Intelligence and Early Mastery of the Reading Skill (Final republished version)

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Abstract:

Summary overview of intelligence development in young children, coinciding with neocortex verbal areas development by means of mastery of the reading skill and of the state of children literacy development in the world.

Keywords: Pavlov, Chauchard, Korzybski, neocortex, verbal areas, conceptual thinking, comprehension process, intelligence, teaching methods.

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The text of this article has been integrated in its definitive version as **Chapter 4** of monograph

"***General Neurolinguistics***"

Other articles in the same research project:

INDEX – General Neurolinguistics Conceptual Thinking

The final version republished in 2022 is reproduced here (**Chapter 4**):

4. INTELLIGENCE AND EARLY MASTERY OF THE READING SKILL

Summary overview of the development of intelligence in children, which coincides with the development of the verbal areas of the neocortex through learning to read; and the state of development of children's literacy in the world.

4.1. Foreword

Despite an acute awareness in the educational community for the need to awaken early in life the ability to think and express thoughts coherently for all children, few seem to realize that such awakening is precisely the outcome of early learning and mastery of all verbal abilities, particularly the reading skill, which, by very nature, favors the concurrent mastery of all other aspects of verbal development.

Conclusive research has shown that early mastery of this particular skill in due time, and to a lesser extent, that of writing, has undeniable consequences on the structuring of the brain and on the development of the general understanding ability, generally viewed as intelligence, that extend far beyond what is generally believed.

Very often though, when the topic of early tutoring of the reading skill is broached, the classical objection is *Let them play, they have ample time!* We will see that the period of time available for each child to optimally master all verbal skills is not unlimited. In fact, biological reasons at the level of the construction of the brain will cause verbal skills that are not mastered to a sufficient level before the age of 7, to become more difficult to completely master afterwards ([37], see **Section 1.11**).

In this regard, I wish to express my wholehearted gratitude to René Angel for his outstanding collaboration, who from France, provided me with the better part of the information presented here regarding the state of language teaching in his country and most importantly regarding the very effective early childhood language teaching methods of Glenn Doman and Jeanine Cougnenc, both of which are described in Reference [33].

My unmitigated thanks also, to Jeanine Cougnenc, renowned French pedagogue and field educator, who provided me, grounded on her 38 years span of direct teaching to preschool and 1rst cycle elementary school in France, with an important pool of documentation about her past writings, including some unpublished material, and authorized me to reproduce some parts that were important for the integrity of Reference [33].

4.2. Introduction

Over the course of the last 7 years of his life (1929-1936), renowned neurophysiologist Yvan Pavlov eventually came to understand the causal link that exists between articulated language and conceptual thinking, and it is consequently to him that we owe this extraordinary discovery [64]. According to his conclusions, the highest cognitive functions of the human brain are the end result of a process initiated by the memorization of the sequences of motion that must be executed by the phonation organs to pronounce each word.

The impregnation of these sequences is accompanied by the establishment in the brain hemispheres of cerebral structures physiologically associating each word to the locations in

the neocortex where a person's past non-verbal sensory perceptions or emotions are stored, thus allowing their analysis and generalization. The whole collection of cerebral structures thus created by learning an articulated language constitutes, according to his conclusions, the seat of conceptual thinking.

Pavlov concluded that in higher animals, including humans, a *first signaling system* develops in the hemispheres of the brain that draws the individual's attention to the signals originating from his environment and emotions, and that in humans, a *second signaling system* also develops that draws the individual's attention to signals originating from the first system.

The following quote from Pavlov, taken from his essay *Versuch einer physiologischen Interpretation der Symptomatologie der Hysterie*, 1932, [25], perfectly summarizes his conclusions already mentioned in a book by Paul Chauchard published in 1960 [5], here translated to English for the first time to this author's knowledge:

