followed by someone picking up the receiver and
beginning to talk

a light switch being pushed or toggled, resulting in the lighting of a lamp
or other fixture

a button being pushed to start/stop a tape recorder, radio, TV, etc.

the pushing of a button to activate a door bell

the opening of a refrigerator door/cabinet door/etc, revealing the inside

the pulling of the string of a blinds, causing them to raise

II. Naturally occurring events

a ball being rolled slowly and striking another object

paper being torn

children (or objects) sliding down a slide (large or miniature)

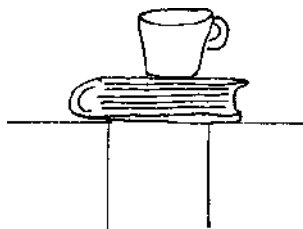
objects being placed into a container and partially (or fully) disappearing
inside (including pouring of liquid into a cup then pouring it back out)

animals walking or running in her field of view

objects being supported or not supported by other objects

Actually, there is a great deal of information that can be provided on this subject of "support". For instance, you can place a book across two equally high tables to form a bridge. If you then place a cup on top of the book, the cup should be supported. If you place a single sheet of typewriter paper down instead of the book, the cup will not be supported

and will



fall to the

KNOWLEDGE NEEDS: 3 MONTHS THROUGH 5 MONTHS

floor.

CHAPTER REVIEW: 3 MONTHS THROUGH 5 MONTHS

However, if you hold the edges of the paper tightly and have someone else put the cup on the paper's surface, the cup will not fall. These conditions reflect the physics of our planet and should be shown to your infant during this age period. When able to use her fingers more skillfully, your baby will explore these object properties and relationships herself.

These are only a few ideas, and you can probably think of many more in your particular environment. Use the planning sheet to write down your ideas and schedules. The critical element in these visual demonstrations (or motor enactments --see paragraph below), is that your baby sees an event that results consistently in a cause-effect sequence from some operation, behavior, statement, or other action.

Case History: Mark tells of an activity he used with Sara which she enjoyed at 5 and a half months. He would make a fist and "fly it" slowly over the top of her from her feet towards her head while she lay on her back. He said he made the sound of a jet. Then, when his fist was over her head area, he would expand his fingers suddenly and say "zoom", speeding his hand up and away. At first, Sara startled to the sudden action. But after several more repetitions, she began tracking the fist and even laughing when he opened his hand and said "zoom".

In these suggested demonstrations of cause--effect in the environment, note that you are also providing your infant with information on how differing objects are manipulated. Keep your baby with you a lot during these months to allow her to see what you are doing. In the course of any given day, you pick objects up, put them down, combine them, put them out-of-sight, open and close containers/drawers/ cabinets/doors, toss some objects, wash some, pull or push others, pound/wipe/ stretch/tear/cut, some you set in motion, others you stop, and so forth. Move slowly enough at times so she can grasp what you are doing to what. You will find as she moves through this age period that she is attentive and observant.

When your infant is opening her fingers and is not resistive to having you hold and direct her hands, you can motor her arm/hand to turn on a light switch, push a doorbell, swivel a faucet handle, etc. She will become progressively more alert and reactive to such events. Such learning is very powerful and constructive.

Language Development

You will begin to hear many more sounds from your baby during this 3-5 month period. She will stare intently at your face and your mouth if you produce vowel, consonant, and vowel-consonant sounds (such as "e-e-e", "i-i-i", "m-m-m", "s-s-s", "ba", "mo" and maybe "moo"). She may even attempt to imitate you. Most babies are in great humor during this age period and spending time socializing with them is plain fun. As stated in the previous section, your infant will not know the meaning of any word you say to her for several more months, but talking to her about what she is doing or what you are doing affords her maximum opportunity to hear the particular phonic sounds of English and how they differ from other sounds in the environment. There is a great deal to be sorted out when learning a first language. When you ask your baby "Are you hungry, do you want something to eat?" she hears this as

"areyouhungry doyouwantsomethingtoeat?" (If you paused at the comma).

Listen to the speech of adults—it is really a constant stream of sounds. Your brain knows the



The typically happy 5 month old

CHAPTER REVIEW: 3 MONTHS THROUGH 5 MONTHS

boundaries between the words and differentiates them. But babies cannot segment them and must rely on intonation, rhythm, and associations as they hear the same words again and again. For instance, with attention to the stress pattern, she should start picking out “AreyouHUNgry doyouwantSOMethingtoEAT?” If you pause slightly between your words, you may help her to hear the boundaries more easily. Learning language is hard enough!!!!

Speaking to your baby also affords a means by which you can interact socially and begin to convey meaning through your voice tone (the average age for an infant to understand **tone** as meaningful is about 7-8 months---see the next age section for more details). So exaggerate with your voice when you tell your baby that the food you are offering is s-o-o-o-o-o GOOD! (It is, isn't it?)

Case History: Shirley reports that when her Eric was 4 months and 3 weeks old, she heard him making an "ah" sound with his mouth open. On and on he went. She stuck her finger over his lips and moved it about, causing his lips to vibrate. The sound he then was making was really funny, she said, and Eric reacted to her laughter. Over the next week Eric made the same "ah" sound more often when he saw Shirley, seeming to invite her to play the "sound game" with her. Janice commented that Jason at 5 months and 3 weeks would make a "popping" sound with his lips. And Mary said Brian would act "delighted" when she repeated his gurgles at this same age.

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Listen carefully to what your baby is saying as she verbalizes—you might use a tape recorder to review the sounds. You can also play them back to her. Write down what you hear over the next few weeks. .

--CHAPTER REVIEW--

During the 3-5 month age span

1. Show progressively smaller designs for view, but use your baby's reactions to tell you what size she prefers.
2. Show outlines of common objects
3. Vary familiar and novel designs and pictures. Be repetitive until your baby turns away almost immediately.
4. Show her all sides of objects, rotate them in space.
5. Offer her lots of opportunities to practice shoulder and hand control
6. Show her typical cause-effect events over and over, slowly if possible.
7. Voice vowel sounds for her, again with slow patterning.
8. Enjoy how much fun she is to be around!

