

Proposal for a Psychological Research Experiment

to examine this question:

**Does inhibition and integration of the Moro reflex
help children to pay attention more easily and
effectively?**

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Introduction

It is axiomatic that development of sensory, perceptual and cognitive skills is dependent upon motor activity. (Campos, 2000) Motor activity develops out of reflex-based movement patterns. (Fiorentino, 1965) Therefore we would expect to see a direct relationship between key primitive reflexes and cognitive skills such as attention, perception and learning.

Although psychology has a rich history of studying the psychophysiology of reflexes as arousal and response mechanisms (e.g., work of Pavlov and J. Watson), this promising area has been all but ignored in recent research related to problems of attention and learning in humans. New insights as to the development of reflexes in utero and infancy as well as their role in the development of cognitive skills have developed from fieldwork in various branches of applied kinesiology and occupational therapy.

New methods of influencing the reflexes have demonstrated a great deal of success in the field with remarkable changes in sensory, motor and cognitive performance being seen relatively quickly and easily. This success warrants closer examination by research psychologists to better understand how and why these methods may be effective in working with various neuro-developmental problems.

Central questions to explore in the study of reflexes include:

- Through what mechanisms do reflexes develop and change?
- What experiences activate these mechanisms?
- At what levels do these mechanisms work: neurologically, muscularly, biochemically?
- How are reflexes involved in overall child development: in utero, at birth, and at critical stages of sensory-motor and cognitive development?
- What role do reflexes play in adult performance?

Specific Aims of this Experiment

Several lines of research point to a possible role of the Moro reflex with regards to voluntary, sustained attention. Higher levels of arousal and defensiveness exhibited by easy startling, anxiety, and anger are found in children diagnosed with AD/HD. (Harris, 2001) The Moro Reflex, highly associated with defensive behavior, is seen at 28 weeks in utero and develops from the startle reflex, seen as early as 8 weeks. The Moro reflex is also seen as a gateway to the development of other critical reflexes related to both defensive behavior and learning. (Taylor et. al., 2005)

Specifically, the Moro reflex activates as a defensive reaction to perceived threat. Over-activation leads to retention of the reflex action and inhibits the muscle activation pattern from integration into whole body movement schemas. (Masgutova, 2004) Under threat, brain stem activity increases and executive cortex functions decrease. This activation pattern increases involuntary attention and correspondingly decreases voluntary attention.

The purpose of the proposed research is to elucidate the role of the Moro Reflex in attention control. My specific research goals are to:

- + correlate attention as measured by a standardized continuous performance test with the status of the Moro reflex in children
- + examine whether the inhibition and integration of the Moro reflex can improve attentional control
- + test the efficacy of the Masgutova method for inhibition and integration of the Moro reflex
- + generate some data on the percentage of children with and without AD/HD who exhibit a non-integrated Moro reflex
- + generate some data on differences in percentages of girls and boys who exhibit a non-integrated Moro Reflex
- + to substantiate the general role of reflex development in learning and cognition.

BACKGROUND AND SIGNIFICANCE

Many individuals in our society who have problems of attention, including ones diagnosed with AD/HD exhibit a great deal of anxiety. (Brown, T.E. 2000) A National Institute for Mental Health survey shows that the number of children diagnosed with AD/HD has held steady between 6 percent and 7 percent during the period 1994 and 2004. NIMH, 2005) This author's clinical practice evidences that approximately 50% of those diagnosed with ADD or AD/HD have a chronically active Moro Reflex. This is based on results from evaluations of approximately 200 clients, male and female, ranging in age from 5 – 57, participating in the author's attention recovery and concentration training program, between March, 2003 and March, 2006.

According to the National Institute of Mental Health research survey almost half of all children aged six to eleven who are diagnosed with AD/HD also have an identified learning disability. Many of these also are diagnosed with Oppositional Defiant Disorder, Tourette's Syndrome, Conduct Disorder, anxiety, and depression. (Brown, 2000). Possible causes for these disturbances include: genetic factors; maternal use of alcohol, drugs and tobacco during pregnancy.