> *"Bei den höheren Tieren einschließlich Menschen ist die erste Instanz für die komplizierten Wechselbeziehungen des Organismus mit seiner Umwelt das den Großhirnhemisphären nächstliegende subkortikale Gebiet mit seinem hochkomplizierten unbedingten Reflexen (nach unserer Terminologie), seien Instinkten, Neigungen, Affekten, Emotionen (nach der unterschiedlichen üblichen Terminologie). Das ist das einzige Signalsystem im Tierorganismus und das erste Signalsystem des Menschen. Beim Menschen, kommt ein anderes Signalsystem hinzu, die Signalisierung des ersten Systems. Sie erfolgt durch die Sprache und durch ihre Basis, die ihre zugrundeliegenden Komponenten, durch die kinästhetischen Reize der Sprechorgane.*
>
> *Damit wird ein neues Prinzip in die Nerventätigkeit eingeführt, die Abstraktion und gleichzeitig damit die Verallgemeinerung der unzähligen Signale des vorhergehend-en Systems. Parallel dazu erfolgt ebenfalls das Analysieren und Synthetisieren dieser neuen verallgemeinerten Signale. Dieses Prinzip erlaubt eine grenzenlose Orientierung in der Umwelt und bergründet die höchste Anpassung des Menschen, die Wissenschaft, sowohl in Form des allgemeinmenschlichen Empirismus als auch in ihrer spezialisierten Form.*
>
> *Dieses zweite Signalsystem und sein Organ müssen als die allerletzte Errungenschaft des Evolutionsprozesses besonders anfällig sein."*
>
> *Yvan Pavlov, 1932 ([25], p. 265)*
>
> *"In higher animals, including humans, the primary organ responsible for the complex interactions of the organism with its environment is the subcortical area closest to the cerebral hemispheres, with its highly complex conditional reflexes (according to our terminology), instincts, tendencies, affini-ties, emotions (according to the various usual terminologies). It is the only signaling system in the animal organism and the first signaling system in humans. In humans, another signaling system is added, namely the signaling of the first system. It is done through language and its underlying components, via the kinesthetic stimuli of the speech organs.*
>
> *So, there comes into being a new principle of nervous activity, which abstracts and simultaneously generalizes the innumerable signals of the first system. In parallel, the ability to analyze and synthesize the newly generalized signals comes into being. This new principle allows a boundless orientation in the environment and*

constitutes the foundation of the ultimate realization of Man, science, under its generalized form as well as under its specialized forms.

This second system and its organ are the very last and particularly delicate push of the evolutionary process."

More should be cited from these few pages of this extraordinary description by Pavlov to more clearly describe all aspects of conceptual thinking and its relation to articulated language, particularly the fact that the signals coming from the senses are colored by the emotions felt by the individual during the passage through the limbic system of the coherences perceived in the environment, before they reach the neocortex. But these few quotes already cover the main aspects.

4.3. Historical developments

It must be said that these major conclusions by Pavlov were the object of very little attention in western countries. According to this author's investigation, the famous translations done by G. V. Anrep in 1927, *Conditioned Reflexes, an Investigation of the Physiological Activity of the Cerebral Cortex* [109], and by W. H. Gantt in 1928, *Lectures on Conditioned Reflexes* [110], seem to be about all that was published of his work in the western world until recently. These translations obviously do not mention the research that he carried out after their publication. It was only in 1998 that Dr. Lothar Pickenhein published the bulk of what Pavlov wrote between 1929 and 1936 (*I. P. Pawlow – Gesammelte Werke – Über die Physiologie und Pathologie der höhere Nerventätigkeit* [25]).

It also seems that only one group of western researchers of that era developed sufficient interest for these conclusions by Pavlov to push further this line of research in the neurophysiology domain. The most prominent researcher of this group was Dr. Paul Chauchard, French neurophysiologist, Director of Research at *l'École des Hautes Études* in France in the 1940's and 50's.

His most important result was the direct causal link that he established between the density of the network of synaptic links being established in the verbal areas of the neocortex as a consequence of learning the words of a language between birth and the age of 7 and the level of intelligence reached by individuals. His results were published in 1960, in a popularization book titled *Le cerveau et la conscience* [5].

A researcher contemporary to Pavlov, Alfred Korzybski, who founded the *Institute of General Semantics*, conducted on his part a remarkable independent research on the links existing between the words of languages and the external objective reality that these words are meant to describe. His results were published in 1933 in a book titled *Science and Sanity* [13], as summarized in **Chapter 1**.