Chapter Six

Neurological Age Six and Seven Months

Overview: By six months your baby should be free of all reflexive constraints. Her brain and body from now on become increasingly oriented to seeking new experiences. She is a curious individual and is much more easily bored. As she is able to roll about on the floor and then to creep and crawl, she will not need for you to bring her stimulating experiences--she will locate them herself if they are available to her. Thus, the need to consider what objects are available to her to explore throughout her reachable physical



space becomes important. It is, in fact, starting at about this neurological age that what experiences you provide your child will markedly accelerate her intellectual growth well above the course of "average" intellectual development. If at all possible, arrange your next year to spend 8-10 hours a day interacting with her and/or providing experiences for her. If you cannot stay at home with her during that time, have your sitter or caretaker read these books! It is that important and that worthwhile to the development of her intellectual potential.

You may be reading this section because your baby has been rapidly developing her understanding and language skills and needs more complex activities ---- but yet is not yet 6 months of age. No problem. It is best to go by what your baby appears to need,

not her chronological age. Remember that the ages cited in this publication are based on what have been reported as typical ages. If your presentations are boring her or if she needs more involved interactions at a younger age, she will let you know. You have to be "in tune" with her, because she will be constantly giving you feedback about your efforts.

Sensory Motor Development

I. Vision: Although your baby will not be able to see objects at a distance as clearly as an adult until she is about one year of age, her vision for objects close to her face is quite good by six months. By 8 months her close vision is so good that she will be able to notice detail differences in two small buttons. This increased visual acuity and ability to differentiate patterns often results in the so-called "stranger anxiety" seen during this age period. Your baby will have seen your face and other family members enough to recognize them from other faces. When a strange face is seen, an emotional reaction will sometimes occur. Some infants never show stranger anxiety and others show it frequently. You may notice that, as opposed to how she would smile for everyone just a couple of months ago, she now stares at strangers first with a sober expression and may or may not smile at them.

Case History: Janice relates the story of being in a costume shop and trying on several Halloween hats. She was holding 7 month old Jason, and as she put on a hat he would stare at her intently, then he would smile. It was as if he had to reevaluate her image when she covered up her head with a differing appearance.

Case History: Mark noted that one afternoon he brushed his teeth as he held Sara on his hip. She leaned out in front of him and stared at him. He was not sure if she was wondering what the heck he was doing with all that foam in his mouth or checking him out to see if he was the same person still holding her.

SENSORY-MOTOR DEVELOPMENT: 6 MONTHS THROUGH 7 MONTHS

Because she can see small objects so well and because she tends to put items she grasps into her mouth, it is imperative that you watch your infant closely and do as much as you can to keep her environment free of small items she can locate on her own and put in her mouth. Do not interpret this comment as meaning you should confine her to a clean, sanitary, and clutter-free playpen, however. She should have constant freedom to move and explore freely, with supervision. You have to be her "environment manager", making available lots of interesting and safe objects.

Sometime during the 6-9 month period your baby will start showing an interest in picture books. Construct the first ones yourself with pictures of the faces of family members and friends. Next, put together a picture book showing your baby engaged in various activities. As you thumb through the book with her, you can verbally describe the situations and associated events.

You can also show her pictures of real objects. These pictures should illustrate one object only and be either photos or realistic drawings. Begin showing her, when she demonstrates an interest, a "classification" series, such as things that we wear, things we eat, things we use to make music, etc. Of course, you can combine such presentations with live action or video (again, if she shows interest).

Continue with the use of the letters discussed earlier. If you have been showing her the alphabet for 2-3 months, you can add words as well, such as "ball" or "spoon" or the names of other objects with



SENSORY-MOTOR DEVELOPMENT: 6 MONTHS THROUGH 7 MONTHS

which she often comes into contact. Show her the words printed about 5" in height and say them just once as you present them to her. Stop while she still shows an interest. Definitely do not bore her.

II. *Hearing*: You may find that your infant looks at your mouth as you speak.

She is focusing more intently on the language sounds you produce and the manner in which you produce them.

Case History: Mark in fact noted this behavior with Sara at 7 months, 3 weeks. He said "she enjoys staring at my mouth if I make strange sounds....sometimes I can see her lips move a little, as if she's trying to get the pattern". Mark also noted that at this age Sara liked to watch people sing on TV!

Her hearing is quite good for high pitched sounds in particular. She will notice also the tone you use and she will discriminate among those that are chastising, happy, threatening, etc. She is developing a strong association between the sounds of the environment and their accompanying events. For instance, when she hears the water running in the tub she will associate it with bath time if such has been her previous experience. A spoon banging in a jar may mean it's time to eat; a cat meowing may mean that a creature is at the back door; a certain voice may mean that daddy's home from work.

SENSORY-MOTOR DEVELOPMENT: 6 MONTHS THROUGH 7 MONTHS

WHAT YOU CAN DO

You, of course, can create a more predictable environment for her (which aids not only in her intellectual development but her sense of emotional security as well) by intentionally linking sounds to events that occur frequently----such as

1. humming/singing a special song before you go outside for a stroll with her,
2. clapping your hands before you pick her up,
3. making a certain sound before you tickle or nuzzle her,
4. whispering to her before you wash her face

You should also be speaking words to your baby when you instigate these events, as you do want her to link up actual words with events (see LANGUAGE section below); however, before she will learn words, she will associate tones with events. The intent in using the associations suggested here is not to expedite language learning but rather to key into her interest in prediction and in events that occur together.

Your infant's ability to discriminate facial patterns, combined with her increasing ability to infer meaning from tones, makes her more attuned to and interested in facial expressions that are accompanied by emotional reactions.

Try holding her facing a mirror and making exaggerated faces & sounds typifying happiness, surprise, sadness, fear, and curiosity. If you don't get any reactions, wait a couple of weeks and try again.



III. Motor Skills

The development of motor skills in the middle of the first year generally focuses on coordination among body parts to achieve some end, such as rolling across the floor to secure an object. Muscle strengthening continues to be a priority as well, and there is refinement in head and shoulder control.

GROSS MOTOR: Once your baby is beginning to show the motor coordination to make crawling movements, dress her torso (leaving her arms and legs uncovered) and place her onto a linoleum floor or other slick surface to allow her to practice. On a smooth surface she will be able to move forward with relatively little effort, encouraging such activity. A rug does not work as well because as long as her stomach is on the floor as she attempts to crawl, there will be too much friction. Then the crawling experience can become notably frustrating to both of you. You will find that at the time your baby can crawl, she can reach out and grasp objects very successfully; thus, you should not allow her to be left unattended on the floor or in her crib with a crib gym. As far as the crib is concerned, by 6 months you should only use the crib for her sleeping- or somewhat later to give her practice, as you coach and applaud her, in pulling herself to a standing position and "cruising" around the perimeter.

