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FACULTY OF SPECIAL EDUCATION
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12. MEĐUNARODNI NAUČNI SKUP „SPECIJALNA EDUKACIJA I REHABILITACIJA DANAS”

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NEUROPSYCHOLOGICAL REHABILITATION AS HISTORY IN THE MAKING*

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Introduction: *Regardless of whether it is beheld in its broad or narrow sense, neuropsychological rehabilitation (NR) postulates, as a premise, the necessity to be based on knowing (and relying on) commandments of neurocognitive organization. However, the early optimism regarding the productiveness of such an approach hasn't been fulfilled either smoothly or regularly.*

Aim: *The aim of this review is to focus on principal hubs that channeled the evolution of neuropsychological rehabilitation towards current empirically based, realistic, and more convincing approaches to the treatment of both neurodevelopmental and acquired cognitive disturbances.*

Methods: *The topic is approached by comparing the main paradigms of NR (as) postulated in predominant literature and our contemporary practice.*

Results: *The main facets directing present shifts in doctrines of neuropsychological rehabilitation ensue from increasing data supply on research-based comparisons of diverse NR methodologies and exploration of treatment effects using neuroimaging techniques, largely accumulated during the previous decade. Neuropsychological rehabilitation in our territory has been grounded on sound theoretical bases from its outset (Bojanin, 1979) and holds true potential for further development in line with modern highest standards.*

Conclusion: *The theory of (neuro)cognitive organization is necessary but not sufficient precondition for NR. Neuropsychological rehabilitation requires functional models of the treatment itself; presently, their share gradually expands. The sum of knowledge enriched during the last decade involves a promise that NR might reach its true maturity in years to come.*

Keywords: *neuropsychological rehabilitation, evidence-based treatment, theoretical models*

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INTRODUCTION

Albeit there are numerous examples - like Broca’s attempt of rehabilitation program for aphasia or Seguin’s techniques to improve the cognitive skills of children with neurodevelopmental disorders – suggesting that neuropsychological rehabilitation (NR) is as old as neuropsychology itself, it mainstreamed just about the early eighties, largely related to the expansion of theoretical models offered by cognitive neuropsychology (Ben-Yishay & Prigatano, 1990; Boake, 2003; Wilson, 2017). However, despite tenable conceptual bases of cognitive-neuropsychological rehabilitation (Coltheart et al., 2005), its practical outcomes often fell short of hopes (Malec, 1999; Prigatano et al., 1994). The last two decades have significantly remodeled the discipline; among the influences that have promoted major advances and cutting-edge developments in the field, a notable role belongs to increasing understanding of the mechanisms of plasticity in recovery and accumulation of a solid database of NR research.

NEUROIMAGING, PLASTICITY, AND PROSPECT FOR REORGANIZATION

For decades, the idea of NR has generally followed Luria’s concept of reorganization (Prigatano, 2013; Wilson, 2017), but beyond the model that enabled interventions for aphasia, disorders of motor planning, visual perception or executive functions (Luria et al., 1969; Christensen & Castano, 1996.) little was known about true mechanisms and dynamics of reorganization after injury or in erroneous development. New vistas were unlocked by introducing brain structural and especially functional imaging from the late 80s. Magnetic resonance imaging (MRI), a ‘gold standard’ for visualizing structural elements of the brain, informs us with growing precision of the properties of cerebral morphological reshaping of both maturational or postlesional nature (Dubois et al., 2021.; Genon et al., 2022). Applying different mathematical models on the data – as in diffusion tensor imaging (DTI) – enabled not only describing the primary orientation of white matter axonal pathways (O’Donnel et al., 2019; Sotiropulous et al., 2013) but even subtle connectivity changes in/after illness or trauma as well (Puig et al., 2020; Smits et al., 2023). In addition to task-related functional MRI (fMRI), important for relaying brain activity to specific cognitive processes (Lebreton et al., 2019), later developed resting-state fMRI has shown particular potential in mapping the brain’s functional connectivity/interregional information transfer (Raimondo et al., 2021; Yang et al., 2020). Unmasking previously hidden mechanisms of brain plasticity entails, among others, dissociating structural versus functional (Dresp-Langley, 2020; Olafson et al., 2021; Stampanoni Bassi et al., 2019) or intrahemispheric versus interhemispheric reorganization (Coelho et al., 2021; Sebastianelli et al., 2017), discovering temporary pathways that can persist and replace damaged ones in early development lesions (Eyre et al., 2001; Staudt, 2007), the role of lesion timing, size, location or etiology in activating diverse reorganization mechanisms in children and adults (Batschelett et al., 2022; Sebastianelli et al., 2017; Staudt, 2007) and else.

