

**STRATEGIES IN DEAFBLIND  
EDUCATION BASED ON NEUROLOGICAL PRINCIPLES  
Jan P. M. VAN DIJK, Margot J. M. KLONBERG  
Catherine NELSON**

**- Pays-Bas -  
Instituut voor Doven, Sint-Michiëlgestel, Pays-Bas**

**An educative strategy for plurihandicapped deafblind children based on a  
neuropsychological model**

.The life of a congenital deafblind child can be described as imprecise, unpredictable and unfiltered. The child does not know which stimulus to orientate to. By carefully observing the child it can be determined which specific stimuli elicit approach or withdrawal behaviour. By using continuously "approach" stimuli a chain of orientative reactions can be elicited : These lay the foundation for attachment behaviour and communication. In an early intervention program for deafblind children the neural mechanisms of the orienting reflex play a fundamental role. These mechanisms will be discussed and illustrated by video recordings.

Une stratégie éducative pour les enfants sourds aveugles pluri handicapés basée sur un modèle neurolinguistique. La vie d'un enfant atteint de surdi-cécité congénitale peut être décrite comme imprécise, imprévisible et non filtrée. L'enfant ne sait vers quel stimulus s'orienter. Par l'observation attentive de l'enfant, il est possible de déterminer quels sont les stimuli spécifiques qui provoquent des comportements de rapprochement ou d'évitement. Par utilisation continue de stimuli "de rapprochement", il est possible d'obtenir une chaîne de réactions d'orientation : celles-ci posent les fondements de comportements d'attachement et de communication. Dans un programme d'intervention précoce auprès d'enfants sourds aveugles, les mécanismes neuraux du réflexe d'orientation jouent un rôle fondamental. Ces mécanismes seront discutés et illustrés par des projections vidéos.

**STRATEGIES IN DEAFBLIND EDUCATION BASED ON NEUROLOGICAL  
PRINCIPLES SUMMARY**

In this paper we hope to clarify some important principles of deafblind education which are based upon neurophysiological assumptions. Concepts such as orientational reflex, selective attention and anticipation will be discussed in relationship to a stimulation program for children with congenital deafblindness. In order to clarify some of the ideas, reference is made to normal development.

**INTRODUCTION**

When a baby is born, he/she must interpret and understand the environment to which he/she must adapt through meaningful and coherent behaviour. A prerequisite for this adaptation is that the brain perceive the information coming from the distance and near senses (hearing, sight, touch). The child is exposed to a continuous stream of such experiences and must habituate or cease responding to some stimuli in order to pay attention to another specific stimuli (selection).

The child then learns to selectively habituate based on whether or not a stimulus is relevant. This is a basic element of learning. There are two different levels in this attention process :

**1- Tonic level :** This level is basal activation of the brain and *determines the threshold for stimuli* to reach our consciousness. Anatomical studies have shown that this basal activation is regulated by cholinergic cell groups in the Formatio Reticularis, the ARAS-system, a cholinergic cell group in the basal forebrain, nuclei of the thalamus, and the locus coeruleus.

**2- Facic level :** This is the level of selective attention, where as one of the stimuli comes out of the continuous stream. To direct our attention towards a specific spot to detect relevant sensory stimuli, the pulvinar of the thalamus, the colliculus superior and the parietal lobe play an important role. It's called the posterior attention system and its most important role is *detection and integration of stimuli*.

This whole system is under control of the anterior system, regulated by the basal ganglia and the prefrontal cortex. This system plays a role in the *anticipation*.

Both systems are related to the mesolimbic system which plays an important role in the *motivation process*. At this level it is determined whether a stimulus has a positive (appetite) or a punishment (aversive) value. The discussion of these attention mechanisms is important when one observes that a child who is deafblind appears so overwhelmed by certain stimuli that all of his/her attention is attracted.