Interest in kicking and partial weight bearing will increase at this age. One game you can play with your baby is to hold her facing away from you and, by moving her body forward, have her feet/legs strike a large balloon or a lightweight ball. After she gets

the idea and, in conjunction with your enthusiasm, she will really enjoy this experience

SENSORY-MOTOR DEVELOPMENT: 6 MONTHS THROUGH 7 MONTHS

with you.

If your infant has already begun creeping about on her hands and knees, you can give her some motor challenges she will enjoy. If you have firm, removable sofa cushions, you can arrange them to make two steps by placing two together on the floor and another in the middle of that foundation. That gives her an opportunity to go up two levels.

The more capable your infant becomes physically, the more she will want to practice her skills. If she has started pulling to a stand, she will need more of your supervision time, as her balance will take time and experience to develop.

FINE MOTOR: In conjunction with the development of greater visual acuity comes improved ability to pick up and finger smaller and smaller objects. The use of the fingers and fine motor movements of other body parts becomes increasingly associated with goal-directed activities. Again, as you make available experiences in one area of development, other areas will be also positively affected. Opportunities to use the fingers in more refined prehension should routinely occur, but remember that she may put anything and everything in her mouth. Small bits of cookie or other foodstuffs that can be safely gummed and/or swallowed make appropriate items for her to take hold of and manipulate before putting



into her mouth. Giving her a hard cracker to mouth affords her the opportunity to practice smooth hand to mouth action and the pleasure of massaging her gums.

Case History: James tells of taking Brian into a restaurant at 6 and a half months. He gave him a cookie, and within a few minutes Brian had it all over his face, ears, neck, and nose. (I hope some went into his mouth! Actually, the self-feeding experience is both valuable and messy, no question about it.)

You might also consider objects which afford opportunity for coordinated manipulation: several small measuring spoons hooked together will be interesting, as would two pieces of velcro (you will have to show her how to put the pieces together and pull them apart). In any case, giving her small objects to finger, manipulate, and explore are valuable to her developing dexterity and sense of understanding about the properties of objects (for more on object exploration, see the special section later in this age grouping).

Knowledge Needs

As has been suggested in other sections, once you child attains controlled sitting posture and adequate visually-directed reach, she will engage in behaviors that directly assist her to better understand the nature of objects and their relationship to her and to one another. You may notice, for instance, that she drops objects off the tray of her high chair table. She will have a variety of ways to remove an item from her tray, from brushing at it, to banging on it, to swiping to and fro, to even carefully picking it up and tossing it off. She may look over the edge to see where it goes. At this age, the primary reason for such activity is not to drive a parent crazy, even though repeated acts would

might easily so be interpreted (you might consider spreading a plastic table cloth on the

floor underneath her high chair). Just realize there are knowledge benefits from her direct dealings with the objects and give her a variety of types of objects to bat at and/or drop--not just food bits.

As mentioned in the subsection "HEARING" earlier, your baby will really enjoy experiences that allow her to form predictive associations. Some of these associations she will learn on her own, as suggested in the previous paragraph. But there is even more you can do as a facilitator.

WHAT YOU CAN DO

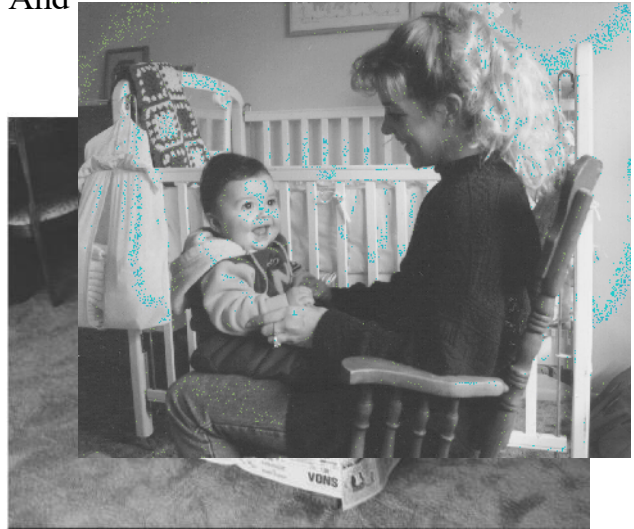
Interaction Games

Starting at about this age, peek-a-boo games become more and more interesting. At first, those that are the most fun to your infant involve your hiding your face with fabric or paper and suddenly removing or dropping the cover and saying "peek-a-boo" (actually, there is no magic in that phrase; you can choose to use anything you like to make the association, but grandparents and others may not take as readily to your creativity). Then when your baby can reach out and remove the article herself from your face, she will show how much she likes to predict that you will still be there by laughing aloud. She will delight in this game for many months.

You might make a note of what your baby's response was to "peek-a-boo" initially and over the next couple of weeks. You may observe changes in her behavior and her interest in physical interaction.

During the normal course of any day we as adults engage in a variety of sequential actions. Allow your baby to witness what you do. For instance, instead of bringing food out to her that was prepared elsewhere, let her see your preparation of the meal. And continue to speak about your activities, offering verbal descriptions of your physical actions.

Now back to the games, with another variation on peek-a-boo/hide-and-seek. Using a card table as a structural foundation, tape opened newspapers to each of the four sides as illustrated in the photo to the right.



Sit underneath the card table with your baby in your lap. Then have a friend or your spouse say something like " _____ (baby's name), can you find me?" Talk aloud as you process what is going on, finishing with "where is _____ (name of helper)? I'm going to look here" (lifting up one of the newspaper sides). When you expose the helper, everyone smiles and laughs at the fun. Once you have done this a couple of times, let her make the moves (if she has not already taken over the action). Then, if she is comfortable, leave her inside and play the game with you being the outsider, seeing if she can locate where you are around the table.

There are other interaction games which not only afford language associations but a

sense of predictability and interest as well.