Last but not least, the overall concept of brain organization has progressively shifted from purely modular localizationist models to connectomal accounts of cerebral processing where high-level cognitive functions are presumed to emerge through dynamic interactions between specialized functional systems (Fuster & Bressler, 2012; Herbet & Duffau, 2020). In such a milieu, previous evidence, together with the rising knowledge about molecular mechanisms supporting neural repair, have set more rational and yet more elastic scene for future NR, announcing innovative treatment approaches like targeting network patterns to enhance recovery (Guggisberg et al., 2021; Hartwigsen & Volz, 2021; van den Heuvel & Sporns, 2019) or directly aiming existing plastic potential (Jasey & Ward 2019; Lyu et al., 2021).

RESEARCH ON NR OUTCOMES

Advances in any clinical field, NR as well, heavily depend on research arguments on the efficacy of certain therapeutic approaches. Especially in the domain of cognitive rehabilitation, the literature has long remained scarce in this respect, largely confined to general theoretical recommendations and empirical support offered primarily by narratives, small-group studies, or single case reports. Indeed, producing high-quality research in NR is heavily burdened by numerous methodological issues, including difficulties in selecting variables – consequent to a wide variety of clinical population, scope of interventions or possible outcome measures (Covington & Duff, 2021; Negrini et al., 2020; Weuve et al., 2015), problems in application of adequate randomized control trials (Arienti et al., 2021), favoring cross-sectional to more appropriate longitudinal designs (Schultz & Tate, 2013), insufficient clinical applicability of the results (Negrini et al., 2019), biases in evaluating rehabilitation (Tate & Perdices, 2017) and other. Still, in the last twenty years, NR research has been constantly growing, even at a rate exceeding research in general (Arienti, 2021), initially embracing adults with acute lesions originating from stroke or traumatic brain injuries (i.e. Cappa et al., 2005; Cicerone et al., 2000, 2005), gradually expanding to other forms of adult brain pathology and acquired cerebral lesions in children (Laatch et al., 2020; Slomine & Locascio, 2009) and, finally, to neurodevelopmental disturbances (Dandil et al., 2020). By now, this recent endeavor to provide hard data on the efficiency of NR has already offered sufficient evidence about certain restorative and compensatory strategies (i.e., Clare & Jones, 2008; Creighton et al., 2013), in defined cognitive domains (Azouvi et al., 2017; Loetscher et al., 2019) and specific pathologies (Dang et al., 2017; Markham et al., 2020; Wilson et al., 2021), even regular updating of evidence-based therapeutic recommendations (Cicerone et al., 2011, 2019). Yet, some very basic issues remain of concern, like the question of adequacy of strict methodological demands in this field (Eichler et al., 2021; Sherman et al., 2016.) or underusing imaging data (Nasios et al., 2019), particularly in NR of children (Prigatano, 2013).

AN OLD APPROACH IN THE NEW SHOES

In addition to promoting novel paradigms in NR, fresh touchstones acquired during the last decades also decouple the old ones. As the core of the therapy has shifted from cognition to emotions (i.e., Salas et al., 2019; Shields et al., 2016) and to prioritizing patient perspectives (Patterson et al., 2016; Wilson, 2017), narrow focusing on cognitive retraining gradually dissolved while a holistic framework has strengthened to the point of prerequisite (Diller & Ben-Yishay, 2020; Marklund et al., 2019). Although no single model, theory, or framework is considered sufficient to address the complexity of issues in comprehensive holistic NR (Wilson, 2017), one approach might, in many ways, dispute this assumption: reeducation of psychomotricity (RP), one of the oldest methods of NR. Grounded in the ideas of Dupres (1862-1921) and Vallon (1879-1962) and appearing around 1960 with the work of Julian de Ajuriaguerra (i.e., Ajuriaguerra & Bonavalot-Soubiran,1960; Le Camus, 1994), RP integrates knowledge from neurology, psychiatry, developmental psychology and psychoanalysis into a therapeutical method crossbreeding and fusing original disciplines (Bojanin, 2016; Constant, 2007). On the practical side, RP might be of particular interest due to its deep roots in our special education and rehabilitation, where it was introduced as early as the late 70s (Bojanin, 1979) and has been widely used for decades either as the primary treatment or conjoined with other therapeutic strategies (Govedarica & Bojanin, 2000; Šćepanović & Nikolić, 2015).