“Attention” refers to the activity of “attending” by living beings. At maturity, “attending” is a complex, dynamic process that selects and co-generates the experience/awareness of “objects” with arousal, sensory, response, and volitional, neuropsychological systems. This definition basically follows that of John Ratey, M.D. clinical professor of psychiatry at Harvard Medical School, and well-known author and researcher into AD/HD. His basic schema of attentional processes is: arouse, orient, detect and execute. (Ratey, 2001, p. 115) Reflex activation is particularly involved in the “orient” and “detect” aspects of attention.

The study of reflexes is part of the study of movement development. Dr. Masgutova includes the following in her definition of movement development:

- Forming of infant reflex motions and their integration;
- Integration of infant reflexes and consciously controlled movements;
- Evolution of whole and basic body movement schemes (Masgutova, p. 9) ;

as well as understanding the role and relationship of proper reflex development and integration into sensory-motor coordination for cognitive skills such as attending, reading, writing, and listening.

A recent study at the University of California suggests that muscle reflex activity could generate neurotransmitters. (Borodinsky, Spitzer, Nature, June 3, 2004) They found that increased electrical activity increased the levels of neurotransmitters that inhibit the activity of nerve cells across the synapse and decreased the levels of neurotransmitters that stimulate nerve cells. They found that decreasing electrical activity had the opposite effect. The researchers proposed that while genes control the formation of structures that produce electrical activity in nerve cells, the activity itself could determine what neurotransmitters are produced. This may be part of the mechanism which allows for flexible growth and operation of the nervous system. Since muscle movement stimulates electrical activity, it may well activate neurotransmitters production. Numerous studies have proven the increase of dopamine through exercise.

To emphasize the magnitude of reflexes for human development, Masgutova quotes Russian physiologist, I.M. Setchenov, “All acts of conscious and unconscious life are reflexes in their origin.”(source unknown) She defines a reflex as an automatic, involuntary response nervous system reaction caused by stimulation off the receptors of the skin, tendons, muscles, mucous membrane and pupils.” (Masgutova, p. 20) While Masgutova accepts that many reflexes are inhibited in natural development she also sees many of them with two stages of development, one before inhibition, the other after inhibition, which integrates into whole body movement schemes that are available for voluntary, conscious control. So rather than looking for the inhibition and extinction of the reflex, Masgutova looks for the integration of primitive reflexes into postural reflexes and whole body movement schemes.

“It is the development of normal infant reflexes and their integration into the general system of body movements, and not their extinction, according to the majority of literature, which leads to the fullest formation of body dimensions and related brain functions.” (Masgutova, p. 38)

Understanding the Moro Reflex

The Moro Reflex is a primitive, survival reflex triggered by a sudden change of the baby’s head position either mechanically or as a reaction to a loud or sudden sound. “In response to this action the baby opens the core of the body extending his arms and fingers, and takes a deep breath in and holds it. Next, he closes the core, contracts the limbs, clenches fingers into fists, and breathes out.” (Masgutova, 2004, p. 89) It is seen posturally as the common action of “curling up into a ball.” Sally Goddard’s seminal work on reflexes describes the Moro reflex further:

“The Moro reflex acts as a baby’s primitive fight/flight reaction. It should be inhibited by circa 4 months of post-natal life to be replaced by an adult "startle" reflex. If it persists in the older child, it can be associated with:

- Hypersensitivity
- Hyper-reactivity
- Poor impulse control
- Stimulus bound-effect (cannot ignore peripheral stimuli to focus attention on one thing – has to pay attention to everything)
- Sensory overload
- Anxiety (particularly anticipation anxiety)
- Labile emotions
- Emotional and social immaturity” (Goddard, 2005, pp. 4-7)

Sally Goddard relates the Moro reflex to the fear-paralysis reflex, which, if retained beyond the first few weeks in utero, she found to be the cause of elective mutism, a form of autism in which the child can’t talk. In normal development, it should transform into the Moro Reflex. The Moro reflex starts in utero and then disappears about the second month after the baby is born. If the Moro does not inhibit, the child has exaggerated reactions to sounds, hot and cold, touch, and visual input and hearing.

