A decorative background pattern consisting of thin, light blue lines forming a circuit board layout. The lines are vertical and horizontal, with small circles at the ends, resembling a printed circuit board (PCB) design. The pattern is most dense on the left and right sides, with some lines extending towards the center.

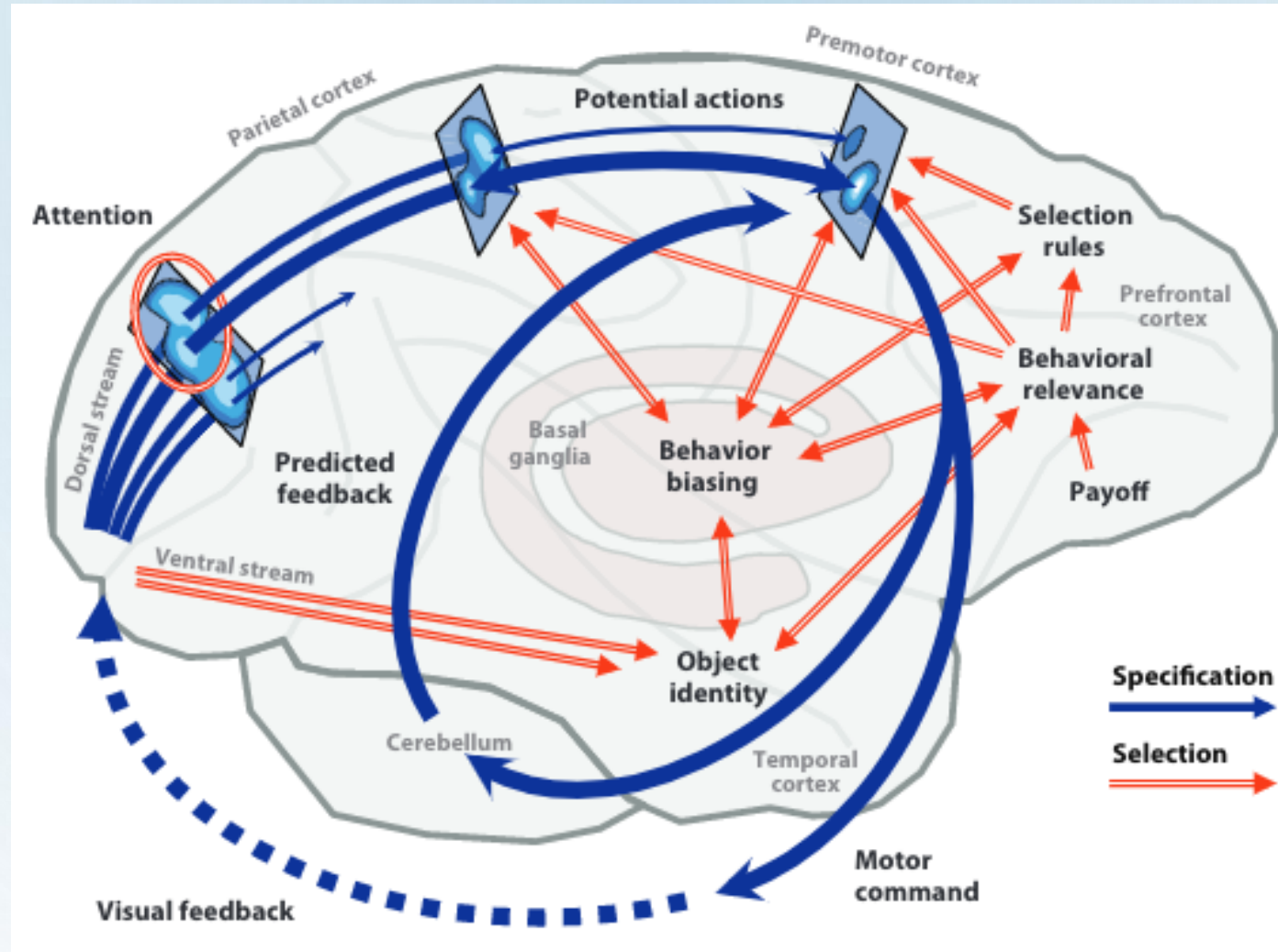
Age-related loss of early grasp affordance when viewing a safety handle

