JOJ Ophthalmology
ISSN: 2473-5477

Editorial
Volume 11 Issue 3 - August 2024
DOI: 10.19080/JOJO.2024.11.555811

JOJ Ophthalmol

Wish we Understanding the Relationship Between the Neuro-Motor System Development, and the Visive Areas Development in Infancy?

Anna Piro[1], Teresa Iona[2], Simone Curcio[2], Teresa La Rosa[4], Gabriele Curto[2], Giuseppe Nicoletti[1] and Domenico Bosco[1,3]

[1]*Consiglio Nazionale delle Ricerche, Istituto di Bioimmagini e Sistemi Biologici Complessi, Catanzaro, Italy*

[2]*Dipartimento Scienze Mediche e Chirurgiche, Università Magna Graecia, Catanzaro, Italy*

[3]*Azienda Ospedaliera Universitaria "R. Dulbecco", Catanzaro, Italy*

[4]*Ingegneria Informatica e Biomedica, Scuola di Medicina e Chirurgia, Università Magna Graecia, Catanzaro, Italy*

Submission: July 29, 2024; **Published:** August 07, 2024

***Corresponding author:** Dr. Anna Piro, Consiglio Nazionale delle Ricerche, Istituto di Bioimmagini e Sistemi Biologici Complessi, Via Tommaso Campanella, Catanzaro, Italy

Abstract

Recalling the title of the present work, we can confirm the relationship between the neuro-motor system and the neuro-physiology of the brain visive areas development in Infancy. Obviously, this relationship shows the definitive course in adult age

Keywords: Infancy Age; Neuro-Motorial Development; Color Vision; Neuro-Physiology Development

Infancy Brain Visive System Development

Color is a pervasive feature of our psychological experience, having a role in many aspects of human mind and behavior such as basic vision, scene perception, object recognition, aesthetics, and communication. Understanding how humans encode, perceive, talk about, and use color has been a major interdisciplinary effort. We can consider the development of various aspects of the psychological experience of color, ranging from low-level color vision to perceptual mechanisms such as color constancy phenomena such as color naming and color preference. We can identify neurodiversity in the development of color perception and cognition and implications for clinical and educational contexts.

Color is a ubiquitous feature of our psychological experience, and provides a key for basic vision. Color holds useful information about the properties of objects and scenes [1]. Color provides a signal about people's internal states, the blush of someone's cheeks tells us if they are embarrassed or aroused, whereas the pallor of someone's skin can indicate poor health [2] with the color of food contributing to how it tastes [3] and the color of a room's illumination contributing to its perceived temperature [4]. Given the importance of color for so many aspects of human mind and behavior how humans encode, perceive, talk about, respond to, and use color has been a major interdisciplinary research effort.

Understanding how infants and children see color has the potential to provide insight into broader aspects of their minds and behavior, for example, object reasoning [5] and language acquisition [6]. Finally, the development of color perception has relevance to clinical, educational, and industrial contexts. Color perception is atypical in children with neurodevelopmental disorders [7], congenital color vision deficiency (colorblindness in infancy) in children can present barriers in education and children's color perception has implications for design [8].

Several decades of neurobiological, electrophysiological, and psychophysical research provide evidence that trichromatic color vision is present by around 2-3 months of age, with certain color discriminations such as those that rely on red-green cone opponency earlier [9]. Psychophysical studies, in particular the pioneering work of Davide Teller, have been pivotal in determining that infants have true color vision using chromatic neural pathways. Visual evoked potentials, which measure electrophysiological changes over the occipital cortex in response to visual stimuli, have also identified the development of the chromatic and luminance neural pathways in infancy [10] charts developmental changes in the above technique to achromatic red-green, and blue-yellow gratings, presenting data for individuals ranging from 1 week to 90 years of age, evoked visual potentials appear for red-green gratings around 4 weeks and for blue-yellow around 6-8 weeks. However, infant' evoked visual potential waveform is different from child to adults. There are rapid and complex changes in the waveform shape and latency of components over the first year of life, and by 12 months infant chromatic evoked visual potential has positive negative complex rather than the negative positive complex of the adult waveform. The shape of the chromatic evoked visual potential waveform continues to change throughout childhood and is not adult like until 12-14 years of age [10] considers that there is likely a cortical reason for these changes, as suggested by source localization of child evoked potentials in another study [11]. Evoked visual potentials to achromatic gratings appear in their mature form at 12-15 weeks of age, pointing to more rapid maturation of luminance than chromatic neural pathways.

