Letter to the Editor

Primitive reflexes beyond neonatal paediatrics: primitive reflexes and the visual system

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Currently, knowledge of primitive reflexes (PRs) is focused on the neonatal paediatric level. The tests performed are a useful tool for paediatricians, and they can be used in a simple way during the standard periodic medical evaluation of each child [1]. It is common that once possible alterations or pathologies are ruled out, PRs are no longer an essential part of the neonatal follow-up in most cases and become secondary; however, these reflexes may be present in the absence of a manifest brain pathology [2]. Certain skills of the visual system in children have an early but relatively slow developmental process, and although at first glance there may be nothing alarming because the children do not show anything out of the ordinary, their retained presence may cause difficulties in such important visual processes as motility, projection, binocularity, or even stereoscopic vision. Many of these difficulties have a motor component, based on the correct appearance and inhibition, in an orderly fashion, of the RPs. During the first year of life, because there is greater stimulation, there is greater involvement of the higher brain centres, which results in a progressive inhibition of the RPs beyond 6–12 months and their subsequent transformation into postural reflexes [3].

Their inadequate inhibition can manifest in 2 ways, the first affecting visual perception and the second affecting ocular motility. Both may seem unconnected, but they are linked in practice by a common element: the human motor system, and more explicitly by the development of RPs beyond the neonatal period. When a child shows visual disturbances that cannot be qualified as pathological, there is a tendency to look for the consequences and not always for the causes. The problem is that looking for the cause can become an odyssey, because cross-referencing data, correlating symptoms, and interpreting what the body shows us is not an easy task.

Looking back in history, in 1966, as a result of a political decision on the birth rate, the so-called 770 decree was carried out in the Romania of dictator Nicolae Ceausescu, which was an attempt to increase the population almost indiscriminately to consolidate itself as a great power. Unfortunately, it became one of the most studied sociological cases because it led to a plethora of cases with learning disabilities. The explosive birth rate forced by the dictator led to massive abandonment of newborns in orphanages. The neglect of newborns and children due to the lack of medical and sanitary professionals led to serious developmental problems. The lack of motor stimulation caused a wide range of problems, including developmental and sensory problems, with the lack of binocularity being a very common one. Sometime later, learning problems appeared [4].

Visual perception can be understood as the brain's interpretation of the retinal image related to prior knowledge and emotional state. The visual input information has a tortuous path due to the different variables that can interfere along its way, the brainstem being the one that exerts a great influence on the thalamus and especially on the lateral geniculate nucleus [5]. The visual field and its processing is not static; it is a dynamic whole, because everything may be apparently fine in its origin but not respond adequately in practice. One of the basic functions of the brainstem is to act in response to certain stimuli with complex and automated movement patterns, which develop during gestation. With the maturation of the central nervous system, the PR responses are inhibited [6]. But this is not always the case. When it occurs, those same reflex patterns can alter and interfere with the way our brain interprets the world around us. And that distorted information is what the visual cortex, coming from the lateral geniculate nucleus, must subsequently forward to more than 30 different places in the cerebral cortex to be used in different actions. In the case of the Romanian orphans, this stimulation did not occur, and this had consequences. For example, the understanding of visual projection through the Van Orden Star determines how the eyes behave individually when working binocularly, and the result is that objects can be interpreted to be where they are not really located. With inhibition of the RPs visual projection improves [7].

In parallel, the basal ganglia, associated with the cerebellum, are an essential part of the oculomotor process. Both play an important role in the cortical acquisition of cognitive functions [8]. This complex mechanism not only influences ocular motility, but also affects, among others, limb control. The basal-ganglia motor circuit and the basal-ganglia oculomotor circuit are not segregated circuits, but, on the contrary, communicate and feed back to each other, the efferents from the basal-ganglia terminating in different subdivisions of the thalamus, which, in turn, project more widely to regions of the cerebral cortex [9]. Thus, inhibition of the RPs ends up improving certain visual skills. This results in a balance of visual parameters such as fixations used in saccades and regressions, both of which are important in the reading process [10]. Abnormal persistence of RPs makes children more likely to have visual skill deficits [11].

An error in the approach to vision therapy to correct both perceptual and oculomotor difficulties centres on inadequate understanding of the effects that RPs exert not only on the body, but also on vision. The visual pathway is nourished by a multitude of inputs of all kinds, and retained RPs are a permanent source of information that disorganizes body and oculomotor movement. They are a torrent of distorted stimuli where the brain must work excessively to correct the discrepancy between what is perceived and what is really happening, between where objects are thought to be and where they really are, between where a sentence in a text to be deciphered is located and the distance at which it is really located. This mismatch forces a permanent compensation because otherwise those words belonging to the text would not be perceived clearly if they were really projected or focused where they are believed to be.

The presence of RP in the oculomotor processes also requires an overexertion because the presence of some of them does not facilitate the balance in the harmonic functioning between both eyes. Subsequent therapeutic processes cannot achieve complete success if the brain does not move both eyes in the same way. This is not because vision therapy cannot achieve this goal, but because it involves dragging a constant weight that directs eye actions in a direction opposite to what the voluntary eye movement requires. That is a clear consequence of a retained PR.

Therefore, the question is whether RPs are important beyond 12 months of life in healthy children, and obviously the answer is yes. The inhibition of RPs is not the end in itself; it is merely the organizational process through which the body reorganizes the perceptual and motor base it will need to achieve good visual functioning.

Conflict of interest

The author declares no conflict of interest.

References

1. Gieysztor EZ, Choińska AM, Paprocka-Borowicz M. Persistence of primitive reflexes and associated motor problems in healthy preschool children. Arch Med Sci 2018; 14: 167-73.
2. van Boxtel MP, Bosma H, Jolles J, Vreeling FW. Prevalence of primitive reflexes and the relationship with cognitive change in healthy adults: a report from the Maastricht Aging Study. J Neurol 2006; 253: 935-41.
3. Blythe SG. releasing educational potential through movement: a summary of individual studies carried out using the INPP test battery and developmental exercise programme for use in schools with children with special needs. Child Care Pract 2005; 11: 415-32.
4. Nelson C, Furtado E, Fox N, Zeanah C. The deprived human brain. Am Sci 2009; 97: 222.
5. Hess RF, Thompson B, Gole G, Mullen KT. Deficient responses from the lateral geniculate nucleus in humans with amblyopia. Eur J Neurosci 2009; 29: 1064-70.
6. Capute AJ, Shapiro BK, Accardo PJ, et al. Motor functions: associated primitive reflex profiles. Develop Med Child Neurol 1982; 24: 662-9.
7. Domingo-Sanz VA. Inhibition of primitive reflexes and their relationship with visual projection in children and adolescents Optom Vis Perf 2022; 10: 183-97.

8. Caligiore D, Pezzulo G, Baldassarre G, et al. Consensus paper: towards a systems-level view of cerebellar function: the interplay between cerebellum, basal ganglia, and cortex. Cerebellum 2017; 16: 203-29.
9. Bostan AC, Dum RP, Strick PL. Functional anatomy of basal ganglia circuits with the cerebral cortex and the cerebellum. Prog Neurol Surg 2018; 33: 50-61.
10. Berne SA. The primitive reflexes: treatment considerations in the infant. Optom Vis Dev 2006; 37: 139-45.
11. Andrich P, Shihada MB, Vinci MK, Wrenhaven SL, Goodman GG. Statistical relationships between visual skill deficits and retained primitive reflexes in children. Optom Vis Perf 2018; 6: 106-11.