



## **The Neuro-Building Blocks of Learning: Improving School Readiness and Overcoming Learning Difficulties**

**Helena Karabulut\***

### **Abstract**

Every child should be given the benefit of a well designed early childhood education as this prepare them for the formal education they will receive in the following ten to fifteen years. The latest researches of how children learn and how the brain functions are fundamentally changing the educational paradigm and with it the approach to teaching pre-school children. This discusses new insights into the neuro-sensory and motor development of children and its implications for child development, school readiness and effective approaches to minimise the effects of learning difficulties. In order for the brain to cope with the demands of formal education, it needs to be exposed to and learn to deal with a rich variety of sensory and motor experiences, both at home and in early childhood education facilities. The sedentary indoor lifestyle dominated by screen time as experienced by many children today will not provide sufficient brain activation, whilst exposure to storytelling and music, and most notable outdoor play, will provide the growing child and the developing brain with a much more challenging and rewarding sensory and motor experience. Early childhood education plays a key role in facilitating healthy neurological development in pre-school children, which will filter through to increased attainment at primary and secondary school level. This article provides recommendations for effective ECD policies for Turkey, based on increased sensory, motor and outdoor play activities.

**Keywords:** Education, school readiness, neurodevelopment, learning difficulties.

---

\* BA., University of Durham, Faculty of Social Sciences, Durham, United Kingdom.  
E-mail: helenak@sascentre.com

## INTRODUCTION

Learning is fast becoming a science. Recent developments in the area of neuroscience are making an impact on how learning, development, and the brain are understood and perceived. These new ways of understanding and brain-friendly approaches to learning are creating waves of change in all levels and domains of education from the instruction of formal schooling in both private and state based programmes, to education policy, to an increase in academic research institutes, to special needs education, to private educational and therapeutic enterprises. However, such new advances are still young, with research yet in its early stages of development and acceptance. Many educational systems across the world still adhere to more traditional approaches and more enlightened institutions are grappling with the transition from the old ways of thinking to the new.

The recent advances in the area of neuroscience have given birth to the whole array of terminology and concepts concerning learning. Terms such as 'multiple intelligences' and 'learning styles' coined by academics have now become commonly used and accepted terms. Concepts of creating sensory-rich and emotionally safe learning environment have become standard criteria within a growing number of educational institutions for all ages. This is especially true in the area of early childhood care and education, where a large proportion of brain, development and learning research is focused. This voluminous body of research indicates that the early childhood care and education programmes are of paramount importance in promoting healthy child development, acquisition of the skills required for formal schooling and ultimately laying foundations for their future growth as responsible citizens.

The short and long term benefits of quality early education are well-documented. One of the key short term aims of early childhood development (ECD) programmes is to promote a whole host of appropriate measures in order to instigate children's developmental readiness for formal school learning. The broadest and most internationally applicable definition of school readiness encompasses the five dimensions of physical well-being and motor development, social and emotional development, language usage, cognition, and general knowledge (Kagan, Moore and Bredekamp, 1995). There are a small number of school readiness tests, such as the Bracken School Readiness Assessment (BSRA), or the Wechsler Preschool and Primary School Scale of Intelligence (WPPSI). However, these tests are not routinely used, require careful assessment of the results and have been met with criticism for their limiting view of a child's overall development and the possible future misuse of the data procured by such testing (High, 2008). The vast majority of schools across the world use the traditional criterion for school entry based on age only. This criterion is entirely divorced from any concerns for the child developmental and maturational readiness for entering formal learning environment (Ogletree, 1990).

Recent brain research has uncovered additional areas of development required for a young child to embrace the academic life of primary education and beyond, which promote this maturational readiness for learning. These areas fall within the framework of the five dimensions described above and give an insight into the neurological aspect involved in any learning process. This essay discusses the most

recent scientific discoveries in the area of neurological development and maturation, the prerequisite in achieving school readiness, and uncovers its consequent relationship with mild learning difficulties recognised in children in the early stages of formal academic learning. Following a discussion on the foundations of what the brain requires for optimal learning, recommendations for early childhood care and education will be presented with an additional focus on recommendations specifically for Turkey.