Resulting from a theoretical position that places the body at the center of all learning and postulating that subtle interplay between sensation, tone, and emotion is the very heart of any mental image, RP is truly a holistic approach in its essence, thus able to overcome intricacy of coordinated interdisciplinary rehabilitation. Moreover, purported semiology and underlying mechanisms reasoned to explain motor and cognitive behavior in disharmonic development (Bojanin, 2006, 2016; Paquet & Vaivre-Douret, 2019; Reinersmann & Lucke, 2018) correspond contemporary views on complex networking underlying neurocognitive functioning (Bagarinao et al., 2019; Junker-Tschopp, 2017) and offer rational account of plasticity in maturation and carrying these processes (Raimo et al., 2019). Rehabilitation research evidence suggesting the role of specific systems in overall cognitive reviving (Beltrán et al., 2022; Moreau-Debord, 2021; Olszewska et al., 2021; Xing & Bai, 2020) additionally confirms the basic assumptions of the model. However, RP still lacks sufficient corpus of presentable and modernized empirical evidence for many reasons (Rivière, 2010), though a number of tries can already be found (Lazović, 2021; Rodriguez, 2022; Zilić & Šečić, 2022).

CONCLUSION

NR has entered the third decade of the century with plausible empirical support and paradigms freshened by new theoretical models that improve our understanding of mechanisms of plasticity in brain injury or malfunctional maturation. Among other things, novel positions have strengthened demands for

holistic rehabilitation programs suited to comprehensively address the specific needs of patients. Reeducation of psychomotricity, a practice with a strong tradition and intrinsically holistic by its theoretical bases, still offers a prosperous framework for NR of the future, especially if tighter related to neurocognitive research. What is still lacking in this domain is sturdy research evidence on the effectiveness of RP, including more rational approaches to evaluation itself.

REFERENCES

Ajuriaguerra, J., & Bonavalot-Soubiran, G. (1960). Indications et techniques de reeducation psychomotrice en psychiatrie infantile. *La psychiatrie de l'enfant, 2*, 423-494.

Arienti, C., Armijo-Olivo, S., Minozzi, S., Tjosvold, L., Lazzarini, S. G., Patrini, M., & Negrini, S. (2021). Methodological issues in rehabilitation research: a scoping review. *Archives of Physical Medicine and Rehabilitation*, *102*(8), 1614-1622. https://doi.org/10.1016/j.apmr.2021.04.006

Azouvi, P., Jacquin-Courtois, S., & Luauté, J. (2017). Rehabilitation of unilateral neglect: Evidence-based medicine. *Annals of physical and rehabilitation medicine*, *60*(3), 191-197. https://doi.org/10.1016/j.rehab.2016.10.006

Bagarinao, E., Watanabe, H., Maesawa, S., Mori, D., Hara, K., Kawabata, K., ... & Sobue, G. (2019). Reorganization of brain networks and its association with general cognitive performance over the adult lifespan. *Scientific Reports*, *9*(1), 11352. https://doi.org/10.1038/s41598-019-47922-x

Batschelett, M., Gibbs, S., Holder, C. M., Holcombe, B., Wheless, J. W., & Narayana, S. (2022). Plasticity in the developing brain: neurophysiological basis for lesion-induced motor reorganization. *Brain Communications*, *4*(1), fcab300. https://doi.org/10.1093/braincomms/fcab300

Beltrán, M. I., Dudink, J., de Jong, T. M., Benders, M. J., & van den Hoogen, A. (2022). Sensory-based interventions in the NICU: systematic review of effects on preterm brain development. *Pediatric Research*, *92*(1), 47-60. https://doi.org/10.1038/s41390-021-01718-w

Ben-Yishay, Y., & Prigatano, G. P. (1990). Cognitive remediation. In M. Rosenthal, M. R. Bond, E. R. Griffith, & J. D. Miller (Eds.), *Rehabilitation of the adult and child with traumatic brain injury* (pp. 393–409). F A Davis.

Bikson, M., Brunoni, A. R., Charvet, L. E., Clark, V. P., Cohen, L. G., Deng, Z. D., ... & Lisanby, S. H. (2018). Rigor and reproducibility in research with transcranial electrical stimulation: an NIMH-sponsored workshop. *Brain stimulation*, *11*(3), 465-480. https://doi.org/10.1016/j.brs.2017.12.008

Boake, C. (2003). Stages in the history of neuropsychological rehabilitation. In: B.A. Wilson (Ed.) *Neuropsychological Rehabilitation: Theory and Practice* (pp 11-23). Swets & Zeitlinger.

