Might synthetic cannabinoids influence neural differentiation?

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Published online: 28 Sep 2021.

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Interactive technologies in stroke recovery: uncovering challenges and opportunities through physiotherapist's perspective

S. Pinto[a,b,c,d], H. Nicolau[d], D. S. Lopes[d] and A. M. Pereira[a,b,c]

[a]Department of Physiotherapy, Escola Superior de Saúde Egas Moniz, Caparica, Portugal; [b]Centro de Investigação Interdisciplinar Egas Moniz (CiiEM), Egas Moniz Cooperativa de Ensino Superior, Caparica, Portugal; [c]Hospital Garcia de Orta, Almada, Portugal; [d]INESC-ID, Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal

ABSTRACT

Introduction: It is estimated that 55% to 75% of individuals who experience a stroke have persistent impairment of the affected upper limb (UL) [1,2]. It is needed to identify training strategies allied with interactive systems for retraining motor function of the UL. Virtual reality (VR), using either immersive or nonimmersive technology, seems to be one of those promising strategies. Virtual reality allows patients to have close-to-reality experiences, providing them varied, engaging, and realistic experiences [3]. For the physiotherapist, the use of the interactive technologies is a challenge which can improve treatment adherence, allow new environments adapted to patient needs, abilities and goals, as well as different task options [4]. The objective of this analysis was to systematically review the benefits and limitations of VR towards motor recovery of upper limb in post-stroke population.

Materials and methods: Randomised controlled trials were researched in Pubmed and PEDro databases, between January 2009 and January 2019, using the following keywords: "Virtual reality", "video games", "upper limb" and "stroke". We included articles that used immersive and nonimmersive technology in upper limb recovery after stroke, and which compared VR with others modalities We excluded all articles in which the patient received home based intervention or community rehabilitation programs. All included clinical trials had level of evidence equal or superior to 6 score, assessed by PEDro scale.

Results: Fifteen studies met the inclusion criteria. Only three studies considered immersive VR. The training of functional tasks appears to provide the greatest benefits in upper extremity function with improvements in joint range of motion, hand motor function, grip strength, and dexterity. Two studies indicated that long-term improvements persist at follow-up. None of the studies reported any significant adverse effects.

Discussion and Conclusions: There is moderate to high evidence that supports the beneficial effects of VR on stroke patient upper limb motor recovery. However, more studies are needed to determine what kind of VR systems are the most appropriate, particularly which ones may contribute or affect cortical reorganisation. It is also needed to identify the most adequate frequency, duration and intensity for the sessions.

CONTACT S. Pinto ✉ ftsofiapinto@gmail.com

References

[1] Dobkin BH. Strategies for stroke rehabilitation. Lancet Neurol. 2004;3(9):528–536.
[2] Kwakkel G, Kollen BJ, van der Grond J, et al. Probability of regaining dexterity in the flaccid upper limb: impact of severity of paresis and time since onset in acute stroke. Stroke. 2003;34(9):2181–2186.
[3] Corbetta D, Imeri F, Gatti R. Rehabilitation that incorporates virtual reality is more effective than standard rehabilitation for improving walking speed, balance and mobility after stroke: a systematic review. J Physiother. 2015;61(3):117–124.
[4] Saposnik G, Cohen LG, Mamdani M, et al. Efficacy and safety of non-immersive virtual reality exercising in stroke rehabilitation (EVREST): a randomised, multicentre, single-blind, controlled trial. Lancet Neurol. 2016;15(10):1019–1027.

Might synthetic cannabinoids influence neural differentiation?

Evguenia Bekman[a,b,c,d], Tiago Barata[a], Cláudia Miranda[a], Sandra Vaz[b], Carla Ferreira[c,e] and Alexandre Quintas[c,e]

aSCERG – Stem Cell Engineering Research Group, IST – Taguspark, Porto Salvo, Portugal; bInstituto de Medicina Molecular, Faculdade de Medicina da Universidade de Lisboa, Avenida Prof. Egas Moniz, Lisboa, Portugal; cCentro de Investigação Interdisciplinar Egas Moniz (CiiEM), Egas Moniz Cooperativa de Ensino Superior, Caparica, Portugal; dThe Discoveries Centre for Regenerative and Precision Medicine, Lisbon Campus, IST – Taguspark, Porto Salvo, Portugal; eLaboratório de Ciências Forenses e Psicológicas Egas Moniz, Campus Universitário – Quinta da Granja, Caparica, Portugal