It is very important to point out that the area of neurological development will not be discussed in isolation and restricted only to what goes on in the brain. The areas to be explored, such as the importance of well-balanced sensory development, the role of the cerebellum which is responsible for all movement, and well-balanced communication between the two brain halves, are whole body experiences. The mind/body connection is central to these astounding new insights into how the brain learns (Hannaford, 1995).

### **The Sensory System**

As mentioned before, the five dimensions of school readiness include physical well-being and motor development, social and emotional development, language usage, cognition, and general knowledge. These fall under the term of outer/inner behaviour patterns and can be assessed and understood by observing the output generated by the child. Motor development can be observed through a child's movement; a child's level of social development can be understood via his or her interactions with others and subsequent reactions to these experiences. General knowledge can only be evaluated through the child's own expression of this knowledge. All observed expression and behaviour of a child is a result of what he has experienced and how that experience and information is processed within the brain. All input from the outside world, experiences are absorbed

through the sensory system. However, in order for the input to be effectively translated into output of the appropriate form of expression, how this incoming information is processed by the brain is a critical part of the equation. Unless a child has a recognised disability or disadvantage, there is a general assumption that the brain has the ability to process information correctly and is functioning as it should be for the appropriate age group.

The brain processes the inflowing information provided through the five senses: hearing, sight, touch, smell and taste. There are additional two senses which influence the physical experience: proprioception, or orientation of the body in its surroundings and vestibular or balance system. So, by exploring all the senses we can examine the sensory processing requirements needed for optimal learning.

### **Hear to Understand**

When discussing the auditory system it is important to understand the difference between the physical mechanism of the ear and the central auditory nervous system in the brain responsible for processing auditory information. Indeed these two are inexplicably linked but at the same time two very different systems (Bellis, 2002).

For prime learning capacity it is important that both systems operate optimally and harmoniously both independently and respectively.

Hearing loss has long been recognised as a handicap linguistically, educationally and socially (Goddard, 2002:65). Routine screening tests are provided in many countries for newborn babies and often for school children too. A routine hearing test is concerned predominantly with hearing loss. However, auditory discrimination, the ability to distinguish and differentiate between different sounds, is not recognised in such screenings. A standard hearing test will test if a sound is heard or not, not 'how' it is heard. It is precisely the 'how' that indicates the nature and quality of the sound processing by the auditory nervous system. Auditory discrimination is learned in infants primarily between birth and the age of 3 when the child is 'tuning-in' to the frequencies of his mother tongue. Here, the child's auditory system is working on analysing and understanding the details of the sounds required for his own language. A child's language skills may develop at the correct time, however, any discrepancies in auditory discrimination, such as not being able to hear the difference between similar or blended sounds: 'ch' and 'sh', or 'th' and 'f' in English, may later cause difficulties with reading comprehension and writing, which is argued to be one of the factors of dyslexia. Other problems arising from discrepancies in auditory processing may include difficulties recognising where a sound has come from, or recognising patterns in sounds. Such difficulties may stem from intermittent hearing loss in early childhood due to frequent ear, nose or throat infections. They may also have their origin in either lack of auditory stimulation, or its opposite, being exposed to too much noise. A constant flood of background noise in early childhood may discourage early 'listening' and the child may shut out or ignore incoming sound (Goddard, 2002:67). Exposure to overly loud sound above 85 decibels or to repetitive sounds can cause considerable damage (Lonsbury-Martin, 1993), in turn limiting what the auditory system is exposed to has influence what it is able to reference for future use.