Bojanin, S (1979). *Neuropsihologija razvojnog doba i opšti reedukativni metod*. Privredna štampa: centar za rehabilitaciju gluvih i nagluvih.

Bojanin, S. (2006). Reedukacija psihomotorike ili tretman pokretom. *Psihijatrija danas*, *38*(1), 11-27.

Bojanin, S. (2016). *Tretman pokretom i savetovanje* (2. izdanje). Beograd: Pomoć porodici.

Cappa, S. F., Benke, T., Clarke, S., Rossi, B., Stemmer, B., & van Heugten, C. M., (2005). EFNS guidelines on cognitive rehabilitation: report of an EFNS task force. *European Journal of Neurology*, *12*(9), 665-680. https://doi.org/10.1111/j.1468-1331.2005.01330.x

Chamard E, Lichtenstein JD. (2018). A systematic review of neuroimaging findings in children and adolescents with sports related concussion. *Brain Injury, 32*(7), 816-831. https://doi.org/10.1080/02699052.2018.1463106

Christensen, A.L. & Castano, C. (1996). Alexander Romanovitch Luria (1902-1977): Contributions to neuropsychological rehabilitation. *Neuropsychological Rehabilitation*, *6*(4)*,* 279-303. https://doi.org/10.1080/713755511

Cicerone, K.D., Dahlberg, C., Kalmar, K., Langenbahn, D.M., Malec, J.F., Bergquist, T.F., ... & Morse, P.A. (2000). Evidence-based cognitive rehabilitation: recommendations for clinical practice. *Archives of physical medicine and rehabilitation*, *81*(12), 1596-1615. https://doi.org/10.1053/apmr.2000.19240

Cicerone, K. D., Dahlberg, C., Malec, J. F., Langenbahn, D. M., Felicetti, T., Kneipp, S., ... & Catanese, J. (2005). Evidence-based cognitive rehabilitation: updated review of the literature from 1998 through 2002. *Archives of physical medicine and rehabilitation*, *86*(8), 1681-1692. https://doi.org/10.1016/j.apmr.2005.03.024

Cicerone, K. D., Langenbahn, D. M., Braden, C., Malec, J. F., Kalmar, K., Fraas, M., ... & Ashman, T. (2011). Evidence-based cognitive rehabilitation: updated review of the literature from 2003 through 2008. *Archives of physical medicine and rehabilitation*, *92*(4), 519-530. https://doi.org/10.1016/j.apmr.2010.11.015

Cicerone, K. D., Goldin, Y., Ganci, K., Rosenbaum, A., Wethe, J. V., Langenbahn, D. M., ... & Harley, J. P. (2019). Evidence-based cognitive rehabilitation: systematic review of the literature from 2009 through 2014. *Archives of physical medicine and rehabilitation*, *100*(8), 1515-1533. https://doi.org/10.1016/j.apmr.2019.02.011

Clare, L., & Jones, R. S. (2008). Errorless learning in the rehabilitation of memory impairment: a critical review. *Neuropsychology review*, *18*, 1-23. https://doi.org/10.1007/s11065-008-9051-4

Coelho, A., Fernandes, H. M., Magalhães, R., Moreira, P. S., Marques, P., Soares, J. M., ... & Sousa, N. (2021). Reorganization of brain structural networks in aging: A longitudinal study. *Journal of Neuroscience Research*, *99*(5), 1354-1376. https://doi.org/10.1002/jnr.24795

Coltheart, M., Brunsdon, R., & Nickels, L. (2005). Cognitive rehabilitation and its relationship to cognitive-neuropsychological rehabilitation. In: P.W. Halligan & D.T. Wade (Eds.) *Effectiveness of rehabilitation for cognitive deficits* (pp.11-20). Oxford University Press.

Constant, J. (2007). Un métissage en quête d’identité: pédopsychiatrie et psychomotricité. *Neuropsychiatrie de l’enfance et de l’adolescence*, *55*(2), 87-92. https://doi.org/10.1016/j.neurenf.2007.02.007

Covington, N. V., & Duff, M. C. (2021). Heterogeneity is a hallmark of traumatic brain injury, not a limitation: a new perspective on study design in rehabilitation research. *American journal of speech-language pathology*, *30*(2S), 974-985. https://doi.org/10.1044/2020_AJSLP-20-00081

Creighton, A. S., van der Ploeg, E. S., & O’Connor, D. W. (2013). A literature review of spaced-retrieval interventions: a direct memory intervention for people with

dementia. *International Psychogeriatrics*, *25*(11), 1743-1763. https://doi:10.1017/S1041610213001233