One such game is often called "horsey-horsey". Sit down, sit your baby down on your legs facing you, and hold onto her arms/hands. Then bounce her gently up and down to the words of "horsey-horsey go to town, horsey-horsey don't fall down". On the word "down" you spread your legs slightly and allow her to drop a short distance downward (perhaps onto the sofa). As she becomes accustomed to the pattern, she may even make noises as you sing. This is an activity she will like over and over for several years (though by age 3 she will want more

Exploration of Objects

There is a dramatic increase in interest in object exploration at this age. Infants, if presented a wadded up piece of clean typewriter paper will not only explore it with their mouth, they are likely to shake it, pound it on nearby surfaces (including their own body), stare at it, rub it against something else, etc. You need to offer your infant ample opportunity to investigate the properties of objects of differing weight, texture, hardness, flexibility, smell, shape, and appearance. And don't forget those that make differing noises when "banged". Prop a bread board up to make a small incline which she can use to experiment with how differing objects move down a ramp; this action also contributes to both her sense of control and prediction. Give her containers and objects that will and won't fit into those containers. You can demonstrate for her actions she might take with object or objects in combination.

Below is a "starter" list for you to add to; look for other common objects around your house.

--Pots with lids illustrate "heavy", "hard", act as containers to help develop

concept of "in-out", "some", "none", with the use of lids, the concept of object permanence.

-- Sheet of plastic (as what covers a student's report) illustrates "thin", "flexible", and "smooth".

-- Rubber ball (various sizes) shows "resiliency", "sphere", and when tossed illustrates trajectory; a ball is also very responsive to the baby's actions.

-- Empty small potato chip bag is "noisy" "crinkly", also acts as a container.

-- A piece of plain typewriter paper is another example of flexibility, thinness, noise-making, as well as something that changes its shape when crumpled.

-- A belt (with its buckle removed) is a flexible object which responds to the infant's movements and yet retains its shape.

-- A telephone cord illustrates this spring/coil movement, flexible but retains its shape.

-- A shoe can act as a container and be used for object permanence games without the need for a lid.

When your infant has had sufficient opportunity to explore the basic properties of objects (meaning their comparative sizes, weights, textures, etc.) she will turn her interest to their functional properties, or the way they "work". Hinges, lids, door knobs, levers, switches, and the like become focuses of considerable attraction (these activities are covered more completely in the next publication).

You can also assist your infant to focus on categories of objects. Present her with a set of objects one at a time which all have a common dominant feature-- for example, five or six balls (initially, use identical balls). Then remove the balls and show her, one at a time, some five or six identical blocks. Next, arrange the

balls on one side of her blocks on the other side (remember to verbalize what you were doing). Then handed her an additional block or ball. Talk her through the process of analyzing the similarity between the object and others in that category then place it in that group. Show her a couple more (balls or blocks, it doesn't matter) and let her look or handle them. Then change activities. You can return to this type of presentation with other objects later--- but keep it fun; this is not a test and shouldn't be sensed as a "forced" situation. Be responsive to your baby's interests and reactions in this and other activities suggested in this section.

Water Play

Babies enjoy water play (as do toddlers, preschoolers, school age children, teenagers, and even adults). Exactly what they learn from splashing is not clear, but the pleasure of the experience is undeniable. There is a similarity to object exploration, and the elements of prediction and causation are present; but the delight on the faces of the children suggests there's much more. Suffice it to say that you should permit (even set the stage for) water play, and not just in the tub. Once your experimenter has good trunk control, you can position her outdoors on the lawn and offer her containers of water, a tray of water and objects to float in it, and even a hose with the water turned on at low pressure. In conjunction with "real containers," give your baby cup-size pieces of plastic piping. Those that are about 2 inches in diameter look like cups from the side, but since they have no top or bottom seals, they will not hold water (or any other object for that matter). Having a similar sized white cup available will increase the likelihood she will notice the differences in the cup and the pipe. Of course, in this activity as well as in others cited in this workbook, you should be right there with her. Not only is this a safety concern, your involvement supplies an interactive component that will enrich her learning immeasurably.

Language Development

The notion of talking to your infant about what one of you is doing at the present moment takes on added importance during these 2 months. The content of your speech will provide the basis for your infant's understanding and eventual production of her first true words. Most infants will begin recognizing their first real words around 8 months of age (apart from the inflections, which they are learning in the 6th and 7th month).

*** WHAT YOU CAN DO ***

This is the time for you to become a virtual narrator of events. Talk about what your baby is seeing, touching, moving, manipulating, tasting, hearing; talk about how she is doing what she is doing; talk about what you are doing with her or to her; in general, make her life rich with verbal descriptions. You should also give her advance verbal information as to what you are about to do to her or with her (as in "I'm going to pick you up now"). Here is an example dialogue of such practice, starting with this "advanced information" sentence:

(In front room): "I'm going to pick you up now. Here you go up in the air....up, up..... now down, down. We're going over to the window.

(At the window) I'm going to touch the window. I'm touching the window with my finger. Oh, look, there is dirt on my finger. That window is dirty. Let's go to the sink and I'll wash the dirt off my finger.

(At the sink) I'm going to turn on the handle---and look, here comes the water out of the faucet. I am putting my finger under the water. Now you are putting your finger under the water. It is cold water, isn't it? Look, the dirt is gone from my finger. I'm going to turn off the water and then we'll dry our fingers on the towel. I'm rubbing

my finger on the towel. Now you are rubbing your finger on the towel. Our fingers are dry! Now let's go back to the window and you can rub your finger on the window just like I did".

- -

One researcher observes that infants, before they have a real awareness of the nature of spoken language, will still produce sounds that have meaning. These sounds include showing delight (an exclamatory intonation), effort (a struggling intonation), and want (a requesting intonation).

Your baby will be producing an increasing variety of consonant-vowel sounds by 7 months, from "buh" to "pah" to "yaw" and "dah". When she makes one of these sounds, say it back to her. If she repeats it, you repeat it. Intonational mimicking is also useful. Accent the first part of "upa" or the last. See if she will follow you. You can also try a questioning pattern, raising your pitch at the end of, for instance, "muh?" When you experiment in this word play, make sure you have your video camera or tape recorder handy!

---CHAPTER REVIEW

At 6 months your baby will be a true sensation seeker who responds to what you do with her in a true give-and-take manner. Her energy level and coordination heighten and you will see her use her body and hands in ways not previously observed. She will begin showing interest in problem solving, as in trying to get to something. If you keep in mind that your baby is not just “waiting to grown up” but constantly learning and in

need of your assistance, you will be motivated to spend as much time as you possibly can with her. Beginning at this age, life itself is like a theme park, and she is newly noticing what sounds accompany what movements or objects. She is still a few months from understanding that words stand for objects or events, but by talking slowly with emphasis on syllables about what is happening at the moment, you are preparing her well to understand.