Another aspect of hearing not given consideration in standard hearing tests is auditory 'hypersensitivity' or hyperacuity, the ability to hear certain frequencies above the expected norm. The ability to hear too much or being hypersensitive in high or low frequency bands is a strain on the auditory processing centres in the brain which may become overwhelmed with incoming information. This in turn, often results in difficulties with concentration, behaviour, learning and social interaction (Goddard, 2002:68). All of the above auditory difficulties may exist alongside typical speech development. The symptoms however, are often, especially in preschool children, within what is socially expected for the age group and therefore not recognised as a difficulty. A preschooler with auditory processing issues may be developing normally, be sociable and happy and at the same time be easily distracted by surrounding noises, have a slightly shorter attention span, and not always follow the instructions given by his teachers. His behaviour is not strikingly different enough for a problem to be detected at such a stage. However, when he begins school he may find to be unable to fully concentrate on the task at hand, follow and understand instructions, and be unable to satisfactorily perform what's expected of him. This often poses much frustration for the child and the teacher alike. It often

leads to emotional outbursts, behaviour problems which further corrode the child's confidence and self-esteem.

### **See to Comprehend**

*"Unless a child sees what he is assumed to see, the very stuff of learning is lacking."* Arnheim R. (1969)

Neurological findings agree that it is very difficult to discuss the sense of vision relating it only to the most obvious organ of sight, the eyes. It is known that only less than five percent of seeing occurs in the eyes. The other ninety-five percent takes place in visual centres in the brain in association with touch, hearing and our sense of proprioception (Hannaford, 1995:50). Vision and touch are the first two senses to come together when a child is born. Through touch a baby learns dimension, texture, line and even colour. For a child to see the world as we see it takes at least until their first birthday (Hainline, 1998). Vision is a learned sense. The connections made by the brain between what the eyes see and all information received via the other senses is put together for us to understand what we are seeing.

For a child to begin school where he will be writing and reading, both from books and the board, his entire visual system needs to be sufficiently mature. A child needs not only good distance vision but also good foveal vision, the sharp central focus ability required for reading, writing and watching TV, and eye muscles working together effectively. For children with less experience of books in the home or in a pre-school environment it is expected that foveal vision develops at around the age of 7, by which time for many children it is late as they are already expected to be reading. Children with experience of books in the early years are more likely to have developed foveal vision.

The development of the visual system is very much dependent also on the other senses, and particularly on proprioception and the vestibular senses related to movement. The eye muscles are in full use and are being strengthened every time we move. When the eyes are responding to messages from our vestibular sense, which indicates where the body is in relation to its surroundings, it is not only strengthening the eye muscles but also it is constantly creating new neural connections. The stronger the eye muscles the more neural connections in the brain are developed. Therefore the more we move the more our eyes and visual processing is allowed to develop. Children with abundance of outdoor experience, such as climbing trees and tackling the natural obstacles in nature, are of an advantage as this is a perfect training ground for vestibular-visual-proprioceptive senses.

There is also a strong link between vision and stress. When the body is in danger, the built-in fight or flight reflex is triggered which ensures that the eyes are able to see as much of the surrounding area as possible in order to maintain safety. The brain does this by switching to peripheral vision. Children who experience continued stress in their lives may tend to train their eyes into a sustained state of peripheral vision making foveal vision, tracking and therefore both reading and writing very difficult (Wilkins et al., 2004).

## **Move to Learn**

The first of the sensory systems to develop in utero at just 16 weeks, the vestibular system is responsible for our balance, gravity, motion. Body awareness and how our body relates in relation to its surroundings is the domain of proprioception, processed by the vestibular system. Although the receptors for incoming vestibular information are located in the inner ear the processing centre in the brain responsible for that task is the largest of all the senses. The vestibular system and sense of proprioception are not only responsible for body and movement orientated information but also act as the main switchboard for all other sensory information. 'It is believed that sensory impulses from the eyes, ears, muscles, and joints must be matched to the vestibular input before such information to be reprocessed efficiently (Pyfer & Johnson (1981) quoted in Goddard, 2002:68). If that is true, what we see, hear and feel makes sense only if the vestibular system is functioning adequately.' Any difficulties with the vestibular system often translate into difficulties with balance, motor skills, vision, hearing. This directly translates into impaired school performance with reading and writing being the first difficulty to be observed. A well-functioning vestibular system is therefore at the very core of understanding and learning.

