Research Article

BIOMEDICAL
Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2025.60.009403

Motor System and Color Vision: A Clinical-Experimental Pivotal Research project on Infancy

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ARTICLE INFO

Received: December 19, 2024

Published: January 02, 2025

Citation: Anna Piro, Simone Curcio and Teresa Iona. Motor System and Color Vision: A Clinical-Experimental Pivotal Research project on Infancy. Biomed J Sci & Tech Res 60(1)-2025. BJSTR. MS.ID.009403.

ABSTRACT

Color Vision resulted to be an useful biological marker in studied related to Adults and Infancy. It allows us to analyze the correspondence between the different steps of the Central Nervous Motor System and Physiological Brain pathways of Color Vision growth. Moreover, the pseudo-isochromatic clinical tests allow us to identify genetic and acquired vision and color vision defects, in adult and infancy, and to compare it, too.

Keywords: Color Vision; Biological marker; Central Nervous Motor System; Infancy

Introduction

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, and communication. Understanding how humans encode, perceive, talk about and use color has been a major interdisciplinary effort. A decrease of the central motor conduction time exists during the first decade of life. Several mechanisms are relevant and include the establishment of direct cortical-motoneuronal connections, the growth processes of the central system axons, and the maturation of the synaptic excitability at the cortical and spinal levels. Color is a ubiquitous feature of our psychological experience. The human visual system constructs a perceptual experience of color from wavelengths of light reflected or emitted from the objects and surfaces around us.

Understanding how infants and children see colors has the potential to provide insight into broader aspects of their minds and behaviors, for example, object reasoning and language acquisition [1]. Finally, the development of color perception has relevance to clinical, educational, and industrial contexts. Color perception is atypical in children with neuro-developmental disorders [2], congenital color vision deficiency, in children who present barriers in education [3] and children's color perception has implications for design [4]. Psychophysical studies, in particular those pioneering works, 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. Ossenblok [5] showed also a hint that 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 find that it is not until 10 years of age that red-green and blue-yellow color discrimination develop at a similar rate [6].

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Material and Methods

During the studies on color vision, generally, an Ophthalmologist must examine all patients in order to rule out diabetic retinopathy, cataracts, senile maculopathy, or ocular fundus anomalies. Fixed sampling of males allows to avoid the genetic Lyon phenomenon [7] which is present only in the heterozygous females for X-linked diseases such as colorblindness (the inherited red-green color vision deficiency). The acquired color vision deficiency is real in the male cohort because they have not the compensation presence by second X chromosome

Ishihara Test, Modified on Infancy Studies

Ishihara test [8] is the most reliable among the pseudo-isochromatic tests to identify inherited colorblind subjects. Patients who made more than five errors reading the first 17 plates were diagnosed as being colorblind. The modified Ishihara test to study Infancy show 11 tables containing a colored back with a colored image representing a little animal. Child must identify the little animal, rightly

Foot Tapping Test. Clinical test on Infancy Motor development

The foot tapping test can be used to assess upper motor neuron dysfunction in clinical populations [9]. Visual counting tends to be the most utilized method as it does not require special equipment and can easily be performed. According with the live count, the investigator makes the count using live visual inspection. The investigator visually counts and records the number of times the subjects tapped their foot in 10'. Any foot taps that did not appear to fully strike and/or clear the force plate were disregarded.

Results

We show the results obtained on 48 subjects, 33 males and 15 females. 16 males with age range 3-4 years, 9 males with 5-6 age range, and 8 with 7-8 age range. For females, 12 show 3-4 age range, 3 show a 7-8 age range. According with the Literature at to-day, we have not any complete both motor and coordinative Neural System development at 3-4 age range. In this age range the foot tapping tests are for both skillful and not skillful limb. At 5-6 age range, we can show a decrement of the errors which are not present at 7-8 age range. Same course is showed in color vision analysis on the only males.

Discussion and Conclusion

Maturation of the corticospinal tract and hand motor function provide paradigms for central nervous system development. The motor latencies decrease with age, and this presumably corresponds to the maturation processes, such as myelination and axon growth [10]. Facilitated and relaxed motor conduction times were described to be adult-like at different stages during ontogeny, namely around the age of 4 and 10 years, respectively [11]. As the basic Neurobiology of mature color vision is relatively well understood, investigating the development of color vision could provide insight into the development of the neural structures and pathways that underpin vision. As a result, there has been a concerted effort to understand the development of trichromatic color vision in infants and to identify changes in color discrimination across the life span [12].

Conflicts of Interest

All the Authors declare no Conflicts of Interest.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2025.60.009403

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