In the 1940's, as the first research were being carried out on the internal structure of the neocortex, Donald O. Hebb, neuroscientist from *McGill University* in Montreal, explored the manner in which information is processed by data correlation in the 6-layer human neocortex, which is the most complex neural network in existence. His results were published in 1949 in a book titled *The Organization of Behavior* [14], as summarized in an April 1990 article by Janette Lawrence in specialized journal *Dr. Dobb's Journal*, *Untangling Neural Nets* [96].

In the field of pedagogy, Dr. Glenn Doman, physician at the *Philadelphia University Hospital* succeeded over the course of 20 years of research on re-education of children

suffering from brain damage, in teaching many of these children to read rather well, which even involved children as young as 3 years of age. His exploration allowed him to experimentally determine the most favorable period during children's growth for learning to read. His results were published in 1963 in a book titled *Teach your Baby to Read* [8]. Remarkable intellectual development was noted for most children who learned to read early from his method.

In fact, Doman was the true modern precursor in the field of pedagogy, the first to really demonstrate and publicize on a broad scale the benefits of early tutoring of the reading skill. It is true that his method was the object of much debate for a while, due to some excesses that some parents seemed to have been led to, but the very debate that was stirred up led to the elaboration of many offshoot approaches that effectively addressed the controversial aspects of his pioneering work.

Let us also mention the exhaustive work of Fitzhugh Dodson, *How to Parent*, 1970 [9], in which we find mention of Dr. Dolores Durkin's work, who followed all through primary schooling in California 49 children who already knew how to read as they entered primary school, previously tutored by their mothers without academic support. All of them, without a single exception, remained ahead in their classes all through primary schooling. She reports that none of the children who learned to read at the beginning of primary school ever caught up with them.

There also is the study published in France by Rachel Cohen and Ragnhild Söderbergh, *Apprendre à lire avant de savoir parler* [111]. Inheritor of a tradition of early teaching of the reading skill that finds its roots in a booklet titled *Christmas Gift by Cadmus – or the easiest way by which small children may learn to read* published in Sweden in 1800 by a clergyman named Israel Gustaf Wänman, Dr. Söderbergh's approach, known to Swedish educators as *The Cadmus Method* consists in letting the required material at the disposal of children, and in encouraging them without formal tutoring to establish the correspondence between the written and spoken word, in such a way that they eventually discover by themselves the structure of the written language, just like they discover by themselves the structure of the spoken language, and eventually associate both structures at all levels.

The value of this approach is resoundingly confirmed by the very positive results noted in the Öjaby preschool in Vaxjo, Sweden, (1 to 6 years of age) directed by Assar Thorsjo, who introduced and developed Dr. Söderbergh's ideas for a number of years. The outcome was that none of the 225 children who graduated in 2002 from the Öjaby preschool to elementary school showed any sign of reading or writing difficulty.

The admirable *Lire à 3 ans* by Françoise Boulanger [112] must also be mentioned, whose popularity never let down since it was first published in 1992, reprinted in 2002 under the title *Le bonheur d'apprendre à lire*.

Her approach was put in practice in the preschool institution of Chessy (a village near Paris, France), directed by Béatrice Machefel, who has been applying it since 1998 with particularly rewarding results: practically 100% success in 1rst grade for the first group of children from Chessy to enter primary school, all social origins included. Finally, the numerous publications of Jeanine Cougnenc, renowned field pedagogue in France, must be mentioned.

This list of names in no way exhausts the list of educators and researchers who developed valuable approaches all over the world, and the intent here is not to compare the merits of the various approaches proposed by these authors, because they are not in competition in reality,

but are rather fighting the same battle, however uncoordinated and isolated from each other they might be, to induce the acceptance of the idea that early mastery of verbal skills, particularly the reading skill, are a mandatory requirement for optimal intellectual awakening in all children.

Unfortunately, early teaching of the reading skill and its priceless benefits are not sufficiently emphasized in the current programs of formation of teachers, in many countries. It must be understood that all methods are proper if applied with wisdom and respect for the need of children to always think that they are playing, not *working*, so they never perceive this activity as a chore.