For the vestibular system to develop sufficiently well one thing is of prime importance: movement. Toddlers climbing, jumping, rolling and generally being endlessly energetic and active may be tiresome for the parent, but children are naturally exercising and developing their vestibular system, the most important ingredient of their overall mind/body system that will enable them to make full sense of the world and succeed in how they interact with it in every way.

Another important learning related aspect of the vestibular system is its relationship with the neocortex in the brain. The neocortex, when stimulated, increases our excitability and responsiveness to sensory stimuli from the environment, an optimal state for learning. When we move, information from the vestibular system is sent to the Reticular Activating System (RAS) in the brain stem. It is this RAS system which in turn 'wakes up' the neocortex and prepares us to take in information and appropriately respond to our environment (Hannaford, 1995:40). It is important that we move to be in a state to learn effectively.

The vestibular system, processing all sensory input, is also very dependent on touch. The effect of touch on human development has been well researched. We know that without human touch a baby cannot thrive. Studies show that when touch is lacking it results in decreased mental functioning. Being touched stimulates nerve growth and neural function. The touch of closely bonded family not only stimulates nerve growth but specifically, increases activity in the hippocampus, an important centre for both spacial, and general learning and memory (Liu, 2000). The idea behind hands-on learning, is that when touch is combined with other senses, more of the brain is activated and therefore the potential for learning is greater (Hannaford, 1995:47). As we know, a baby will explore its world primarily through touch, especially with his mouth where the touch receptors are most concentrated. Free and largely unrestricted hands-on learning is what a child requires to fully understand his environment.

## Two Halves Make a Whole

A well-developed and well-integrated sensory system is paramount to a child's experience and understanding. How this information is then organised and put to use in the brain is coordinated by the two brain hemispheres. The two brain halves work very differently from each other and are physically separate, but at the same time these two very unique halves together weave a single seamless perception of the world (Taylor, 2008: 29). Very simply put, the left hemisphere thinks and recognises logic, patterns, numbers, details. It is analytical, linear and time orientated. The right hemisphere sees the world as a whole, it deals with emotions, meanings, colours, shapes, music. It is creative, spontaneous, and recognises only the present moment. Jill Bolte Taylor, the brain scientist who suffered left brain stroke and spent the better part of 8 years functioning only through her right hemisphere describes a process of acquainting herself with her right mind:

*“My right mind is open to new possibilities and thinks out of the box. It is not limited by the rules and regulations established by my left mind which created that box. Consequently, my right mind is highly creative...It is kinesthetic, agile.... and it learns through touch and experience”* (Taylor, 2008:140-141).

Well-developed hemispheric specialisation and good inter-hemispheric communication or integration ensures that a child utilizes his full potential. Coordinating these two different halves is the job of the corpus callosum, the neural information highway that carries information between the two hemispheres creating a unified operating system. The two hemispheres work together crosslaterally, with the right hemisphere controlling all sensory motor functions of the left side of the body and the left hemisphere controls it on the right. At birth both brain halves control all life functions, as the specialisation hasn't taken place at this stage yet, and only begins to form as the baby grows. This lack of specialisation can be seen very clearly in many physical activities of children like the uncontrolled flailing of all limbs of a newborn to a 3 year old trying to brush his teeth (watch the other arm!). A growth spurt of connections occurs between the ages of four and seven and is complete between the ages of nine and twelve (Hannaford, 1995:91). The development of the corpus callosum and efficient specialisation of each brain half is reached through all sensory-motor and emotional experience. When the corpus callosum is fully developed it transfers information between the two halves efficiently enabling quick access to information and fully operational language skills thinking and formal reasoning (Hannaford, 1995:91). Interhemispheric integration is a natural developmental process but very much occurs with the support of the practice and constant use of the body, senses and cognitive function. For example, it is known that a baby's cross lateral crawling is one of the practice movements strengthening interhemispheric integration in the brain, and that in children with learning difficulties a higher proportion of these children missed the crawling stage and jumped straight to walking (Hannaford, 1995:91).