Dandil, Y., Smith, K., Kinnaird, E., Toloza, C., & Tchanturia, K. (2020). Cognitive remediation interventions in autism spectrum condition: A systematic review. *Frontiers in psychiatry*, *11*, 722. https://doi.org/10.3389/fpsyt.2020.00722

Dang, B., Chen, W., He, W., & Chen, G. (2017). Rehabilitation treatment and progress of traumatic brain injury dysfunction. *Neural plasticity*, vol.2017, Article ID 1582182, 6 pages. https://doi.org/10.1155/2017/1582182

Diller, L., & Ben-Yishay, Y. (2020). The clinical utility and cost-effectiveness of comprehensive (holistic) brain injury day-treatment programs. In: G Prigatano, N Pliskin (Eds.) *Clinical neuropsychology and cost outcome research* (pp. 293-312). Psychology Press. https://doi.org/10.4324/9781315787039

Dresp-Langley, B. (2020). Seven properties of self-organization in the human brain. *Big Data and Cognitive Computing*, *4*(2), 10. https://www.mdpi.com/2504-2289/4/2/10#

Dubois, J., Alison, M., Counsell, S. J., Hertz-Pannier, L., Hüppi, P. S., & Benders, M. J. (2021). MRI of the neonatal brain: a review of methodological challenges and neuroscientific advances. *Journal of Magnetic Resonance Imaging*, *53*(5), 1318-1343. https://doi.org/10.1002/jmri.27192

Eichler, H. G., Pignatti, F., Schwarzer-Daum, B., Hidalgo-Simon, A., Eichler, I., Arlett, P., ... & Rasi, G. (2021). Randomized controlled trials versus real world evidence: neither magic nor myth. *Clinical Pharmacology & Therapeutics*, *109*(5), 1212-1218. https://doi.org/10.1002/cpt.2083

Eyre, J. A., Taylor, J. P., Villagra, F., Smith, M., & Miller, S. (2001). Evidence of activity-dependent withdrawal of corticospinal projections during human development. *Neurology*, *57*(9), 1543-1554. https://doi.org/10.1212/WNL.57.9.1543

Fuster, J. M., & Bressler, S. L. (2012). Cognit activation: a mechanism enabling temporal integration in working memory. *Trends in cognitive sciences*, *16*(4), 207-218. https://doi.org/10.1016/j.tics.2012.03.005

Genon, S., Eickhoff, S. B., & Kharabian, S. (2022). Linking interindividual variability in brain structure to behaviour. *Nature Reviews Neuroscience*, *23*(5), 307-318. https://doi.org/10.1038/s41583-022-00584-7

Govedarica, T., & Bojanin, S. (2000). *Opšta reedukacija psihomotorike*. Institut za mentalno zdravlje.

Guggisberg, A. G., Koch, P. J., Hummel, F. C., & Buetefisch, C. M. (2019). Brain networks and their relevance for stroke rehabilitation. *Clinical Neurophysiology*, *130*(7), 1098-1124. https://doi.org/10.1016/j.clinph.2019.04.004

Hartwigsen, G., & Volz, L. J. (2021). Probing rapid network reorganization of motor and language functions via neuromodulation and neuroimaging. *Neuroimage*, *224*, 117449. https://doi.org/10.1016/j.neuroimage.2020.117449

Herbet, G., & Duffau, H. (2020). Revisiting the functional anatomy of the human brain: toward a meta-networking theory of cerebral functions. *Physiological Reviews*, *100*(3), 1181-1228. https://doi.org/10.1152/physrev.00033.2019

Jasey, N., & Ward, I. (2019). Neuroplasticity in brain injury: maximizing recovery. *Current Physical Medicine and Rehabilitation Reports*, *7*, 333-340. https://doi.org/10.1007/s40141-019-00242-7

Junker-Tschopp, C. (2017). Psychomotricité et neurosciences: la place du corps dans la représentation. *Revue suisse de pédagogie spécialisée*, *4/2017*, 40-46.

