Reflexes, Learning and Behavior
A Window Into the Child’s Mind
By Sally Goddard

It is when the withdrawal reflexes are gradually lessening, estimated at 9 weeks in utero, that the first of the primitive reflexes emerge. The Moro reflex appears at 9-12 weeks after conception and continues to develop throughout pregnancy so that it is fully present at birth.

Neural development—not chronological age—determines at what time each reflex emerges and at what time it becomes inhibited. Thus the presence or absence of reflexes at key stages in development may be used as diagnostic signs of central nervous system (CNS) maturity.

MORO REFLEX

Emerges: 9 weeks in utero
Birth: fully present
Inhibited: 2-4 months of life

TRIGGERS TO THE MORO REFLEX:

1. Sudden, unexpected occurrence of any kind
2. Stimulation of the labyrinth by change in head position (Vestibular)
3. Noise (Auditory)
4. Sudden movement or change of light in the visual field (Visual)
5. Pain, temperature change, or being handled too roughly (Tactile)

PHYSICAL RESPONSE TO THE MORO REFLEX:

1. Instantaneous arousal
2. Rapid inhalation, momentary “freeze” or “startle” followed by expiration—often accompanied by a cry
3. Activation of “fight or flight” response, which automatically alerts the sympathetic nervous system and results in:
   A. release of adrenaline and cortisol into the system (The stress hormones)
   B. increase in the rate of breathing, particularly in the apices (upper lobes) of the lungs (Hyperventilation)
   C. increase in heart rate
   D. rise in blood pressure
   E. reddening of the skin

4. Possible outburst, e.g. anger or tears

LONG TERM RESPONSE

Poorly developed CO² reflex

The CO² reflex causes spontaneous inhalation of the upper and lower part of the lungs. When CO² levels become too high in the blood, chemical changes take place in the medulla, which will then open the arteries to increase blood supply to the brain and at the same time stimulate deep breathing.

The Moro reflex is a composite series of rapid movements made in response to sudden stimuli. It consists of a sudden symmetrical movement of the arms upward—away from the body—with opening of the hands, momentary freeze and then a gradual return of the arms across the body into a clasping posture. Abduction is accompanied by a sudden intake of breath. Abduction facilitates the release of that breath. Moro in 1918 emphasized his belief that it is essentially a “grasping” reflex, analogous to the one seen in young apes who instinctively cling to their mothers. He called it “Umklammerungsreflex” which literally translated means clamping reflex.

The Moro reflex is an involuntary reaction to threat. The baby cannot yet analyze incoming sensation to assess whether that threat is real or not. The brain stem releases an immediate Moro response as if an emergency trip-switch were triggered automatically. It acts as the earliest form of “fight or flight” response and may be triggered occasionally in later life in situations of extreme danger. Essentially, however, it should be inhibited in its crude form from 2 to 4 months of age to be replaced by an adult startle reflex or Strauss reflex.

Its role as a survival mechanism in the first months of life is to alert, to arouse and to summon assistance. It is also thought to play a major part in developing the baby’s breathing mechanism in utero, coinciding with the earliest breathing-like movements observed in the womb. It facilitates the first “breath of life” at birth and helps to open the windpipe if there is threat of suffocation.

If the Moro reflex fails to be inhibited at 2-4 months of life, the child
will retain an exaggerated startle reaction which may result in
continued hypersensitivity in one or several sensory channels, causing
him to over-react to certain stimuli. Sudden noise, light, movement or
alteration of position or balance—any of these—may elicit the reflex at
unexpected moments, so that the child is constantly “on alert” and in a
heightened state of awareness. The Moro-directed child is poised on
the edge of fight or flight through most of his waking moments, caught
up in a vicious circle in which reflex activity stimulates the production
of adrenaline and cortisol—the stress hormones. These same hormones
increase sensitivity and reactivity so that both the trigger and the
response are built into the system. Such a child may present a
paradox—acutely sensitive, perceptive and imaginative on the one
hand, but immature and over-reactive on the other. He may cope in one
of two ways: by being the fearful child who “withdraws” from
situations, has difficulty in socializing, and can neither accept nor
demonstrate affection easily. On the other hand, he may become the
over-active, aggressive child, who is highly excitable, cannot read body
language and who needs to dominate situations. Either child will tend
to be manipulative, as he attempts to find strategies which will give
him some measure of control over his own emotional responses.

Adrenaline and cortisol are two of the body’s chief defenses against
allergy and infection. If they are in constant use as “Leitmotif” in the
child’s life, they are diverted from their primary function, and there
may be insufficient stores available to provide good immunity and
balanced response to potential allergens. This may be the child who
picks up every cough and cold in circulation and who over-reacts to
certain medication. The child may be sensitive to certain foods or food
additives, which in turn will affect behavior and concentration. He will
also tend to burn up blood sugar quickly than other children, which will
further exacerbate swings in mood and performance.

The child who still has a Moro reflex will experience the world as too
full of bright, loud and abrasive sensory stimuli. The eyes will be
drawn towards changes in light and to every movement within his
visual field. His ears may receive too much auditory information. He
cannot filter out or occlude extraneous stimuli, so he becomes easily
overloaded. He is, in effect, “stimulus bound.”

As Arneheim (1969) said, “Too many impressions which arrive from
several sensory sources and which fall simultaneously on a mind which
has not yet experienced them separately, will fuse for that mind into a
single undivided object.”