The first steps to reading with many children begin between the ages of 5-7. When children first begin to read they are predominantly using the right hemisphere as specialisation of both halves is still in its early stages. However, as their reading skills improve and the child matures the left hemisphere takes over as the main centre dealing with reading. It is argued that one of the features of dyslexia is that this shift from right to left has not occurred or is delayed.

A well-developed system of communication between brain hemispheres is key to fast processing of information. Being able to decode and process incoming sensory input quickly is the foundation for understanding, comprehension, language development and cognitive thought processes.

### **Examples of What can be Done**

For a child to be developmentally at a stage where they are able to respond, interact, absorb and ultimately enjoy the experience of a formal learning they need to have had a history rich in appropriate sensory, emotional and motor experience.

Good quality early childhood care and education services are a large part of the equation as they are the primary source of providing necessary opportunities for growth and development stimulation. Continuing efforts in improving ECD services in developed economies and initiatives to ensure the availability of such services worldwide are an important step in ensuring that children are exposed to the experiences needed for them to blossom and for their neurological development in a balanced way. However, the effectiveness of ECD services rests in the quality.

A fine example of quality preschool experience providing children with the opportunity to exercise all their senses and their bodies are Forest Kindergartens originated in Scandinavia in the 1950s. These kindergartens catering for children between the ages of 3–6 are, as the name suggests, primarily outdoors facilities organised usually in a forest environment. The children spend most of their daily activities outdoors. Although there is always an indoor space available, it is usually used in extreme weather only. The children learn about many different subjects but all through the use of what they find in the forest. Very few commercial toys are used. By drawing with sticks they discover art, they sing songs and rhymes, and of course they spend much time physically grappling with the terrain of the forest, exploring its rich tapestry infused with unique smells, colours, shapes and sounds. The children are able to exercise all senses but especially their vestibular system to the fullest through constant movement. The documented benefits of these kindergartens are many and varied from improved balance to stronger immune systems.





**Photo 1.** Adventure Playground, Berkeley, CA, USA.

In Germany teachers reported that children who attended forest kindergartens showed significantly improved reading writing mathematics and social interactions\*.

Another opportunity for children to exercise and move is provided by the neighbourhood playground, falling under the banner of informal or community ECD services. With a large proportion of children in the world living in urban environments and with technology playing an ever increasing role in the lives of children, youngsters are moving less and less. This not only leads to obesity and health problems but perhaps is also contributing to the increase in learning disabilities as children are not given the opportunities to exercise enough, and their brain not given enough stimulation for correct neural development. Playgrounds around the world are often standard. A slide, a few swings and perhaps a climbing frame. While the benefits of playground play area are well- understood, playground design can enhance this opportunity for development further. Playgrounds providing opportunities for children to crawl, balance, interact with each other, cooperate, manipulate their environment give a richer experience from a developmental point of view. Wonderful examples of extremely creative kids community projects or adventure playgrounds exist, but are not standard fair in many countries.

---

\* Gorges R, Walderkindergartenkinder Im Ersten Schuljahr.



**Photo 2.** An example of a playground that provides opportunity for challenging motor play.

London Play is an organisation in Central and Greater London with the slogan, 'Working for a capital where all children can play'. The organisation is very active in the areas of street play, adventure playgrounds and nature play with the aim that all variety of play of is accessible to all.

