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## FACILITATING NEUROPLASTICITY AND REDUCING ANXIETY RELATED TO THE THERAPEUTIC MANAGEMENT OF AMBLYOPIA THROUGH VIRTUAL REALITY TECHNIQUES

**Marcel-Alexandru Găină<sup>1,2</sup>, Cristinel Ștefănescu<sup>1,2</sup>, Dănuț Costin<sup>3,4</sup>**

<sup>1</sup> Department of Medicine (III) – Psychiatry, Faculty of Medicine, Grigore T. Popa University of Medicine and Pharmacy Iasi, 16 Universitatii Street, 700115 Iasi, Romania;

<sup>2</sup>Institute of Psychiatry „Socola”, 36 Bucium Str, Iasi, Romania;

<sup>3</sup>Department of Surgery (II) – Ophthalmology, Faculty of Medicine, Grigore T. Popa University of Medicine and Pharmacy Iasi, 16 Universitatii Street, 700115 Iasi, Romania;

<sup>4</sup>Hospital of Neurosurgery “Prof. Dr. Nicolae Oblu” Iasi, Ophthalmology Ward, 2 Ateneului Str, 700309 Iasi, Romania.

### Rezumat

**Facilitarea neuroplasticității și reducerea anxietății legate de managementul terapeutic al ambliopiei prin tehnici de realitate virtuală**

*Marcel-Alexandru Găină<sup>1,2</sup>, Ștefănescu Cristinel<sup>1,2</sup>, Dănuț Costin<sup>3,4</sup>*

<sup>1</sup> Catedra de Medicină (III) – Psihiatrie, Facultatea de Medicină, Universitatea de Medicină și Farmacie Grigore T. Popa Iași, str. Universității nr.16, 700115 Iași, România; <sup>2</sup>Institutul de Psihiatrie „Socola”, Str Bucium 36, Iași, România; <sup>3</sup>Secția de Chirurgie (II) – Oftalmologie, Facultatea de Medicină, Universitatea de Medicină și Farmacie Grigore T. Popa Iași, str. Universității nr.16, 700115 Iași, România; <sup>4</sup>Spitalul de Neurochirurgie „Prof. Dr. Nicolae Oblu” Iasi, Sectia Oftalmologie, Str Ateneului 2, 700309 Iasi, Romania.

Realitatea virtuală imersivă este înțeleasă drept transpoziția mediului virtual generat de o unitate de procesare grafică într-o manieră stereoscopică prin specializarea echipamentului precum căștile virtuale. Accesibilitatea acestor echipamente este determinată de investiții masive a marilor corporații, ceea ce a facilitat implimentarea lor în medicină. Aceste tehnologii pot oferi noi servicii în oftalmologie precum monitorizarea rezultatelor pacienților la perimetria computerizată, tratamentul ambliopiei etc.

**Cuvinte-cheie:** neuroplasticitate, anxietate, ambliopie, realitate virtuală

Immersive virtual reality (VRi) is currently understood as the transposition of a virtual environment generated by a graphics processing unit into a stereoscopic manner through specialized equipment such as virtual headsets. The recent accessibility of iVR equipment, determined by the massive investments of large corporations have indirectly facilitated the implementation of the potential of virtual reality in medicine. Along with the overcoming of the graphical processing deficit, concepts were turned to real types of equipment that nowadays possess the capacity to offer synesthetic visual, auditory and haptic stimuli at a level that impair human capacity to differentiate reality from the virtual. The concept of gamification therapy enhances therapeutical potential within a playful interface, and was already proven to be capable of facilitating the dynamics of rehabilitation in neurological, psychiatric or motor disorders, by amplifying the patient's motivation. As iVR opens new perspectives in ophthalmology, such as monitoring patient-related outcome measures through standard automated perimetry, current literature reflects a growing interest in also improving therapeutical outcomes.

This paper aims to assess the current state of the art regarding the applicability of iVR in the treatment of amblyopia, as well as the influence on the anxiety

valences associated with the recovery process of stereoscopic vision, focusing in the manner recovery benefits from virtual reality by providing a dynamic frame, which avoids fixed head positions, indirectly reducing the stress associated with the current gold standard. According to the literature, the recovery of anisometropic amblyopia with the help of iVR has led to significant improvements since the first treatment session, with an upward trend in the deficit recovery curve positively correlated with the repetitiveness of exercises and maintenance of long-term benefits of exposure sessions. Last but not least, iVR technology may become a tool used to diagnose and quantify the level of visual impairment in amblyopia.

iVR represents a disruptive technology whose impact in ophthalmology benefits the transition of contemporary medicine to the future of individualized techniques, designed to improve therapeutic efficacy depending on the individual characteristics of the patient. In conclusion, although iVR stands as a promising therapeutic ophthalmological tool, there is a growing need for implementation as the lack of a standardized means of research designs calls for the expertise of medical experts worldwide.

**Keywords:** neuroplasticity, anxiety, amblyopia, virtual reality