ABSTRACT

Phytocannabinoids are psychotropic substances found in cannabis that bind to the endocannabinoid receptors regulating a variety of physiological processes in human body, including synaptic activity in the central nervous system and metabolic effects in the peripheric nervous system among many others [1,2]. Synthetic cannabinoids emerged as popular alternative to cannabis. Most of these substances are synthetic analogues of Δ^9-THC, the psychotropic compound of cannabis, binding with higher affinity to the endocannabinoid receptor CB_1 and eliciting a stronger and long-lasting effect on brain cells. Molecular structure of synthetic cannabinoids is always changing escaping the control by authorities and increasing the hazard for general population. The popularity of cannabis and its derivatives may lead, and often does, to child's exposure to cannabinoids both in utero and through breastfeeding by a drug-consuming mother. Prenatal exposure to cannabis has been associated with higher risk of newborn morbidity [2,3], altered rate of mental development and significant changes in nervous system functioning [4,5]. However, direct evidence that these effects are mediated through the binding of cannabinoids to endocannabinoid receptors is still lacking. Thus, it is paramount to better understand the psychoactive effects of natural and synthetic cannabinoids on the developing human brain.

We conveyed a pilot study in which human induced pluripotent stem cells (hiPSCs) were induced into neural differentiation and treated with a non-psychotropic component of cannabis, cannabidiol, known to bind the CB_2 receptor, and two synthetic Δ^9-THC analogues, THJ-018 and EG-018. Neuronal differentiation and functional maturation were assessed by immunofluorescence, qRT-PCR and single cell calcium imaging. Our results indicate that all three substances have profound impact on the differentiation, maturation and functioning of developing CNS neurons, providing a new evidence for the importance of thorough research of the impact of pre-natal exposure to natural and synthetic cannabinoids.

References

[1] Wu C-S, Jew CP, Lu H-C, et al. Lasting impacts of prenatal cannabis exposure and the role of endogenous cannabinoids in the developing brain. Future Neurol. 2011;6(4):459–480.

[2] Metz TD, Stickrath EH. Marijuana use in pregnancy and lactation: a review of the evidence. Am J Obstetr Gynecol. 2015; 213(6):761–778.

[3] Hurd YL, Wang X, Anderson V, et al. Marijuana impairs growth in mid-gestation fetuses. Neurotoxicol Teratol. 2005; 27(2):221–229.

[4] Fried PA. Conceptual issues in behavioral teratology and their application in determining long-term sequelae of prenatal marihuana exposure. J Child Psychol Psychiatry. 2002;43(1):81–102.

[5] Gray KA, Day NL, Leech S, et al. Prenatal marijuana exposure: effect on child depressive symptoms at ten years of age. Neurotoxicol Teratol. 2005;27(3):439–448.

Modulation of the initial stages of systemic inflammation by intervention in the NFkB signalling pathway

Ângela Amaro-Leal

Faculty of Medicine of Lisbon (FMUL), Cardiovascular Autonomic Function (CAF) Lab of the Cardiovascular Center of the University of Lisbon (CCUL)

ABSTRACT

Sepsis is a systemic inflammatory state mediated by the innate immune system resulting in an excessive cellular response to severe infection, with high levels of morbidity and mortality. Furthermore, patients who survive sepsis, have long-term cognitive and functional impairment. Animal models are essential to clarify the pathophysiological mechanisms of sepsis. Herein, we characterise an animal model of lipopolysaccharide (LPS)-induced inflammation, evaluating neural and cardiac function, during the initial stages of infection. Male Wistar rats (12–20 wks, $n = 24$) were injected with LPS (E. coli serotype O127:B8; tail vein) and divided into 3 groups: LPS6 (6 mg/kg), LPS12 (12 mg/kg) and Sham (NaCl 0.9%; 0.1 ml/100g). At 6 and 24 h after LPS injection, an autonomic evaluation was performed in both conscious animals, with continuous