A growing number of private initiatives offer movement programmes within schools, and preschools. Many of these programmes are based on research from the field of Neuro-Developmental Therapy or Sensory Integration Therapy (Ayres), both remedial therapeutic approaches for children with sensory or developmental issues such as autism, attention deficit or cerebral palsy. Their aim is to improve interhemispheric communication in the brain, and train sensory processing. Such programmes include carefully designed movements that are applied in the classroom by the teacher and are beneficial for both children with and without learning difficulties. Such programmes include Brain Gym (Dennison, [www.braingym.org](http://www.braingym.org)), or the INPP Schools Programme (Goddard-Blyth, [www.inpp.org.uk](http://www.inpp.org.uk)).

The role of movement in the development of a well-functioning human body can not be overemphasized, as it stimulates the senses, trains the vestibular system, the eyes and supports the inter-hemispheric integration.

The auditory system does, however, require auditory stimulation to be well-balanced and efficient, even though it also benefits from motor stimulation. The first experience of auditory stimulation received by a child is the mother's voice. The habit of story telling, rhymes, and reading books is paramount to language development. In the US only 47% of children are being read to every day. 'Reach Out and Read' in Boston Massachusetts and 'BoekStart' in The Netherlands are both examples of reading projects that aim at encouraging reading through the use of interactive reading packs to be used by parent and child in the home together. Such projects raise awareness of the unquestionable benefits resulting from parents

spending quality time with their kids, developing their literacy skills, imagination, language and a love of books.

Another aspect of auditory experience, is of course music. Research has demonstrated that music training in children results in long-term enhancement of visual-spatial, verbal, and mathematical performance (Sclaug et al., 2005). Music training on a basic level such as using songs and music in the classroom exposes children to a wider variety of tones, rhythms and frequencies. Also, the exposure to live music is a rare occurrence for many children, but extremely beneficial in training the many aspects of their auditory system. The 'Memorable Moments' Project initiated by Memorable Moments Foundation in The Netherlands works with approximately 110 artists who play for an audience of around 100,000 children. The Project brings performing arts to very young children in their own familiar environment. MEMO artists regularly visit nurseries, kindergartens and primary schools and give a series of 15-25 minute musical programmes with young children between 3 months and 7 years of age. A MEMO inspired pilot project facilitated by Ege University in Izmir, Turkey was conducted during the summer months of 2011. Musicians were trained by MEMO from the Netherlands and over the period of two months performed for groups of children from two different schools in Izmir. The project was warmly received and a follow on project is currently being designed.

## **Turkey**

In Turkey, data collected by Koç University to assess cognitive stimulation and development (Study on Early Childhood Development Ecologies in Turkey – TEÇGE) suggests that input for the cognitive learning process, such as language stimulation and the availability of learning materials, differ significantly among socio-economic status groups. For the years of 2009–2010 approximately 27% of Turkish children had access to early learning facilities.

With the access to ECD programmes playing a huge role in providing the sensory, language and physical stimulation required for optimal brain development, initiatives to increase accessibility of such facilities are of prime importance. The Turkish Ministry of Education's project to strengthen its pre-primary education system aims to provide 100% preschool accessibility initially for the 60-72 month age group by 2014. In areas of higher socio-economic status, there is an increasing number of private pre-schools offering quality education models. Even though movement through dance and sport may feature highly in their curriculum, the lack of outdoor space facilities for children to move freely is often a major issue.

Inadequate provision of outdoor facilities seems to have its root in overall lack of understanding and knowledge among many professionals, pre-school administrators and parents, concerning important facets of early childhood development. Movement education practices are not aligned with physical-education goals. Children's participation in organized sport activities is valued more as an extracurricular activity by administrators and parents. Limited indoor/outdoor spaces for movement activities seem to be among the limiting factors (Sevimli et al., 2011).

Within the family, often a similar situation can be seen as family relationships in Turkey tend to be authoritarian, restrictive and overprotective (Erkman et al., 2010). This overprotective approach can pose a hindrance to the child's opportunity to fully explore his environment freely and with few restrictions.