It is important to realize that once the interest of a child for the written word has been aroused, he will himself become the very driving force of his own intellectual development. I must say that the work that most caught my attention was that of Jeanine Cougnenc, who taught for 27 years in primary school and was principal of a French kindergarten School for 10 years before retiring, with the rich experience given her from teaching to all 4 pre-school sections in a single classroom. She was able to develop, over that period, a personal pedagogical approach adapted to each section.

The major point of interest of her approach lies in the fact that when they subsequently entered primary school, all children that she had supervised in kindergarten could minimally read texts of combined known words, and thanks to anticipation, could guess the meaning of new words inserted in the text. Others could also decipher new words made up of simple sounds that they had memorized. Many, finally, already mastered deciphering and had learned how to use the various reading strategies, and so had already reached the level at which they could read perfectly without help ([113], p. 61-62).

Irrespective of their social origins, it seems that practically all of these children subsequently manifested sufficient ease of learning to successfully complete their primary and secondary schooling. Her method was published recently under the title *Un enseignement moderne de la lecture* [114].

But a word of caution seems again required at this point. By no means is there any question of promoting any forcing or accelerated tutoring aimed at converting children into child geniuses as they leave the cradle. The aim is simply to begin earlier to use a natural learning ability of children that is still traditionally very little taken advantage of in too many countries.

What ultimately matters, is that all aspects of the verbal abilities be mastered before the myelination of the verbal areas of the brain is genetically triggered, an irreversible and inescapable event that occurs at the age of about 7 years of age for all children [7].

Unfortunately, although the knowledge and meaning of this capital biological deadline has been known to neurophysiologists since the 1920's, it has not yet migrated to educational circles, no doubt due to the hermetic partitioning of disciplines and the tendency to hyperspecialization that has increasingly plagued the university level all through the 20th century; which resulted in educational practices in many countries not to have been adapted to take it into account, coupled to the fact that this discovery still has not been translated to English from its original German language formal publication.

As a matter of fact, the myelin sheaths that wrap the dendritic arborescence of each neuron of the neocortex, that renders easy the circulation of nerve impulses once synaptic links are physically established, apparently make it more difficult, by their physical presence, for new synaptic connections to grow.

But having genetically structured the human neocortex even before birth to allow for the eventual use of articulated languages and of their ultimate manifestation, conceptual thinking, it seems that Nature has also very logically provided for an extended initial period after birth, during which learning verbal abilities is made easy by a genetically programmed delay of the myelination process of all verbal areas until the age of approximately 7 [7]. This is no doubt why children so easily learn languages during infancy.

Considering that the verbal areas in which the reading, writing, speaking and listening skills develop are located in different parts of the neocortex, it is therefore imperative for optimal structuring that all verbal skills be developed to a sufficient level before the age of 7, since the density of these structures depends on the level of intensity of verbal stimulation that the child will benefit from before the age of 7.

Children naturally learn to speak on their own up to a certain level of proficiency as they socialize, but just like it cannot be expected that leaving a piano at their disposal would suffice for them to become new Mozarts, it cannot be expected either that they would reach a superior level of mastery of all aspects of language without enlightened supervision.

History shows that each time the process of verbal awakening in a child is correctly supervised for reading and writing as well as for verbal expression, and carried out in due time, it was observed that this child reached a superior level of intellectual awakening, that remains out of reach of children who are less stimulated during this period, or who are stimulated later. Dolores Derkin's study in this regard is quite telling [9], as are all other similar studies.

It is well understood that children who master all verbal abilities in young age often develop a pronounced taste for reading, which causes them to become indifferent to the added effort involved in expanding their vocabulary, because they now love this activity, which will in turn cause them to become interested and willing actors for the remainder of their schooling.

4.4. The state of literacy in the world

Nowhere is this more obvious than in the Scandinavian countries, with Finland topping them all in literacy scores; these 5 countries topping the chart of literate countries with Japan and the Netherlands, as witnessed by a recent article from *The Guardian* [115] and the 2013 OECD survey [116]. In the Finnish schooling system, all children mandatorily learn to read before the critical age of 7 in a well structured nursery-kindergarten system before starting formal schooling.