Chapter Seven

Special Topics

- *Second Language Learning*

Children in the first three years of life can and do learn multiple languages faster than at other ages. Moreover, being exposed to the sounds of a language before 8 months of age will help them become native-sounding as well. If your or your spouse already speak a second language, the process is basically simple: the spouse who speaks two languages just has to use them both (though never in the same sentence!). If you do use 2 languages with your child, be aware that he/she may begin to talk later than other children. The more the 2 languages are different in their syntax and verb constructions, the longer it will take a child to separate and use them. For instance, a child learning Chinese and English will need longer than a child learning Spanish and English.

At age two, Jasmine was still speaking what sounded like gibberish, verbalizations that were unclear to her Thai-speaking mother and English-speaking father. But within 6 months she had separated the sounds and word order and begun to speak two

distinguishable languages, although her utterances were initially just two-word constructions.

If you are speaking several languages to your child, you should expect more significant delays. One military family discovered this for themselves. The father spoke Dutch fluently, while the mother spoke German. Both parents wanted to preserve the language of their heritage, and each began speaking to their son Brian in their own family language. The 3-some were living in Japan at the time and both parents worked full time. They hired a Japanese woman to care for their son. Friends on the base, as well as other neighborhood children, spoke English. Thus, Brian was exposed to four languages. He was almost 15 months old before he started speaking what sounded like single words. And his selections were from all four languages, regardless of who he was with. This language mixing persisted when he began creating phrases, and at age 4 he still was borrowing from Dutch, German, Japanese, and English. No single person could understand what he was saying! Finally, during his fourth year he began separating the languages, seeming to grasp the structures and sounds common to each language.

What if you want your child to learn a language that neither you or your spouse currently speak? Simply put, you will need to make special arrangements. First, obtain a tape recording of a male and a female speaking that language. The recording should ideally last about an hour to assure all the language sounds and patterns are being used. Let your baby hear this recording at least once a week over the first 6 months. At or around 6 months you will then need to have a fluent speaker of that language begin to interact verbally with your baby for a couple of hours a week. This method will allow your baby to learn the second language in the same way he/she is learning the first language. During a yet unknown period of time in the first few years of life, the first

or primary language is learned. Recent brain imaging techniques show that languages learned later in life utilize a different part of the brain. You probably have a sense of the difference if you learned a second language later in life (even as a teenager). In learning a language as a “second language” there is a tendency to translate the second language through the first, or primary language.

When you begin to label objects for your child in the second language (starting at about 9 months), pick one time to teach one language and another time to teach the second. You can use a video or computer program to assist you in the naming process. But make sure that the objects being named are life-like and the words used described that object only. For instance, if you are teaching the word “swing”, don’t show a swing among other playground equipment. Your child has to know exactly what you are naming.

As your child gets older, he/she will need someone fluent in the second language to speak with in order to develop language capability. You might consider having your child spend a few hours a week at a preschool setting in which that second language is used. Knowing more than one language can be of value in later schooling and job ventures. And of course it is helpful when traveling to foreign countries where the language is spoken.

● *The Effects of Music*

For a well balanced review of the “effects” of music, see the WEB site

<http://musica.cnlm.uci.edu/mrn/V5I2S98.html>

At this location several research studies on music and its effect on persons (and babies) are reviewed. The effects of music on fetuses are questionable, due to nonstandard procedures in the research designs. While it is known that the fetus can hear in the

womb, sounds are muffled, and with the mother's heartbeat so close and so loud, it is hard to believe that other sounds, even if heard, would have a significantly positive effect on the psychological health of the individual. Although the book *What Stimulation Your Baby Needs To Become Smart* addresses appropriate stimulation practices after birth, it may well be that any type of "intervention-oriented" *patterned* sounds might be helpful to the fetus because other sounds are being controlled. That is, many loud and mixed noises may overstimulate the fetus, just as occurs to the newborn. My suggestion would be that during pregnancy, locations where sustained loud noises are present should be avoided.

Another study cited at the WEB site showed that music provided a memory retrieval cue for 3 month olds to recall an event. I don't believe there is anything special about music in this process. Other cues could be used with likely the same result. But music is an available and likely underused method of helping infants associate events.

A lot of misinformation still exists about the "Mozart Effect". The original study, published in 1993, showed that college age students who listened to a composition by Mozart did better on one subtest of an IQ test than did students who did not listen to that composition. No such studies have been conducted with infants.

- *Computers*

Over the last couple of years a few computer software products have appeared on the market, supposedly geared for babies. My position is that babies need the interaction of adults during this age period, and any activity that isolates them with an object, particularly in the first 6 months, is not beneficial. Just as with books, computer programs can be used as vehicles for sharing. But the programs still need to provide visual imagery that is conducive to understanding the real world. If a program can do

that, then there may be some advantages. But what I have seen on the market thus far is academic in nature, ie., focusing on color and shape differentiation, numbers, and the names of the letters of the alphabet. This tie-in to school subjects is of no real value to infants—or young toddlers either for that matter.

- *Toys*

Manufactured toys are, in most instances, not helpful to infants and young toddlers in brain development. That is because they are frequently unlike common objects in the environment and do little to enhance the child's ability to adapt to the environment. Historically adults have used their own values to conceptualize what babies are interested in and need. The notion that infants and toddlers want rattles and stuffed animals is an adult creation. When adults see young children appear to engage in what they consider as play with such objects, it reinforces the idea that such is indeed what they want. In actuality, young children are attracted to these “toy” items because (1) parents make a big deal of the toys and will model their use and (2) the child has predispositional interest in objects and cause-effect events. Remember that the child's brain is trying to determine what is needed for adaptation in the world. Establishing neural networks for stuffed animals, busy boxes, or rattles being adaptively important only adds information that will have to be discarded later. You might need to purchase some objects to help the infant to practice certain motor skills, but not as a source of cognitive stimulation. The child, at least until about age 2, should deal with real objects and real situations. Fantasy should be reserved for the preschool and older years.