Some consider the startle response and the Moro to be identical. But both Masgutova and Goddard see the Moro as a more complex reaction pattern that includes the startle schema. Masgutova identifies the Moro as a more complex reaction pattern that includes but is greater than the startle reflex. Her reflex development schema concerning the Moro is as follows:

Startle reflex -> fear-paralysis reflex --> Moro reflex --> tendon guard reflex

Startle reflex --> Pavlov's Orientation Response

The Moro precedes the asymmetrical tonic neck reflex, (ATNR) symmetric tonic reflex (STR) and tonic labyrinthine reflex. (TLR) possibly serving as a “gateway” to their development. (Taylor et. Al., 2004) however Goddard holds to the theory that primitive reflexes are progressively inhibited and superseded by postural reflexes. Masgutova's theory emphasizes the integration of the reflex activation pattern into whole body movement schemas, following L.S. Vygotsky: “in fact, infant movements don't disappear as the infant develops, they continue to work in connection with higher nervous system structures.” (Masgutova, p.28) Her highly successful work with her patients using “infant” reflex movement schemas with adults underscores the validity of this principle. Additional clinical evidence suggests that the Moro reflex can be re-activated into a disinhibited state in response to trauma.

The startle reflex is seen in normal infants in response to a loud noise, and seen in the fetus as early as eight weeks. It will cause the infant to make a sudden body movement, bringing the legs and arms toward the chest. A great deal of research literature exists on the Startle reflex in relationship to movement, development, fear, neurochemistry and brain activity. For instance, Farid, et al. (Neuropsychopharmacology, 2000) found in a rat population a direct relationship between inhibition of the startle reflex, through the regulation of sensorimotor gating inhibited by a serotonin agonist, to the prepulse inhibition (PPI), “which is the reduction in startle magnitude when the startling stimulus is preceded immediately by a weak prepulse.” Additionally the startle reflex is considered to be the beginning of the

development of auditory processing and language development. The basic response to auditory stimuli is to arouse, orient and distinguish the sounds. (Goddard, 2005) She suggests that the hypersensitivity to sound may be due to a Moro reflex preventing the acoustic stapedius reflex from fully developing. This is a muscle that should contract upon a loud noise protecting the inner ear from noise damage. Also, lack of the stapedius reflex might activate a Moro startle response. (Goddard, 2005, p.38)

Voluntary attentional resources may be diminished by the hyper-activation of the Moro or startle reflex induced by the perception of threat, physical or psychological, on the part of a human, child or otherwise. The proposed mechanism is that of the amygdala as a switching station evaluating the incoming data as to “threat” or “not threat” and activates the protective, survival reflexes including the Moro while inhibiting impulses to activate executive cortex function, including that of voluntary control of attention. (Ratey, p. 66)

Gender Differences

As to whether there are significant gender differences relative to AD/HD, the evidence is conflicted. The National Institute of Mental Health reported twice the levels of boys as girls were diagnosed with ADHD in 2004. (NIMH, 2005) Additionally Halpern (2000) found that, relative to spatial functioning, more boys have learning disabilities and attention problems. But a meta-analysis of the relevant literature by Gaub, (J Am Acad Child Adolesc Psychiatry, 1997) found scant gender differences with respect to impulsivity, academic performance, social functioning fine motor skills, parental education, or parental depression. However he found girls actually displaying lower levels of inattention than boys. Gaub suggests a significant bias in social perception in the identification of AD/HD.

An in-depth study of dopamine cycles in rats found gender differences in rats correlated to the overproduction and delayed pruning of dopamine receptors in prefrontal cortex to attentional problems. They suggest that striatal dopamine receptors rise in males, but not females, in a cycle that corresponds to early motor symptoms of ADHD.