Laatsch, L., Dodd, J., Brown, T., Ciccia, A., Connor, F., Davis, K., ... & Yaeger, L. (2020). Evidence-based systematic review of cognitive rehabilitation, emotional, and family treatment studies for children with acquired brain injury literature: From 2006 to 2017. *Neuropsychological Rehabilitation*, *30*(1), 130-161. https://doi.org/10.1080/09602011.2019.1678490

Lazović, T. (2021). Uticaj tretmana reedukacije psihomotorike na kvalitet doživljaja telesne celovitosti kod adolescenata sa lakom intelektualnom ometenošću. *Beogradska defektološka škola*, (3), 33-49. https://hdl.handle.net/21.15107/rcub_rfasper_4123

Le Camus, J. (1994). Julian de Ajuriaguerra et l'Ecole française de Psychomotricité. *La Psychiatrie de l'Enfant*, *37*(1), 13-23

Lebreton, M., Bavard, S., Daunizeau, J., & Palminteri, S. (2019). Assessing inter-individual differences with task-related functional neuroimaging. *Nature Human Behaviour*, *3*(9), 897-905. https://doi.org/10.1038/s41562-019-0681-8

Loetscher, T., Potter, K. J., Wong, D., & das Nair, R. (2019). Cognitive rehabilitation for attention deficits following stroke. *The Cochrane Database of Systematic Reviews, 2019*(11), CD002842. https://doi.org/10.1002/14651858.CD002842.pub3

Luria, A. R., Naydin, F. L., Tsvetkova, L. S., & Vinarskaya, E. N. (1969). Restoration of higher cortical function following local brain damage. In P. J. Vinken, & G. W. Bruyn (Eds.). *Handbook of Clinical Neurology* (Vol. 3), 453-477. NorthHolland

Lyu, J., Xie, D., Bhatia, T. N., Leak, R. K., Hu, X., & Jiang, X. (2021). Microglial/Macrophage polarization and function in brain injury and repair after stroke. *CNS Neuroscience & Yherapeutics*, *27*(5), 515-527. https://doi.org/10.1111/cns.13620

Malec, J. F. (1999). Goal attainment scaling in rehabilitation. *Neuropsychological Rehabilitation*, *9*(3-4), 253-275. https://doi.org/10.1080/096020199389365

Markham, V. A., Giles, A. F., Roderique-Davies, G., Adshead, V., Tamiaki, G., & May, R. J. (2020). Applications of within-stimulus errorless learning methods for teaching discrimination skills to individuals with intellectual and developmental disabilities: A systematic review. *Research in Developmental Disabilities*, *97*, 103521. https://doi.org/10.1016/j.ridd.2019.103521

Marklund, N., Bellander, B. M., Godbolt, A. K., Levin, H., McCrory, P., & Thelin, E. P. (2019). Treatments and rehabilitation in the acute and chronic state of traumatic brain injury. *Journal of Internal Medicine*, *285*(6), 608-623. https://doi.org/10.1111/joim.12900

Moreau-Debord, I., Serrano, É., Quessy, S., & Dancause, N. (2021). Rapid and bihemispheric reorganization of neuronal activity in premotor cortex after brain injury. *Journal of Neuroscience*, *41*(44), 9112-9128. https://doi.org/10.1523/JNEUROSCI.0196-21.2021

Nasios, G., Dardiotis, E., & Messinis, L. (2019). From Broca and Wernicke to the Neuromodulation Era: Insights of Brain Language Networks for Neurorehabilitation. *Behavioural Neurology, 2019*, 9894571. https://doi.org/10.1155/2019/9894571

Negrini, S., Arienti, C., & Kiekens, C. (2020). Usual care: the big but unmanaged problem of rehabilitation evidence. *The Lancet*, *395*(10221), 337. https://doi.org/10.1016/S0140-6736(19)32553-X

Negrini, S., Arienti, C., Pollet, J., Engkasan, J. P., Francisco, G. E., Frontera, W. R., ... & Edenfield, E. E. (2019). Clinical replicability of rehabilitation interventions in randomized controlled trials reported in main journals is inadequate. *Journal of Clinical Epidemiology*, *114*, 108-117. https://doi.org/10.1016/j.jclinepi.2019.06.008

O'Donnell, L. J., Daducci, A., Wassermann, D., & Lenglet, C. (2019). Advances in computational and statistical diffusion MRI. *NMR in Biomedicine*, *32*(4), e3805. https://doi.org/10.1002/nbm.3805

Olszewska, A. M., Gaca, M., Herman, A. M., Jednoróg, K., & Marchewka, A. (2021). How musical training shapes the adult brain: Predispositions and neuroplasticity. *Frontiers in Neuroscience*, *15*, 630829. https://doi.org/10.3389/fnins.2021.630829

Paquet, A., & Vaivre-Douret, L. (2019). Apport de l'évaluation développementale neuro-psychomotrice auprès d'enfants avec un Trouble du Spectre de l'Autisme. *Corps & Psychisme*, *2*, 143-157. https://doi.org/10.3917/cpsy2.074.0143