- *Hearing*

As a school psychologist I have been amazed at the number of school age children with spelling, reading, and language comprehension difficulties who had a history of chronic

middle ear infections during the first 2 years of their life. Dr. Burton White emphasized the importance of checking the hearing of babies in his publications, and I want to do the same here. Don't let your baby go for even a couple of days with an untreated ear infection. Check his/her hearing frequently by informal means. It's easy to do and very important.

- *On the Value of Books*

For an article in American Baby, I answered a few questions for a reporter. Here is a transcript.

1. Why is it so important to introduce books to children under two? Books should be of interest to young children at several levels.. Infants are intrigued by the hinge action of the covers of the books, toddlers like the pictures and the physical effects of turning the pages . If parents create a cardboard book full of pictures of their family members, most infants will enjoy manipulating and looking at it for many months. Books also provide valuable vehicles for teaching and interaction. As the parent and infant look at the pictures together, there is opportunity to describe many aspects of what the photos display, such as activities, colors, and various associations. Books are usually shared in close physical contact, which can promote positive feelings. The child thus associates looking at books with a pleasurable activity and one in which information can be obtained. That mental set will impact their later interest in books and the reading process.

2. Current research suggests that spoken language can influence later intelligence.

How does this relate to reading aloud to your baby? Competence in language and intellectual capability are related in our culture. Thus, any activity that promotes a child's learning language is valuable for intellectual growth as well. As the infant is spoken to in the early months, he/she begins to learn the sound qualities of the language. If the parent has difficulty finding things to say to their baby, reading a book can help! Describing the pictures in a "book for toddlers" also promotes opportunities for hearing words, this time for learning the associations between words and objects. Books are a means to explore life and become more language-capable.

3. How much stimulation should a parent give an infant? How much is too much? Is there danger of overstimulation? The younger the infant, the more careful the parent needs to be to avoid overstimulation. Infants in the first month of life are unable to effectively screen out stimulation, and when they are overstimulated they become stressed. Stress has been shown to disrupt normal neurological development. Young children give cues as to what stimulation they want (and how much of it they want). What they stare at, reach for, or crawl to are all likely interests of theirs, and generally positive sources of stimulation. They turn away or fuss when they have had enough. I believe stimulation should be provided in a discrete manner because the brain is very distractible in the early years.

4. You write: "Parents can have a significant effect on their children's reading aptitude by virtue of the experiences they provide them in the early years." Can you give specific suggestions to guide parents on introducing books to children under the age of one?

(A) read from books starting at 5 weeks to let the infant hear the language; (B) show them large cutouts of individual letters for brief periods starting at 3 months; (C) show them how a book looks by opening the cover and thumbing through the pages from the second to the sixth month; (D) By 5-6 months place them in your lap as you look at books together; (E) also at 5-6 months, make a cardboard book with large pictures ; (E) encourage their manipulation of thick-paged books by 7 months; (F) put books on a low shelf so they can be accessed easily by the child; (G) if the child has a favorite book, welcome the opportunity to review it again and again and again.

5. If you child doesn't appear interested in books under the age of two, what should a parent do? I would be very surprised if a normally developing child showed no interest in books if the parent displayed an interest and went through the steps in #4 above. But, I would not force a child to attend to activities or be involved with objects if no interest existed. If given an upbringing of total discovery learning (ie., an absence of adult-initiated activities), a child may not spend much time with books if other objects are widely available. But I believe children this age need adult guidance as to what is important. Since being comfortable with and learning from books is an functional element in adapting to our way of life, parents should treat books as important.

Summary Remarks

Your baby's brain undergoes many great and rapid changes during the first 7 months of life. From being a individual whose behavior is almost totally controlled by reflexes and who shuns external stimulation, she becomes a seeker of stimulation, interested in how the world works and determined to see how she can affect it. At the end of 7 months she is an astute observer and can discriminate the details in designs, pick out

one voice in a sea of others, distinguish textures of two separate rugs, and know if she likes a food long before it gets to her mouth. She has attained trunk control and reaches out with intention and skill. She is intrigued and attentive to what-causes-what in her environment. Objects continue to command her interest, and she will experiment with them actively.

Knowing what it is that she is looking for and needs in order to develop her perceptual and conceptual abilities puts you as her parent in a position to insure that is exactly what she gets. A baby whose environment is full of developmentally appropriate stimulation and is responsive to her emotional needs is a happy baby. She is a baby who is a joy to be around. Interaction is a two way street, and what you invest you will get back many times over.

This is indeed a time of rapid change, one that will have seemed to have lasted but a few minutes years from now. But it is a vitally important period of life, when your involvement can mean a foundational difference between your child becoming highly competent and capable or just average. More specifically, what you have done during these first months will have set the stage as to how much of an experimenter and a world class scientist your infant becomes over the following year. Whereas at 8 months you may not be able to distinguish your baby's mental abilities from any other 8 month old, by 18 months, you will clearly see dramatic differences. The next book in this series, *Brain Under Construction*, offers many specific ideas for your young toddler, including ideas on vocabulary development, concept formation, and cause-effect understanding.

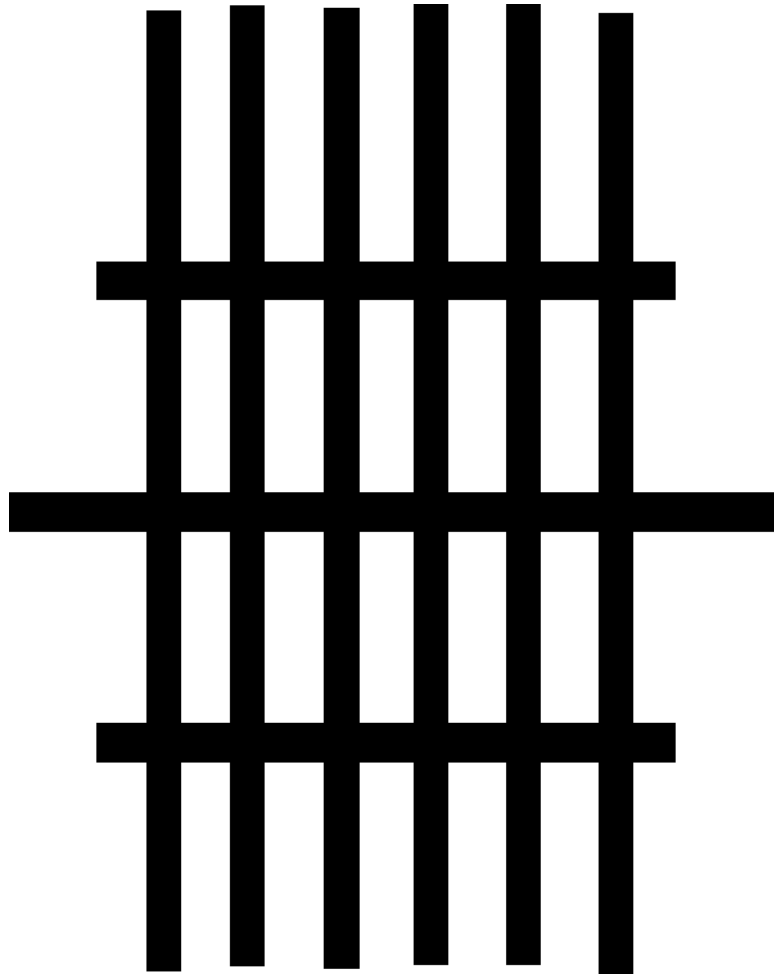
If you have questions or specific concerns, write Dr. Staso at his e-mail address, Wstaso@aol.com. You can also visit the web page at