Further, they found a coincidental pruning of these dopamine receptors corresponding to an estimated 50-70% remission rate by attention. (Anderson, 1997)

A Significant Published Study

The relationship between reflexes and children's neurological and cognitive development promises to be a goldmine of insight and a source of practical knowledge to assist the educational and psychological professions. However, at this time, while there is plenty of research evidence to support the theory of their relationship, direct research is scarce. Taylor, Houghton and Chapman (2004) following the research, theories and work of Sally Goddard, completed a study on primitive reflexes, particularly focused on the Moro and AD/HD, published in the International Journal Of Special Education, 2004. They included an examination of relationships of these reflexes to learning disabilities. They looked at the symptomatologic overlap of AD/HD behaviors and retention of four primitive reflexes. They found that boys diagnosed as AD/HD had more reflex retention than those not diagnosed.

“In terms of indirect effects, Moro retention levels correlated significantly ($ts > 2.278$) with scores on the Conners' Impulsivity ($p = .102$, $SE = .050$), Emotional ($p = .102$, $SE = .045$), and Problematic ($p = .143$, $SE = .048$) Behaviours indices. In all cases, the relationships were positive, indicating that higher retention levels were linked with higher levels of AD/HD symptomatology.

As expected, there was a strong positive relationship between Moro reflex retention scores and retention levels for all three of the remaining reflexes ($ts > 2.488$). Importantly, however, the Moro had no significant direct effects on any of the AD/HD symptomatology or achievement variables. All of the significant effects associated with Moro Reflex retention were indirect (i.e., mediated by the other reflexes).” (ibid, p. 11)

Below is a chart reproduced from their study charting the “gateway” relationship of the Moro reflex to three others, together referred to as “the big 4.” (Goddard, 2005)

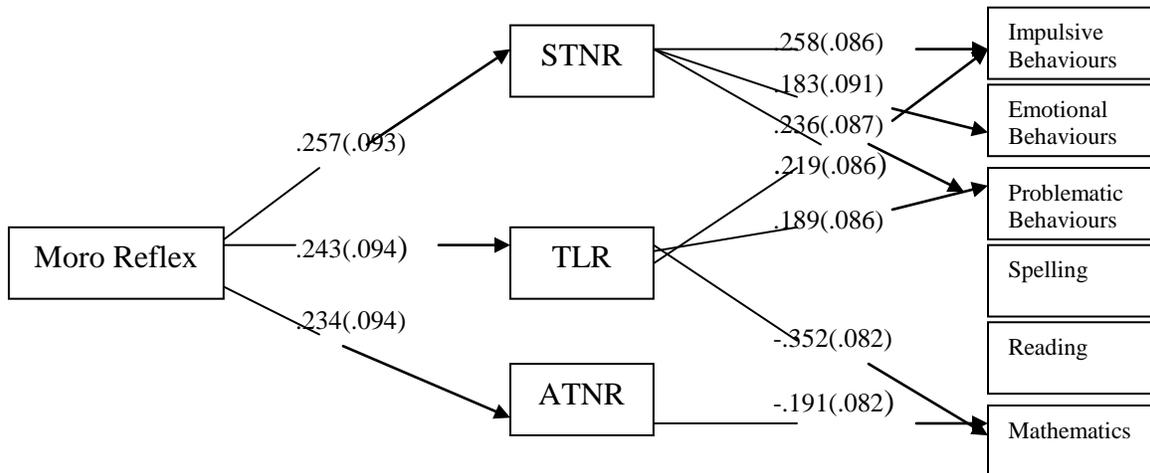


Figure 1: Path diagram of significant relationships between reflex retention levels, AD/HD symptomatology, and academic achievement

This study found a clear relationship between retained reflexes, AD/HD and learning difficulties. The proposed research builds on this work, examining the effect of inhibiting the reflex and integrating it into more mature whole body schema functioning on AD/HD. It is expected that the change in cognitive functioning resulting from the integration of the Moro reflex will produce an immediate and measurable change in attention control.