It is no surprise then to observe that Finland has a literacy rate higher than 90% with the other Scandinavian countries boasting similar rates. Actually, tens of countries, large and small, have literacy rates in the 80% range, and more and more countries are progressively joining the club.

Finnish learners' literacy proficiency is such despite having fewer hours of instruction than peers elsewhere else in the OECD, that this apparently baffles decision-makers and is the envy of learners worldwide as mentioned in Reference [117]. Their results are not surprising however, when correlating their proficiency with the fact that the Finnish school system, either by purpose or fortunate historical progressive orientation towards this benefits observation based optimal method happen to teach all their children to read before the myelination process is triggered in their neocortex.

For those children who have not reached a sufficient level of proficiency when this deadline is reached, the increased effort then required to complete their insufficient verbal mastery is bound to discourage them, as they start comparing their own recently acquired increased effort level needed to decipher new written texts, with the ease with which other already proficient children breeze through the same texts as if it was second nature, which it effectively has become for them.

Don't we discover here the reason why so many children eventually lose interest and the will to learn, when they *unduly* conclude that they may have to constantly sustain such a level of effort in the future? *Unduly* of course, because ***if a sufficient amount of immediate personal support*** is provided to each of them for a few more months from then on, *they will also reach the same level of reading fluency as their peers*.

Nowhere is this more obvious than in a country, a Canadian province actually, where the sound practice of teaching children to read to proficiency during the first year of primary school was abandoned in the mid 1960's, as new educational theories were implemented as part of a major educational reform, which was devastating in this regard.

According to official statistics for 2013 [118], 19% of the Québec province population aged 16 to 65 is categorized level 1 on the literacy proficiency scale, which means that they can at best decode only extremely simple texts, and 34% more are categorized level 2, which means that they could, for example, find the phone number of the organizer of an event on an internet page, but are unable to separate irrelevant information from pertinent content in a text that they are asked a question about, for a staggering total of 53% of the adult population of this province being considered functionally illiterate.

The saddest part is that while literacy has been in constant increase worldwide [119], it has been in constant regression for the past 55 years in the province of Québec, the second most populous province in Canada, to the bafflement of the local experts. The OECD figures reveal that in 1994, the functional illiteracy rate in this province was 38% and that it had risen to 50% in 2005, to reach this devastating rate of 53% in 2013.

But it may be suspected that after 55 years of application of these new educational theories, illiteracy itself may have been a factor in the inability of the local experts to correctly identify the cause, because recently published figures reveal that in 2016, 63% of high school graduates, 40% of college graduates and an incredible 27% of university graduates in the province of Québec are functionally illiterate, that is, do not exceed level 2 in proficiency [118]. The consequences of this possibly worse case of regression in industrialized countries can now be observed and analyzed [15].

So, considering that mastery of language, and particularly that of reading, is a mandatory prerequisite for learning all other subjects, the difficulties that children experience in school and later in life after they reach their seventh birthday without having completely mastered this skill are easier to put in perspective.

It seems obvious besides, that the workload of an educator in his or her classroom is directly related to the number of pupils who experience understanding difficulties, whence the interest for the whole educational community that all children be taught early the skills that will favor a general increase of their understanding ability.

The collective work of the researchers previously mentioned is analyzed in a separate Reference [33], which sets the focus on the neurophysiological foundation of the human understanding ability, which explains why such early tutoring was so beneficial for the intellectual development of adults who benefited from such tutoring at a young age, and

allows understanding how educational techniques should be adapted to allow most children to stop experiencing learning difficulties in school.

4.5. Possible relationship between delayed mastery of articulated language and ADD/ADHD

Considering the function of articulated language in the neurolinguistic structuring of the neocortex that supports conceptual thinking and the optimal establishment of the comprehension ability, it becomes clear that incomplete mastery of language will not allow an individual to think with all the clarity that he would have enjoyed otherwise.

This mastery involves that the acquisition by children of all of the structuring aspects of articulated language be completed to a minimal level of fluency before the myelination of their verbal areas sets in at the approximate age of 7, which is what is systematically provided to Finnish children. When the correct approach is used, children remain calm in relation to the norms of their age, because they gradually become better equipped to understand and control the increasing complexity of the challenges that they face growing up. See **Sections 3.6** to **3.8**.