## DEVELOPMENT OF ATTENTION

1. While this may also be the case with a typically developing newborn, a maturation process takes place which makes it possible for the child to direct his/her attention towards a specific stimulus. This direction of attention is called the **orientational reaction**. This reaction can be seen by observing the focusing of the eyes, the attention for certain sounds or the interest in specific textures or smells. The head, the eyes, the ears, and/or the nose of the child are directed towards the source of the sensorial stimuli. It is important to note that the stimuli which evoke these orientational reactions are *unknown stimuli to the organism*. They have a different intensity, a different colour, they are unexpected or the newborn is uncertain of the meaning of the stimuli. This orientational reaction causes many physiological changes in the body. The physiological threshold of hearing and sight is lowered ; there is an increase of muscle tone, and there is change in blood vessels and skin responses. It is very important to note that certain parts of the brain are activated which can be noticed by increase of blood supply to them. *The orientation reaction thus makes the organism ready for organized behaviour*. Motor responses occur when attention is elicited. Either there is an approach reaction or one of withdrawal. A regular stimulus of moderate intensity evokes extensor responses such as the opening of the hands, and a stimulus which is rather intense evokes flexor responses such as the closing of the hand or pulling it back.

2. This whole chain of reactions is integrated in the memory system. When the chain of activities is repeated over and over, the organism gradually **habituates**. This means that the novelty of the stimulation diminishes. It should be noted, however, that after habituation, the stimuli is integrated in a neural network. When the stimuli change, the organism will respond again. It is very important to note is that the orientational reactions and their habitations are the constituents of a very important self regulating system. It is the basis of all learning as

demonstrated by research which indicates that the speed of habituation is a predictor of cognitive development. An example of this learning is seen when a baby is presented with a new drinking bottle and an orientational reaction is elicited because of the mismatch. If the nervous system is functioning properly, the orientation reaction fades very rapidly and new attention processes will occur when the bottle is changed again. By contrast, in children who are deafblind, it is often observed that it takes a long time for habituation to occur or the stimuli to lose their novelty. Conversely, it can also be the case that the novel stimuli produces no response at all. In these cases, it is very likely that the brain has not processed previous experiences.

3. This is in contrast with normal development in which information from the environment is integrated in the brain and is the **frame of reference** for learning new information. Gradually, a whole network or schemes are developed. When such schemes are stable and well-established, interfering information is kept outside of the system.

4. It is a false assumption to assume that the basic experiences form an integral whole from the beginning. The perception of the outer world is stored in the brain in a fragmentary way. Only through integration with other sensorial experiences does an **integral, meaningful experience** gradually develop. The visual, auditory, and tactile stimuli which recur at regular times become associated with basic needs such as feeding and nursing. These processes are associated with the person who speaks to and holds the child in such a way that he experiences a feeling of security. This totally integrated process is the basis for the emergence of social interaction. Visual or auditory stimuli without adequate tactile stimuli is insufficient for the development of proper social interaction. By the same token, tactile stimuli without auditory or visual stimulation is also insufficient.

5. The distance senses (seeing and hearing) are the most important senses in enabling the child to anticipate and prepare himself for new situations. Through the **process of anticipation**, previous schemes are activated. As he responds to new situations, the child determines whether his reaction is appropriate or whether he has to adjust it. In this process of anticipation, *it is not the sensorial stimulus which evokes the attention but the internal stimulus preceding the external stimulus*. This causes an expectation which is matched with the event. For example : A mother approaches her baby stretching out her hand and saying "Who is here, who is coming to get you?", the child expects to be picked up because of previous positive experiences. However, if the mother is distracted by other stimuli and stops her approach. The child will experience a mismatch with his expectations and adjust his activity accordingly e.g. by moving more vigorously or crying.

### **WHAT DOES THIS ALL MEAN FOR DEAFBLIND CHILDREN ?**

1. Because of difficulties with hearing and vision, the child who is deafblind is less capable of orienting his/herself to the outer world. Consequently, the corresponding systems in the brain will be underdeveloped. This deprivation is the reason that the self regulating systems of orientational reaction and habituation are directed more towards the stimuli from within the organism rather than the stimuli coming from the outer world via the senses. As a result, **self stimulatory behaviour** may develop.

2. The etiology of deafblindness can also play a role. Prenatal infections such as Rubella and CMV can damage the central nervous system to such a degree that the orientational reaction and the speed of habituation can be affected. Research on the **speed of habituation** shows that biological disorders can influence cognitive potential in a negative way. Through the combination of all of the these factors mentioned it will be much harder for a deafblind child to integrate information from the outer world for storage in the brain. The quality of incoming stimuli is far less in quality and quantity in comparison with a typically developing child, and in all probability there will be a need for intensive repetition before the stimuli can be habituated.