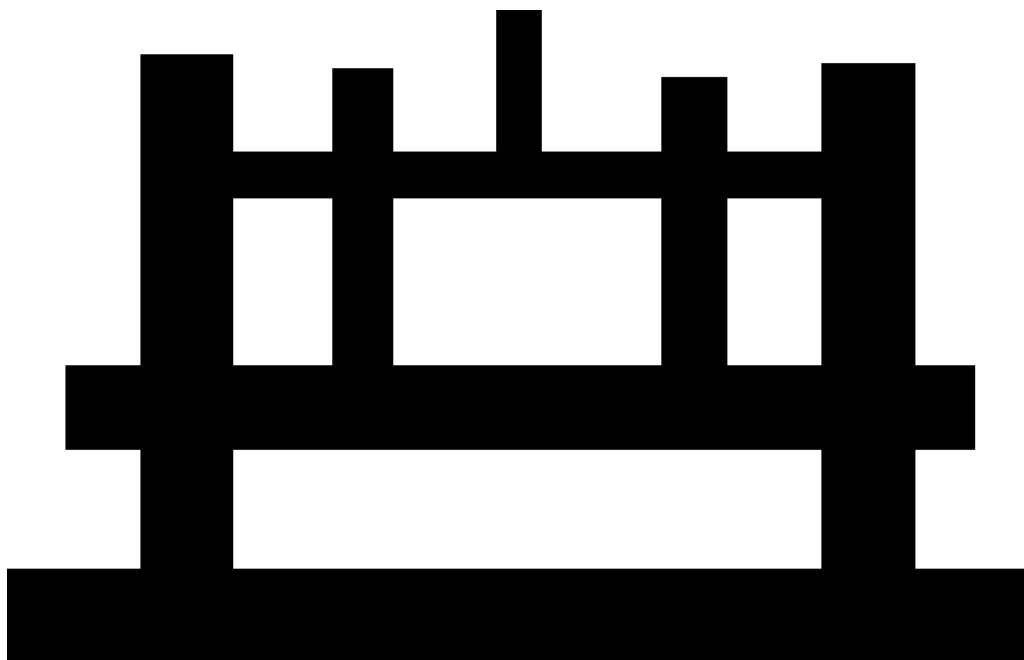
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APPENDICES

Appendix A

The lines on the next pages are sample lines to use for visual stimulation.

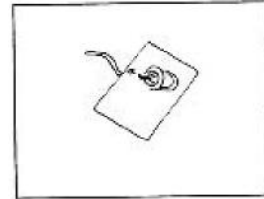




Appendix D

Ideas for constructing a Mobile

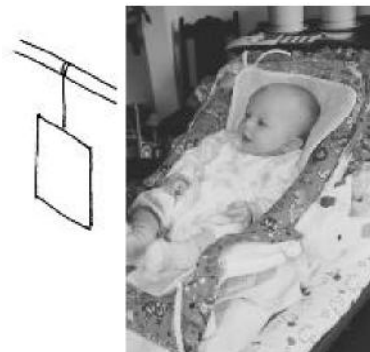
Before your baby is able to reach out or swat successfully at objects, you can create interesting mobiles from common household items. A dowel (or even a taut belt or strong rope) placed across the raised crib bars will support a plastic clothes hanger. Put a string through each of your designs (see appendices A, C, and D for ideas) and ties a knot to secure them. Tie the other end of each string to the hanger. Hang about 3-4 designs some 10 inches above your baby's eyes. Of course you can also hang the pictures directly from a dowel.



You want to realize that whatever you construct for your infant should be for her to look at, not you. Thus, make your pictures and designs hang horizontally if you are making them for her to look at when she is lying down (see drawing below).



Position the images in a vertical orientation if she is to be looking at them while sitting and staring straight ahead.