With approximately three quarters of Turkey's population living in an urban environment many children are lacking in access to nature, the most natural body and mind's developmental playground. Playgrounds are unfortunately often of poor quality and unsafe (Açık et al. 2004). Children living in urban environments play outdoors less and spend a lot of time watching television (Özdirenç et al., 2005). These factors all result in a lack in insufficient opportunity to exercise and involve all their senses.

Figures show that the habit of storytelling and reading in the home is also quite inadequate. In one survey it was recorded that only 38 percent of the parents read stories to their children [UNICEF Turkey: Knowledge, Attitude and Practices Survey in Pre-School Education, 2008]. Libraries with children's sections or children's libraries are a rarity.

## CONCLUSION

This essay has concentrated on and discussed one of the two main areas inherent in a successful learning experience. This area coined as 'school readiness' refers to all aspects of neuro-developmental maturity which has to be in place before any learning in a formal setting can actually occur. The second area, covers educational endeavours and initiatives which promote successful and pleasurable learning experience. These two aspects have to go hand in hand in order that future generations are to benefit the quality of education that fully recognizes and utilizes the inherent potential of each and every person.

The neuro-developmental maturity can be reached through comprehensive exposure to stimulative environments and opportunities abounding with physical activity and sensory input where a child's sensory system and related neural connections are given maximum chance to develop into a cohesive and a well-functioning system.

A well-developed sensory system and efficiently communicating hemispheres form the neurological basis which ensures that a child has all the tools needed to succeed in all academically related endeavours and allow for utilizing innate potential for learning within a formal environment. Since learning is inherent in the very act of living itself, early years learning is of a paramount importance in providing opportunities for the child to achieve a state of developmental maturity.

## **RECOMMENDATIONS**

Research indicates that in many countries the critical role of movement in a young child's life is often not given enough consideration both in formal preschool programmes and community facilities such as playgrounds and nature access. Exposure to language through books and music input is also often limited. These observations also apply to Turkey where education and provisions for young children are still in the early stages and not yet universally available. Increased awareness of ECD providers of the importance of movement, language, and music for the development of the child is the first step required. Implementation of ECD policies on movement and outdoor play for both preschools and community facilities would prove to be of great benefit. Picture book and reading projects would increase children's exposure to language. Such projects should be inclusive of parent cooperation in order to raise awareness of the importance of books and storytelling and its influence on auditory processing and future academic success. Existing music projects could be developed and replicated to cover in a larger proportion of the country.

All such efforts will make a considerable difference in the development of young children. However, in order to ensure that the majority of children in Turkey are given access to experiences that will shape their brain to its maximum potential the importance of, first and foremost movement, then language and music, must be fully understood and integrated into all ECD facilities by the all relevant organisations and institutions.