There is also a hint that in the retina blue-yellow (S cone) color discrimination may initially develop at a slower rate than red-green (L or M cone discrimination) which is supported by a study that finds that it is not until 10 years of age that red-green and blue-yellow color discrimination develop at a similar rate [12]. Other studies suggest a later age of maturation than proposed by Knoblauch with the age varying from 18 to 30 years across studies [13]. The decline in color discrimination post maturation has also been investigated. During this ageing phase, thresholds increase at a rate of around 1% per year for red-green and 1.6% for blue-yellow discrimination over the rest of the life span [14].

Infancy Brain Motorial System development

In children, the latency parameters which measure the time period between the magnetic stimulus and the onset of the motor evoked potential are the most thoroughly examined parameters of transcranial magnetic stimulation [15]. The motor latencies decrease with age, and this presumably corresponds to the maturation processes, such as myelination and axon growth [16]. In addition to maturational changes, the duration of central motor conduction times also depends on the pre-innervation condition under which they are studied facilitation-target muscle is tonically active; or relaxation-target muscle is relaxed [17]. Facilitated and relaxed central motor conduction time were described to be adult like at different stages during ontogeny, namely around the age of 4 and 10 years, respectively [18]. Hayes [19] proposed that the classification of the motor performance could proceed according to the complexity of their neuronal control mechanism, and it is showed that a wider spread of axonal conduction velocity in the younger children is present.

How may it be explained the rapid decrease of the central motor conduction time during the first decade of life? In this context, several mechanisms are relevant and include the establishment of direct corticomotoneuronal connections [20], the growth processes of Central System axons, and the maturation of the synaptic excitability at the cortical and spinal levels. Growth processes of the Central System axons such as that of myelination and axon diameter contribute to the maturational changes of central motor conduction times. The myelination of Central System axons proceeds in a rostro-caudal gradient and is assumed to be completed for cervically projecting neurons by the age of about 3 years [21]. Several authors have proposed that an early constancy of central motor conduction is achieved by a balanced growth of length and width in conjunction with progressive myelination [22].

The early adult-like facilitated central motor conduction times would, therefore, suggest maturation in the ability to propagate the excitatory impulse along a variety of cortico-subcortical pathways, including the corticospinal route. The relaxed central motor conduction times which become adult-like at a later point in time would then correspond to the maturing excitatory synaptic circuitry at the cortical level. The sequence in the acquisition of the different motor performance tests suggests that the maturation of movement velocity occurs before the acquisition of speed of repetitive movements and of manual fine motor skill.

Generally, the complete speed of movement is present around the age of 10 to 12 years. Through the fast Central System, the motor cortex may access the alpha motor neurons with a similar latency as seen for the adult, but the movements parameters examined here are performed far from the adult range. At the end, we can confirm that the maturation of the nervous system's function can be assessed by combining data from several neurophysiological methods. This approach could open new ways of examining and giving example of pathological development that correlate to omissions or lack of developmental progress.

Present Research

Our present research can be considered a pilot study. Our sample was constituted by 33 male children (no females to avoid Lyon genetic phenomenon) [23]. Sample was subdivided into three groups according three age years, 16 male children, 3-4 years; 9 male children, 5-6 years; 8 male children, 7-8 years).

Each child underwent the Tapping Test to measure his errors number for hands and feet, diagnosing the motorial and coordination activity. Errors reading Ishihara tables modified for Infancy, diagnosed the present of the impair color vision united to the previous scarce motorial and coordinative activity (Table 1). From the above preliminar results we can, at first sight, confirm a positive relationship between the motorial and coordinative nervous system and the visive brain areas maturation. 3-4 age years show a no maturation for both, and 7-8 years show a beginning of the both definitive neuro-physiological status, respectively, showing a relatively high number of errors, and relatively low errors number. 5-6 years can represent a cut-off age range, too.

How to cite this article: Anna Piro1, Teresa I, Simone C, Teresa La R, Gabriele C, et al. Wish we Understanding the Relationship Between the Neuro-Motor System Development, and the Visive Areas Development in Infancy?. JOJ Ophthalmol. 2024; 11(3): 555811.
DOI: 10.19080/JOJO.2024.10.555811

Table 1: Preliminar Results.