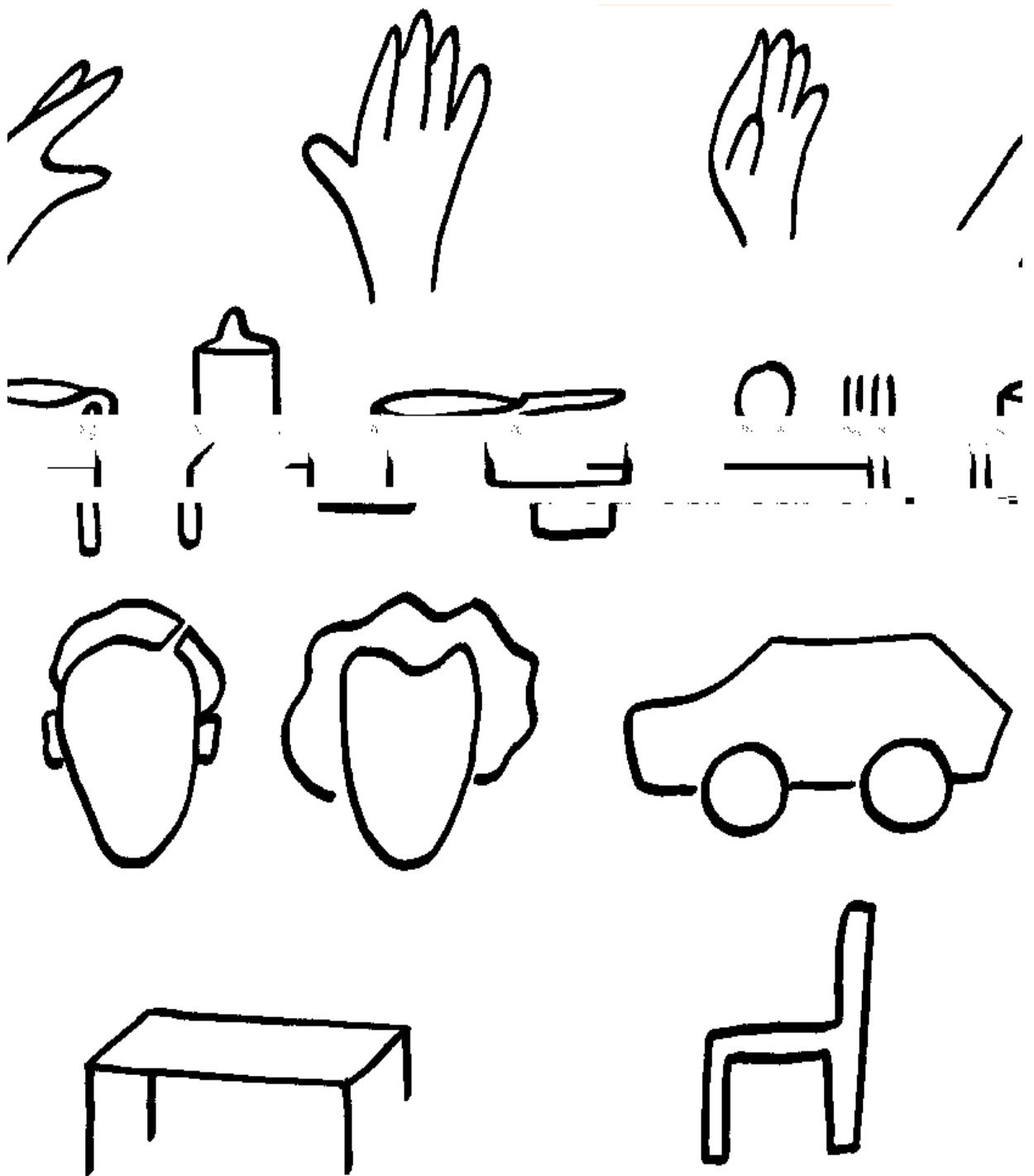


Appendix D

Below you will find an example of the size of letter to make for your baby to look at. If you make letters this size (and they can be hand drawn), she will be able to begin seeing them at 2-3 months. Present them in accordance with the text suggestions.



Appendix D



	VISION	HEARING	LANGUAGE	KNOWLEDGE	SENS-MOTOR
Newborn to 4 weeks	+ INITIALLY ONLY OPENS EYES IN DIM LIGHT + NO SHARP VISION ANY DISTANCE + MAY NOT SHOW A LIGHT REFLEX	+ ATTUNED TO HUMAN SPEECH + TURNS HEAD IN DIRECTION OF VOICE + SHOWS STARTLE RESPONSE	+ CRIES, FUSSES + NO INTENTIONAL ACT TO COMMUNICATE + CAN DIFFER SOUNDS + MAKES MOSTLY VOWEL SOUNDS	+ HAS PREWIRED REFLEXES TO PROMOTE SURVIVAL + EASILY OVERSTIMULATED + NEED FOR KNOWLEDGE LIMITED	+ HANDS FISTED + COORD BREATHING AND SWALLOWING + MANY POSTURES DEVELOP + REFLEXIVE BEHAVIORS
4 weeks to 12 weeks	+ ATTRACTED TO CONTOURS + INTERESTED IN MOVEMENT + RELATIVELY SMOOTH TRACKING + STARES AT FACES + PREFERENCE FOR NOVELTY	+ DISTINGUISHES DIFFERENT VOICES AND TONE QUALITIES	+ MAKES COOING SOUNDS + VERY PHYSICALLY "IN TUNE" + REACTS MOST ATTENTIVELY TO	+ PERCEPTUAL ANALYSIS YIELDS BEGINNING CONCEPTUAL STRUCTURES	+ REFLEXES MORE RELIABLE + POSTURES DOMINATE + LIES IN T-N-R POSITION + PUTS FIST IN MOUTH + FINGERS RELAX
3 MONTHS TO 5 MONTHS	+ MEMORY IMPROVED + FOLLOWS A RING 180 DEGREES + VISION CONVERGES + VOLUNTARY TRACKING + ACTIVE VISUAL INSPECTION + HAS FULL COLOR VISION	+ READILY ORIENTS TO SOUNDS + INTRIGUED BY OBJECTS THAT MAKE NOISE + DISCRIMINATES AMONG DIFFERING SOUNDS/VOICES	+ LISTENS INTENTLY TO WHAT IS SAID + COOS AND BABBLER WHEN SPOKEN TO AND INCREASINGLY MODIFIES SOUNDS	+ STARES AT HANDS FOR 5 TO 10 MINUTES + LIKES CAUSE-EFFECT MANIPULATIONS + EXPLORES OBJECT PROPERTIES	+ ENJOYS PUSHING LEGS OUT + BRINGS OBJECTS TO MOUTH + CAN SUPPORT HEAD WELL + OPENS FINGERS
6 AND 7 MONTHS	+ INTEREST IN PATTERNS + MAY SHOW STRANGER ANXIETY + NOTICES SMALL DETAILS + SEES WELL ACROSS ROOM + RECOGNIZES/REMEMBERS	+ ASSOCIATES SOUNDS MEANINGFULLY + ENJOYS RHYTHM MORE + INTERESTED IN DIFFERING PATTERNS OF SOUNDS	+ CAN IMITATE SOUNDS + STILL NO UNDERSTANDING OF SYMBOLIC WORDS + MAY VOCALIZE TONALITIES OF MEANING	+ SHOWS ABILITY TO PREDICT + MORE DETAILED EXPLORING OF OBJECTS + ENJOYS INTERACTIVE GAMES	+ MOTOR IMITATIONS + ROLLS OR CRAWLS TO SECURE OBJECTS + REFINEMENT OF FINGER CONTROL

APPENDIX E: ASSESSMENT GUIDE

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