## REFERENCES

- Açık Y, Gülbayrak C & Çelik G T (2004). Investigation of the level of safety and appropriateness of playgrounds in Elazığ city in Turkey. *International Journal of Environmental Health Research*, Vol. 14, Issue 1, pp. 75-82.
- Arnheim, R. (1969). *Visual thinking*. Berkeley, CA: University of California Press.
- Bellis, T.J. (2002). *When The Brain Can't Hear*. New York: Atria Books, pp.29-30.
- Erkman F., Caner A., Sart Z.H., Börkan B., & Şahan K. (2010), Influence of Perceived Teacher Acceptance, Self Concept, and School Attitude on the Academic Achievement of School age Children in Turkey. *Cross Cultural Research*, Vol. 44, No. 3, pp. 295-309.
- Goddard S. (2002). *Reflexes, Learning and Behaviour*. Oregon: Fern Ridge Press.
- Hainline L. (1998). *The Development of Basic Visual Abilities. Perceptual Development, Visual, Auditory and Speech Perception in Infancy*. UK, Psychology Press. pp.5-42.
- Hannaford C. (1995). *Smart Moves – Why Learning is Not all in your head*. Utah: Great River Books, p.15.
- High P.C. (2008). 'School Readiness', *Pediatrics*, Vol 121, No. 4 p.1011.
- Kagan S.L., Moore E., Bredekamp S. (1995). *Reconsidering Children's Early Learning and Development: Toward Shared Beliefs and Vocabulary*. Washington DC: National Education Goals Panel.
- Liu. D. (2000). Maternal Care - Hippocampal Synaptogenesis and Cognitive Development in Rats, *Nature NeuroScience*, Vol 3, pp. 128-134
- Lonsbury-Martin, B. (1993). Using the Sounds of Hearing, (February 1993 meeting of the AAAS), *Science News* February 27, Vol 143, p. 141.
- Ogletree E.J. (1990), School Readiness – The Developmental View, *Steiner Education*, Vol 24 No: 2.
- Özdirenç M., Özcan A., Akın F., Gelecek N. (2005). Physical fitness in rural children compared with urban children in Turkey, *Pediatrics International*, Vol 47, Issue 1 pp.26-31.
- Sclaug G., Norton A., Overy K., Winner E. (2005). Effects of Music Training on the Child's Brain and Cognitive Development, *Annals of the New York Academy of Sciences*, Vol 1060, pp 219-230.
- Sevimli S, Kirazcı S & İnce M.L. (2011), Preschool Movement Education in Turkey: Perceptions of Preschool Administrators and Parents, *Early Childhood Education Journal*, Volume 39, Number 5, pp.323-333.
- Taylor J.B. (2008), *My Stroke of Insight, A Brain Scientists Personal Journey*. London: Hodder and Stoughten.
- Wilkins A., Huang J., & Cao Y. (2004) Visual stress theory and its application to reading and reading tests, *Journal of Research in Reading*, Vol 27, Issue 2, pages 152–162.

## **Öğrenmenin Nöro Yapı Taşları Okul Olgunluğunu Geliştirmek ve Öğrenme Güçlüğü Aşmak**

### **Özet**

Çocuklar 10-15 yıl boyunca devam eden örgün eğitim sürecine girmeden önce, onları bu sürece hazırlayan iyi tasarlanmış bir okul öncesi eğitimi almalıdır. Çocukların nasıl öğrendiklerine ve beyin fonksiyonlarının nasıl olduğuna yönelik yapılan son araştırmalar, öncelikli olarak eğitim koşullarını ve bu doğrultuda okul öncesi dönemde çocuklara verilen öğretim modellerini değiştirmektedir. Bu araştırmada da çocukların nöro-duyusal ve motor gelişimlerine, ayrıca çocuk gelişimine dahil olan okula hazır olma ve öğrenme güçlüklerinin etkilerini en aza indirmek için etkili yaklaşımlara yönelik yeni bakış açıları sunulmaktadır.

Örgün eğitimin gereklilikleri ile başa çıkabilmek için beyin, hem evde hem de erken çocukluk dönemindeki eğitimde, farklılık gösteren duyuşal ve motor beceriler ile başa çıkabilmeyi öğrenmeli ve bu uyarılara maruz bırakılmalıdır. Günümüzde pek çok çocuk kapalı alanda bilgisayar, televizyon vb. nedenlerden dolayı hareketsiz bir yaşam tarzına sahiptir ve bu durum onların beyinlerinin yeterli derecede aktif olmasını engellemektedir. Diğer yandan hikâye ya da müzik dinlemek ve dışarıda oyun oynamak çocuğun gelişmesine katkı sağlamakla birlikte duyuşal ve motor becerilerin gelişimini de hızlandırmaktadır.

Okul öncesi eğitimin çocukların nörolojik gelişimlerinde oldukça önemli bir rolü vardır. Bu makale duyuşal, motor ve dışarıda yapılan oyun etkinlikleri üzerine yoğunlaşmakla birlikte Türkiye'deki Okul Öncesi Eğitim politikaları için öneriler de sunmaktadır.

**Anahtar Sözcükler:** Eğitim, okul olgunluğu, nörolojik gelişim, öğrenme güçlüğü.