Patterson, F., Fleming, J., & Doig, E. (2016). Group-based delivery of interventions in traumatic brain injury rehabilitation: a scoping review. Disability and rehabilitation, 38(20), 1961-1986. https://doi.org/10.3109/09638288.2015.1111436

Prigatano, G. P. (2013). Challenges and opportunities facing holistic approaches to neuropsychological rehabilitation. *NeuroRehabilitation*, *32*(4), 751-759. https;//doi.org/10.3233/NRE-130899

Prigatano, G. P., Klonoff, P. S., O'Brien, K. P., Altman, I. M., Amin, K., Chiapello, D., ... & Mora, M. (1994). Productivity after neuropsychologically oriented milieu rehabilitation. *The Journal of Head Trauma Rehabilitation*, *9*(1), 91-102. https://doi.org/10.1097/00001199-199403000-00011

Puig, J., Ellis, M. J., Kornelsen, J., Figley, T. D., Figley, C. R., Daunis-i-Estadella, P., ... & Essig, M. (2020). Magnetic resonance imaging biomarkers of brain connectivity in predicting outcome after mild traumatic brain injury: a systematic review. *Journal of Neurotrauma*, *37*(16), 1761-1776. https://doi.org/10.1089/neu.2019.6623

Raimo, S., Iona, T., Di Vita, A., Boccia, M., Buratin, S., Ruggeri, F., Iosa, M., Guariglia, C., Grossi, D., & Palermo, L. (2021). The development of body representations in school-aged children. *Applied Neuropsychology: Child, 10*(4), 327-339. https://doi.org/10.1080/21622965.2019.1703704

Reinersmann, A., & Lücke, T. (2018). Zum Zusammenhang zwischen Körperschema und sozio-emotionalem Verhalten bei umschriebenen Entwicklungsstörungen der Wahrnehmung und Motorik. [Body schema, multisensory integration and developmental disorders.]. *Fortschritte der Neurologie, Psychiatrie, 86*(4), 233-241. https://doi.org/10.1055/s-0043-119797.

Resch, C., Rosema, S., Hurks, P., de Kloet, A., & van Heugten, C. (2018). Searching for effective components of cognitive rehabilitation for children and adolescents with acquired brain injury: a systematic review. *Brain Injury*, *32*(6), 679-692. https://doi.org/10.1080/02699052.2018.1458335

Rivière, J. (2010, March). L'évaluation des soins en psychomotricité: la thérapie psychomotrice basée sur les preuves versus la psychomotricité relationnelle. In *Annales Médico-psychologiques, Revue Psychiatrique 168*(2), 114-119. Elsevier Masson. https://doi.org/10.1016/j.amp.2007.12.021

Rodriguez, M. (2022). Panorama de la recherche en psychomotricité. *Perspectives Psy*, *61*(1), 33-41. https://doi.org/10.1051/ppsy/2022611033

Salas, C. E., Gross, J. J., & Turnbull, O. H. (2019). Using the process model to understand emotion regulation changes after brain injury. *Psychology & Neuroscience, 12*(4), 430-450. https://doi.org/10.1037/pne0000174

Schultz, R., & Tate, R. L. (2013). Methodological issues in longitudinal research on cognitive recovery after traumatic brain injury: evidence from a systematic review. *Brain Impairment*, *14*(3), 450-474. https://doi.org/10.1017/BrImp.2013.24

Sebastianelli, L., Versace, V., Taylor, A., Brigo, F., Nothdurfter, W., Saltuari, L., ... & Nardone, R. (2017). Functional reorganization after hemispherectomy in humans and animal models: What can we learn about the brain’s resilience to extensive unilateral lesions?. *Brain Research Bulletin*, *131*, 156-167. https://doi.org/10.1016/j.brainresbull.2017.04.005

Sherman, R. E., Anderson, S. A., Dal Pan, G. J., Gray, G. W., Gross, T., Hunter, N. L., LaVange, L., Marinac-Dabic, D., Marks, P. W., Robb, M. A., Shuren, J., Temple, R., Woodcock, J., Yue, L. Q., & Califf, R. M. (2016). Real-World Evidence - What Is It and What Can It Tell Us?. *The New England Journal of Medicine, 375*(23), 2293-2297. https://doi.org/10.1056/NEJMsb1609216