RATIONALE FOR PROPOSED METHOD

The proposed research will generate evidence as to whether the inhibition and integration of the Moro reflex might help children to pay attention more easily and effectively. As demonstrated above, a clear relationship exists between anxiety, startle and symptoms of AD/HD. Additionally, we have shown that the Moro is activated by the perception of threat, raising levels of anxiety and startle thresholds. Therefore it is reasonable to infer a direct relationship.

Taylor, Houghton and Chapman clearly report that AD/HD boys exhibit more retained reflexes. The relationship to the Moro is cloudier. Though they operationalized the definition of AD/HD as a continuum phenomenon, they only used the *Conners'*

Parent Rating Scale – Revised (CPRS-R; Conners, 1997) a highly subjective instrument that measures social perception of ADHD symptoms, without regard to objective performance or neurobiological events, to test ADHD. This study will be able to show if there is a direct effect of the Moro reflex on attention by using a continuous performance computerized test (T.O.V.A.) reporting scores on impulsivity, reaction time and short-term memory.

Of particular importance in this study is the intention to not only analyze for the relationship of AD/HD to Moro but also to test the effects of a treatment protocol that actually changes the status of the reflex using Masgutova’s inhibition and integration method. Goddard also offers a program of inhibition of the Moro reflex based on replication of its movements. The results showed that the children who participated in the daily INPP exercises made significantly greater improvement on measures for neurological dysfunction, balance and coordination. Children who had scores of more than 25% on tests for neurological dysfunction and whose reading age was less than their chronological age at the outset also showed small but significantly greater progress in reading than children who did not take part in the program. (Goddard, 2005, “Research results...”) Similar programs are beginning to appear through different venues such as the Brain Gym® educational movement program. (www.braingym.org)

This design will also yield data on the percentage of those diagnosed with AD/HD who exhibit NI moro and also percentage of those with NI Moro who are not diagnosed AD/HD. Generated will be data on differences in percentages of girls and boys who exhibit a non-integrated Moro Reflex. Overall, this study may substantiate the general role of reflex development in learning and cognition if high correlations are found.

RESEARCH DESIGN AND METHODS

I propose a quasi-experimental design with the participants as 300 children, ages 7-12, composed of two basic groups, either “diagnosed with AD/HD”, or “no diagnosis or suspicion of AD/HD or LD” matched for age and gender (following Taylor et al.,

2005) The dependent variable will be attention as measured by The T.O.V.A. (Test of Variable Attention). Both the *Neuro-Physiological Assessment Test Battery: Erect Drop Back Test for Moro Reflex* from Goddard’s Institute of Neuro-Physiological Psychology and Masgutova’s “status check” for the Moro reflex will be administered as pre-experimental and post-experimental tests. Pre-tests and experimental treatment to be done on day 1 and post-tests to be done on Day 3 with movement schema repetition to be done ten minutes each day by participants receiving the Moro integration protocol. The experimental treatment will be the integration and inhibition of the Moro reflex using a Moro reflex integration protocol as described by Masgutova. Data will be analyzed for an effect of the treatment upon the T.O.V.A. scores.

Participants

The child participants will be divided, on the basis of screening information, into four experimental groups and three treatment groups. The table below shows that the children who have a non-integrated (NI) Moro reflex will participate in the Masgutova Moro integration protocol (“yes”) and that those with an integrate (IN) Moro will not participate in the Moro integration reflex but will instead participate in the “movement and touch” protocol. The “movement and touch” protocol will mimic key features of the Moro integration protocol to control for the widely recognized positive effects of movement and touch on performance.