From the Finnish experience, it can be seen that the absolute prerequisite is that children benefit from the attention of one or more adults all through their childhood, preferably their mother and/or father, who will take care of the initial development of their verbal abilities, and by enlightened educators in kindergarten, pre-school and then in regular school until a relatively advanced stage of their teens.

It really is only a matter of collectively becoming aware of the normal functioning of the human nervous system as it was understood by researchers, and collectively do what is required to ensure that our children's nervous systems are made to develop in the optimal way that nature has evolved them to operate, which should largely prevent the onset of the behavioral problems that unfortunately plague too many children.

Up to now, the mastery of this process was left to chance. Few people are aware that the major discoverers of the past were not gifted *geniuses* in the sense popularized by urban legend and cinematographical hype, but only normal individuals who had properly mastered the comprehension process ([37], see **Sections 1.11** and **3.12**) through sheer chance family and social circumstances. Presently, it was a marvelous gift that their parents gave them more or less consciously.

This optimal manner of thinking is, in reality, within reach of everyone, and often leads to the eventual awakening of this unquenchable thirst to learn about the various aspects of what was understood in the past, coupled with an insatiable curiosity for aspects of reality that have not yet been understood, that caused all past discoverers to better understand the various aspects of nature that specifically attracted their attention, gifting us with the precious discoveries that now make our lives easier.

Birds care for their young regarding feeding, safety and supervision of flight training until they become sufficiently able and autonomous to safely leave the nest. It would then seem that such a feat is easily within reach of the most highly evolved species on the planet.

It seems obvious that so many individuals not having at their disposal the clearness of mind that only proper mastery of language can provide has negative impacts on our societies,

a clearness of mind required to successfully deal with the complex social situations with which each individual is confronted in our modern societies.

Of course, there is no doubt that educators and parents alike are doing their best even in societies with high illiteracy issues, which clearly shows that in these societies, goodwill is not the issue, but that the methods used are at fault and would gain considerably by being deeply reconsidered in light of the current state of knowledge.

In cases in which parents can't cope, doesn't even the most rudimentary notion of social awareness reveal that the burden then shifts to kindergarten, pre-school and the school system in general, to provide their children with a reassuring and motivating alternative to their possibly intellectually depressing family circle? It goes without saying that parents in difficulty must be helped in every way possible by society, so they find themselves in a position to help their own children.

With the knowledge that we now collectively possess, there remains no excuse whatsoever for not collectively providing all of our children, without exception, with the optimal intellectual awakening that they all are entitled to.

As Jeanine Cougnenc so rightly points out, young children learning to read may experience insurmountable difficulties if left to discover on their own what no one directly explains to them. At this stage of their education, it is not enough to refer a group of children to an exercise to be completed in a textbook that only part of the group understands.

Someone must pause and assess the situation of each child who does not understand the next step in his or her personal journey towards comprehension, and must explain individually as required what he or she must now do and how this new exercise is different from those that he or she has already done and understood.

It was suspected from the onset that the runaway dyslexia and hyperactivity problems that plague numerous children could be due, not to never detected hypothetical neurological issues, but to a simple lack of sufficient verbal solicitation in due time, at home as well as at school.

A very revealing study ([120], see **Chapter 5**) regarding unrestrained diagnosis of ADD/ADHD and the totally out of control prescription of habit creating psychostimulant drugs, that reaches industrial proportions in North America and that progressively make headway in Europe, clearly demonstrates that such measures seem to have as an exclusive outcome the intellectual stupefying of an ever increasing number of children.

4.6. Conclusion

Glenn Doman's initial results with numerous children presenting severe brain pathologies and then with tens of thousands of children coming from all walks of life; those of Jeanine Cougnenc with all children from all walks of life that she supervised; those of all these other pedagogues who developed and popularized their own approaches; those of the Finnish society as a whole; and finally those of all parents who taught their children to read early on with methods that they intuitively elaborated; demonstrate beyond the shadow of a doubt that when a child cannot read with ease by the age of 7, then becoming victim of the whole complement of adaptation problems that ensue, it is not because this child suffers from some nondescript intellectual handicap*, it is very simply because nobody really got busy teaching him or her in time*.

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