Shields, C., Ownsworth, T., O’Donovan, A., & Fleming, J. (2016). A transdiagnostic investigation of emotional distress after traumatic brain injury. Neuropsychological Rehabilitation, 26(3), 410-445. https://doi.org/10.1080/09602011.2015.103777

Slomine, B., & Locascio, G. (2009). Cognitive rehabilitation for children with acquired brain injury. *Developmental Disabilities Research Reviews*, *15*(2), 133-143. https://doi.org/10.1002/ddrr.56

Smits, A. R., van Zandvoort, M. J. E., Ramsey, N. F., de Haan, E. H. F., & Raemaekers, M. (2023). Reliability and validity of DTI-based indirect disconnection measures. *NeuroImage: Clinical*, *39*, 103470. https://doi.org/10.1016/j.nicl.2023.103470

Sotiropoulos, S. N., Jbabdi, S., Xu, J., Andersson, J. L., Moeller, S., Auerbach, E. J., ... & Wu-Minn Hcp Consortium. (2013). Advances in diffusion MRI acquisition and processing in the Human Connectome Project. *Neuroimage*, *80*, 125-143. https://doi.org/10.1016/j.nicl.2023.103470

Stampanoni Bassi, M., Iezzi, E., Gilio, L., Centonze, D., & Buttari, F. (2019). Synaptic plasticity shapes brain connectivity: implications for network topology. *International Journal of Molecular Sciences*, *20*(24), 6193. https://doi.org/10.3390/ijms20246193

Staudt, M. (2007). (Re-) organization of the developing human brain following periventricular white matter lesions. *Neuroscience & Biobehavioral Reviews*, *31*(8), 1150-1156. https://doi.org/10.1016/j.neubiorev.2007.05.005

Šćepanović, M., & Nikolić, S. (2015). Postupci u korektivnom defektološkom radu. *U Tematski zbornik radova VI međunarodne naučno-stručne konferencije „Unapređenje kvalitete života djece i mladih”,* 19-21.

Tates, R. & Perdices, M. (2017). Avoiding bias in evaluating rehabilitation. In B.A. Wilson, J. Winegardner, C. M van Heutgen & T. Ownsworth (Eds.). *Neuropsychological Rehabilitation: The International Handbook* (pp 547-559). Routledge.

van den Heuvel, M. P., & Sporns, O. (2019). A cross-disorder connectome landscape of brain dysconnectivity. *Nature Reviews Neuroscience*, *20*(7), 435-446. https://doi.org/10.1038/s41583-019-0177-6

Weuve, J., Proust-Lima, C., Power, M. C., Gross, A. L., Hofer, S. M., Thiébaut, R., ... & MELODEM Initiative. (2015). Guidelines for reporting methodological challenges

and evaluating potential bias in dementia research. *Alzheimer's & Dementia*, *11*(9), 1098-1109. https://doi.org/10.1016/ j.jalz.2015.06.1885

Wilson, B. A. (2011). 'Cutting edge' developments in neuropsychological rehabilitation and possible future directions. *Brain Impairment*, *12*(1), 33-42. https://doi.org/10.1375/brim.12.1.33

Wilson, B.A. (2017). The development of neuropsychological rehabilitation. In: B.A. Wilson, J.Winegardner, C.M van Heutgen & T. Ownsworth (Eds.). Neuropsychological Rehabilitation: The International Handbook. Routledge, p 6-17

Wilson, L., Horton, L., Kunzmann, K., Sahakian, B. J., Newcombe, V. F., Stamatakis, E. A., von Steinbuechel, N., Cunitz, K., Covic, A., Maas, A., Van Praag, D., Menon, D., & CENTER-TBI participants and investigators (2021). Understanding the relationship between cognitive performance and function in daily life after traumatic brain injury. *Journal of Neurology, Neurosurgery & Psychiatry*, *92*(4), 407-417.

Xing, Y., & Bai, Y. (2020). A review of exercise-induced neuroplasticity in ischemic stroke: pathology and mechanisms. *Molecular Neurobiology*, *57*(10), 4218-4231. https://doi.org/10.1007/s12035-020-02021-1

Yang, J., Gohel, S., & Vachha, B. (2020). Current methods and new directions in resting state fMRI. *Clinical imaging*, *65*, 47-53. https://doi.org/10.1016/j.clinimag.2020.04.004

Zilić, F., & Šečić, A. (2022.) Značaj psihomotorne reedukacije u usvajanju sheme tijela kod učenika sa intelektualnim teškoćama. *Multidisciplinarni pristupi u edukaciji i rehabilitaciji, 4*, 229-235.