Age Years Group	sx + dx Hand Errors	sx + dx Foot Errors	Ishihara Errors
3-4 years	65	79	9
5-6 years	25	87	6
7-8 years	1	3	1

Conclusion

The present data confirm the Literature at to-day, and specifically Connolly [16] on the link existing within the different brain areas, confirming the Piaget axiom… *our body is a constituted by different visual, auditory, tactile, kinestethic differences.*

References

1. Osorio D, Vorobyev M (1996) Color vision as an adaptation to frugivory in primates. Proc R Soc Lond B Biol Sci 263(1370): 593-599.
2. Stephen ID, Coetzee V, Law Smith M, Perrett DI (2009) Skin blood perfusion and oxygenation color affect perceived human health. Plos One 4(4): e5083.
3. Spence C (2015) On the psychological impact of food color. Flavor 4: 21.
4. Huebner GM, Shipworth DT, Gauthier S, Witzel C, Raynham P, et al. (2016) Saving energy with light? Experimental studies assessing the impact of color temperature on thermal comfort. Energy Res Soc Sci 15: 45-57.
5. Kaldy Z, Blaser E (2009) How to compare apples and oranges: infants' object identification tested with equally salient shape, luminance, and color changes, Infancy 14(2): 222-243.
6. Wagner K, Dobkins K, Barner D (2013) Slow mapping color word learning as a gradual inductive process. Cognition 127(3): 307-317.
7. Franklin A, Sowden P, Notman L, Gonzales-Dixon M, West D, et al (2010). Reduced chromatic discrimination in children with autism spectrum disorders. Dev Sci 13(1): 188-200.
8. Luo MR (2006) Applying color science in color design. Opt. Laser Technol 38(4-6): 392-398.
9. Teller DY (1998) Spatial and temporal aspects of infant color vision. Vis Res 38(21): 3275-3282.
10. Crognale MA (2002) Development, maturation, ad aging of chromatic visual pathways: VEP results. J Vis 2(6): 438-450.
11. Ossenblok P, Reits D, Spekreijse H (1992) Analysis of striate activity underlying the pattern onset EP of children. Vis Res 32(10): 1829-1835.
12. Ling BY, Dain SJ (2018) Development of color vision discrimination during childhood: differences between blue-yellow, red-grren, and achromatic thresholds. J Opt Soc Am A 35(4): B35-B42.
13. Paramei GV, Oakley B (2014) Variation of color discrimination across the life span. J Opt Soc Am A. 31(4): A375-384.
14. Barbur J, Rodriguez-Carmona M (2015) Color vision changes in normal aging. In: Elliot A, Fairchild M, Franklin A, editors. "Handbook of color psychology". Cambridge: Cambridge University Press, pp. 180-196.
15. Koh THHG (1988) Maturation of corticospinal tracts assessed by electromagnetic stimulation of the motor cortex. Arch Dis Child 63(11): 1347-1352.
16. Connolly KJ, Forssberg H (1997) Neurophysiology and Neuropsychology of motor development. Clinics in developmental medicine n. 243/144. London: Mc Keith Press.
17. Hess CW, Mills KR, Murray NMF (1986) Magnetic stimulation of the human brain: the effects of voluntary muscle activity. J Physiol 379: 37.
18. Eyre JA, Flecknell PA, Kenyon BR, Koh THHG, Miller S (1990) acute effects of electromagnetic stimulation of the brain on cortical activity, cortical blood pressure and heart rate in the cat: an evaluation of safety. J Neurol Neuros Psych 53(6): 507-513.
19. Hayes KC, Marteniuk RG (1976) Dimensions of motor task complexity. In: Stelmach GE, editor. "Motor control. Issues and trend". New York: Academic Press, pp. 201-228.
20. Palmer SE, Schloss KB (2010) An ecological valence theory of human color preference. PNAS 107(19): 8877-8882.
21. Barkovich AJ (1996) Normal development of neonatal and infant brain, skull, and spine. In: Pediatric Neuroimaging. Philadelphia: Lippincott Raven, pp. 9-54.
22. Armand J, Olivier E, Edgley SA, Lemon RN (1996) The structure and function of the developing corticospinal tract-some key issues. In: Wing AM, Haggard P, Flanagan JR, editors. "Hand and Brain: The neurophysiology and psychology of hands movements". San Diego: Academic Press, pp. 125-145.
23. Lyon MF (1962) Sex chromatin and gene action in the mammalian X chromosome. Am J Hum Genet 14(2): 135-148.

FONDAZIONE
CASSA DI RISPARMIO DI CALABRIA E DI LUCANIA

How to cite this article: Anna Piro1, Teresa I, Simone C, Teresa La R, Gabriele C, et al. Wish we Understanding the Relationship Between the Neuro-Motor System Development, and the Visive Areas Development in Infancy?. JOJ Ophthalmol. 2024; 11(3): 555811.
DOI: 10.19080/JOJO.2024.10.555811

How to cite this article: Anna Piro1, Teresa I, Simone C, Teresa La R, Gabriele C, et al. Wish we Understanding the Relationship Between the Neuro-Motor System Development, and the Visive Areas Development in Infancy?. JOJ Ophthalmol. 2024; 11(3): 555811.
DOI: 10.19080/JOJO.2024.10.555811