3. When the education process is not well structured, it will be likely that **fragmented knowledge** will become the basis upon which new information will be learned. This can be observed in the child who gives too much, sometimes obsessive, meaning to certain sensorial stimuli such as light or tactile sensations.

4. The lack of functional hearing and vision makes the **integration of sensorial input difficult**. It is unlikely that activities and events will form an integral experience. Because of hearing loss, the voice of a child's mother will be barely perceived, and her face seem to not be present or only visible in conditions of strong light. The mother's approach and touch thus become a sudden, unexpeted event. Through all of this, it is quite understandable that the social interactions of children with multi-sensory impairments are so endangered that often autistic like behaviour patterns develop.

5. A negative reaction to touch is often observed in children who are deafblind. This can be explained by taking the important role of **anticipatorial reactions** into consideration. Needless to say, through the limited or distorted input, with all its consequences, the information from the outside world reaches the child in a very fragmented way and will be often associated with strong stimuli coming from within the organism itself. The child can be so fascinated by one of these fragments that the development of normal social interactions is disturbed. This can be seen observed in the child who is fascinated by a small irregularity of her mother's hands or is stimulated by the reflection of her spectacles.

### **WHAT ARE THE CONSEQUENCES FOR DEAFBLIND EDUCATION ?**

1. It is important that the damaged sense organs be restored as much as is possible, so that **thresholds are lowered**. It should be noted, however, that fitting the child with hearing aids or with glasses or contact lenses is not enough if the sensorial implications are not properly managed. Auditory or visual stimuli must be managed carefully so that the child learns that certain stimuli can be associated with a meaningful activity. At times it is necessary to make the new stimulus strong enough to ensure that there is no interference with competing stimuli. For this reason, some programs use a socalled dark room with fluorescent objects to motivate the child to orient himself towards a certain stimuli. The stimuli should be moderate in intensity and be very regular and predictable. In this way, the child begins exploring and anticipating events in his environment which is the first step to social interaction and communication with the environment.

2. As previously noted, **repetition** is a very important principle in education of students who are deafblind especially when the speed of habituation is affected.

3. But even more important is that the stimuli form a **coherent chain** which is part of a total chain of activities. These cohesive chains are the basis of ordering which allow the child to participate in the activity. This is called the phenomenon of *resonance*. An example of such a chain might be rocking the child gently in the arms, then stopping for a moment and moving the child back and forth on the lap, and finally holding the child over the shoulder. As this chain is repeated over and over again, the child joins in the movements. Through the creation of a stable, ordered pattern, certain schemes are formed which gradually develop into an integrated experience.

4. It should be stressed here again that the formation of coherent schemata is essential to avoid the interference of other schemata. This demands from the educator a very well **planned chain of activities free of disruption**. The child should be prepared as to which activity will take place and which person will carry out the activity with him. This means that certain activities should be carried out in a particular part of the day and carried out by a consistent person.

5. It is important that these activities and persons are characterized e.g. by using concrete objects or so-called "**objects of reference**" which can be used for referring to a person or an activity. This will increase the chance that the correct schemata will be evoked. When an activity is automated, a change of the stimuli or an interruption of the chain can draw the child's attention to the new information which in turn can be integrated in a more refined network of schemata. As mentioned before, the active manipulation by the child who is deafblind is often endangered by resistance (e.g., fear of touch). Through resonance activity and mutual responsiveness, motor expression can be enhanced. Based on this motor expression, a signal behaviour can be elicited which can be the precursor for social interaction and communication. For example, in the chain of gently rocking or moving the child gently through lukewarm water, the chain of activity is stopped and the child gives a motor response indicating by moving his body or splashing with his arms in the water that he wants the chain to continue.

When this expression is responded to appropriately, the basis of communication is formed.

Receptive/Perceptive	
Ordering of activities	Chains of activities
Persons	Ordering the day
Time	Calendars
Space	Objects of reference

In a later stage, coherent experiences form the basis of anticipation and reflection

Expressive/Motor activity	
Resonance	Mutual responsiveness
Co-active movements	Signal behaviour
Co-active manipulation of objects	

Imitation	Presymbolic communication
Exploration	
	Symbolic communication

On the basis of resonance, co-active movements, and mutual responsiveness, the bases are laid for social relationship and communication.

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