Experimental Design Table

| <u>Groups</u> | Diagnosed AD/HD IN Moro | Diagnosed AD/HD NI Moro | not diagnosed AD/HD IN Moro | not diagnosed AD/HD NI Moro |
|--|---------------------------------------|---------------------------------------|---|---|
| <u>Treatment Groups</u> | | | | |
| Moro integration protocol | no | yes | no | yes |
| “no treatment” | yes | yes | yes | yes |
| “movement and touch” protocol | yes | no | yes | no |

The non-integrated Moro groups will participate in “activation and repatterning” activities as described by Masgutova (Masgutova, 2004) with a two-day interval before doing the post-test. Participants will have ten minutes of practice activities each day. The “No treatment” group is intended to control for any “test learning” effect. They will only take the T.O.V.A. test and the INPP, Moro reflex test, however. Field work shows that even the brief observation and activation of a reflex as is done in the Masgutova reflex status check can have a positive integrating and inhibiting effect. The “movement and touch” group will serve as a control for the effects of social attention, physical activity and light touch from another person.

Pre-tests and Post-tests

1. T.O.V.A., Test of Variable Attention
2. INPP - Erect Drop Back Test for Moro reflex
3. Masgutova’s status check for Moro reflex

(Two facilitators will administer both the INPP and Masgutova status check to control for tester reliability.)

Treatment Procedure

Both “diagnosed AD/HD” and “not diagnosed AD/HD” participants who exhibit a retained and non-integrated Moro reflex will be led through the “Moro integration protocol,” a standard set of activities for inhibition and integration as taught and practiced by Dr. Masgutova’s International Neurokinesiology Institute. Additionally, they will be asked to practice key movement patterns for ten minutes each of the days between the pre-tests and the post-tests. Those who do not exhibit this will experience the “movement and touch protocol.” The third group will receive no treatment.

Testing Rationale

The Test of Variable Attention (T.O.V.A.) is a fairly widely used test with high correlation to differential diagnosis of AD/HD. It measures inattention, impulsivity and

response time variability and is normed to age and gender for AD/HD. For the purposes of this research project, it is particularly well suited as an easily administered continuous performance software-driven test. It can reveal immediate changes in attention. (Greenberg & Waldman, 1993) For this reason it is commonly used by M.D.'s for rapid assessment of the effectiveness of medication. It measures performance independently of the presence or absence of pathology and is independent of the subjective interpretations of behavior such as evidenced on the Conner's Scale.

Blythe and Goddard's Neuro-Physiological Assessment Test Battery is the only formal test available for reflex inhibition status which this author can identify. Responses to the assessment tasks are rated for competency on a five-point scale anchored with appropriate descriptors for each specific reflex. Because Goddard does not recognize the stage of "reflex integration" at this time we propose to use Masgutova's reflex status check for the Moro and as further confirmation of the status of the reflex.

Expectations

Integrating the AD/HD group's Moro reflexes should show an immediate and measurable change in their ability to consciously attend, according to research, theory and clinical experience. We would expect to see the "AD/HD NI Moro" group to exhibit the greatest degree of positive change on the TOVA; no change with the "AD/HD IN Moro" group; some positive change with the "not AD/HD NI Moro" group; and no significant change with the "not AD/HD IN Moro" group. We would expect to see no differences in the "no treatment" group. There may be some improvements in the "contact and movement" group due to the powerful effects of exercise and touch. If results were positive they would support the efficacy of Masgutova's method. We would also expect to see a large percentage of non-integrated Moro in both groups, those diagnosed and not diagnosed with AD/HD. A percentage of the children not diagnosed will be found functioning with a retained Moro. Also expected would be a larger number of boys over girls with retained reflexes.

Significance

If the study should show a robust relationship between the Moro reflex status and attention performance, it would affirm the Moro reflex as a major component in attention difficulties. This in turn would implicate the role of anxiety-inducing factors in AD/HD, encouraging politicians, principals and teachers to cultivate school classrooms with low-stress environments to improve attention, learning, and behavior. Clinically it would reinforce the need to screen patients for fear, anxiety and phobia and then effectively treat these as a priority, before diagnosing or treating AD/HD. Practically, it would support people to seek integration of the Moro reflex if they are afraid or anxious. Perhaps it will catalyze future investigation and deeper understanding of the power of reflexes in human development.

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