What then are the symptoms which a parent or a teacher might
recognize as being suggestive of a strongly residual or retained Moro
reflex?

**LONG TERM EFFECTS OF RETAINED MORO REFLEX.**

1. Vestibular related problems such as motion sickness, poor
   balance and coordination, particularly seen during ball
games
2. Physical timidity
3. Oculomotor and visual-perceptual problems, e.g. stimulus bound effect (cannot ignore irrelevant visual material within a given visual field, so the eyes tend to be drawn to the perimeter of a shape, much to the detriment of perception of internal features)
4. Poor pupillary reaction to light, photosensitivity, difficulty with black print on white paper. The child tires easily under fluorescent lighting

In bright light the pupils should automatically contract to reduce the amount of light entering the eye. In dim light, they should rapidly dilate to allow maximum light to reach the retina. Failure to do this may result in photosensitivity and/or poor night vision.

5. Possible auditory confusion resulting from hypersensitivity to specific sounds. The child may have poor auditory discrimination skills, and have difficulty shutting out background noise.
6. Allergies and lowered immunity, e.g. asthma, eczema, or a history of frequent ear nose and throat infections
7. Adverse reactions to drugs
8. Poor stamina
9. Dislike of change or surprise—poor adaptability
10. Poorly developed CO2 reflex
11. Reactive hypoglycemia

*** While other residual reflexes tend to have an impact on specific skills, it is the Moro which has an overall effect on the emotional profile of the child. ***

POSSIBLE SECONDARY PSYCHOLOGICAL SYMPTOMS.

1. Free floating anxiety—“Angst” (continuous anxiety seemingly unrelated to reality)
2. Excessive reaction to stimuli
   A. Mood swings—labile emotions
   B. Tense muscle tone (body armoring)
   C. Difficulty accepting criticism, as this child finds it so difficult to change
3. Cycle of hyperactivity followed by excessive fatigue
4. Difficulty making decisions
5. Weak ego, low self esteem
   A. Insecurity/Dependency
   B. Need to “control” or “manipulate” events

The Moro reflex is the only one of the primitive reflexes to be connected in some way to each of the senses. As the earliest primitive reflex to emerge, it forms a corner-stone in the foundation for life and for living. It is essential for the neonate’s survival, but its effects are profound if it fails to be inhibited at the correct time and transformed into an adult startle response.
# The Neuro Functional Organization Chart

**The Profile of Development from Dr. Temple Fay, Neurosurgeon**

Suzanne Day, Neuropsychologist – suzanne.day@neuroclinicbarrie.com

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<thead>
<tr>
<th></th>
<th>Visual</th>
<th>Auditory</th>
<th>Tactile</th>
<th>Manual</th>
<th>Language</th>
<th>Mobility</th>
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<tr>
<td>V11</td>
<td>Reading &amp; math at a grade 2 level</td>
<td>Understanding of complete vocabulary</td>
<td>Tactile identification of objects</td>
<td>Writing at a 2nd grade level</td>
<td>Vocabulary/ good sentence structure (2nd gr)</td>
<td>Skilled activities</td>
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<td>V1</td>
<td>Identification of visual symbols &amp; letters within experience</td>
<td>Understanding of 2000 words and short sentences</td>
<td>Description of objects by tactile means</td>
<td>Bimanual function with one hand in a dominant role</td>
<td>2000 words of language and short sentences</td>
<td>Walking and running in complete cross-pattern</td>
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<td></td>
<td>STEREOPTIC</td>
<td>STEREOPHONIC</td>
<td>STEREOGNOSTIC</td>
<td>CORTEX</td>
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<td>V</td>
<td>Differentiation of similar but unlike simple visual symbols</td>
<td>Understanding of 10-25 words of speech and two words couplets</td>
<td>Differentiation of similar but unlike objects</td>
<td>Cortical opposition bilaterally &amp; simultaneously</td>
<td>10-25 words of speech and 2 word couplets</td>
<td>Walking with arms below waist</td>
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<td>13-45 months</td>
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<td>IV</td>
<td>Convergence</td>
<td>Understanding of two words of speech</td>
<td>Perception of 3rd dimension in objects that appear to be flat</td>
<td>Cortical opposition in either hand</td>
<td>Two words of speech used spontaneously &amp; meaningfully</td>
<td>Walking with arms in primary balance at/or above shoulder height</td>
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<td>Simple depth perception</td>
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<td>8-26 months</td>
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<td>III</td>
<td>Detail perception</td>
<td>Appreciation of detail meaningful sounds</td>
<td>Appreciation of gnostic sensation</td>
<td>Midbrain prehensile grasp</td>
<td>Creating meaningful sounds</td>
<td>Creeping toward cross pattern</td>
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<td>Vertical tracking</td>
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<td>4-13 months</td>
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<td>II</td>
<td>Outline perception</td>
<td>Vital response to threatening sounds</td>
<td>Perception of vital sensation - pain</td>
<td>Pons vital release</td>
<td>Vital crying in response to threats to life</td>
<td>Crawling in prone position - cross pattern crawling</td>
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<td>Light reflex</td>
<td>Startle reflex</td>
<td>Babinski reflex</td>
<td>Medulla grasp reflex</td>
<td>Birth cry &amp; crying</td>
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