• Doug McDannald

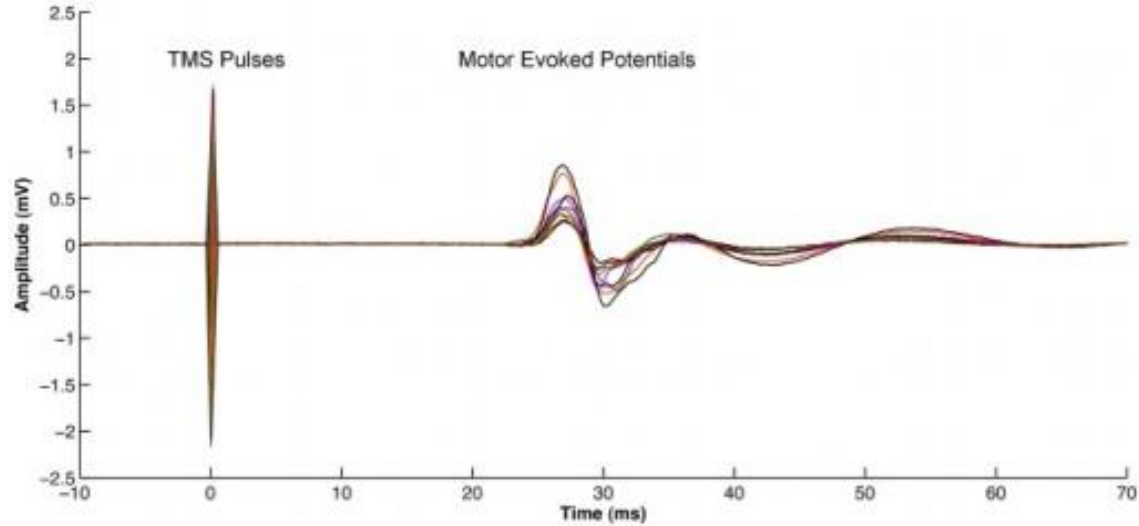
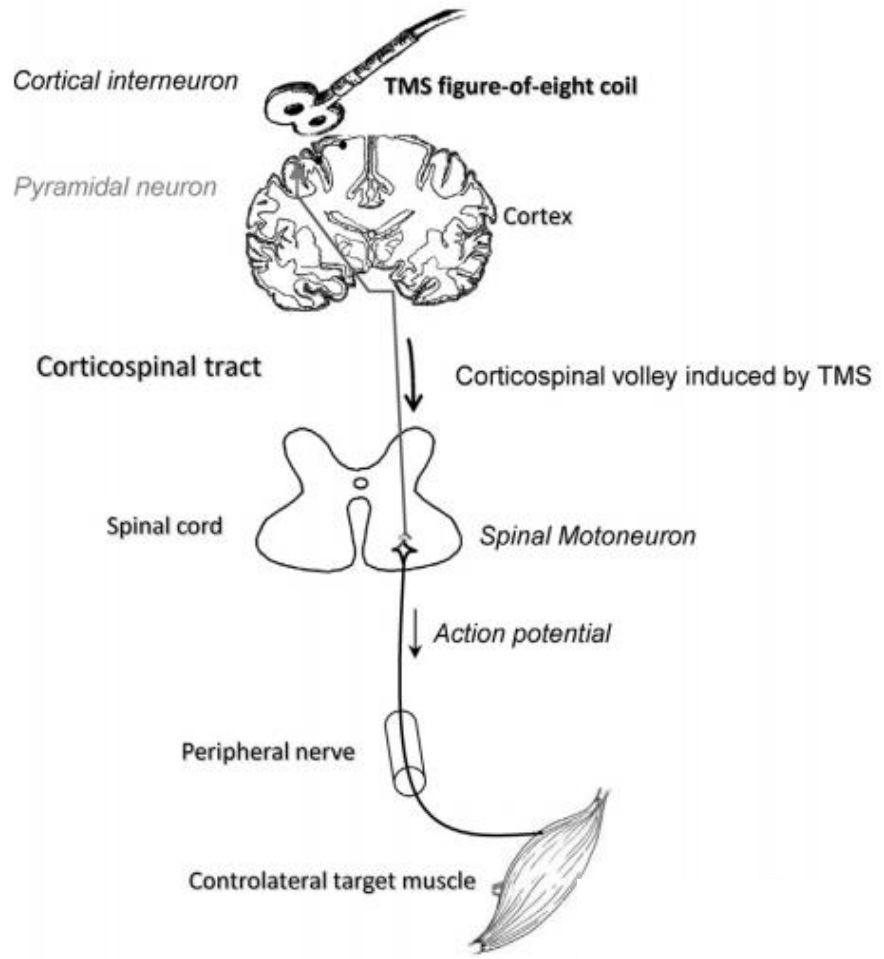
Affordance

- James Gibson – 1979
 - “the opportunities for action that the environment presents to an animal”
 - When we observe objects in close proximity, we also quickly process it in terms of how we can interact with it.

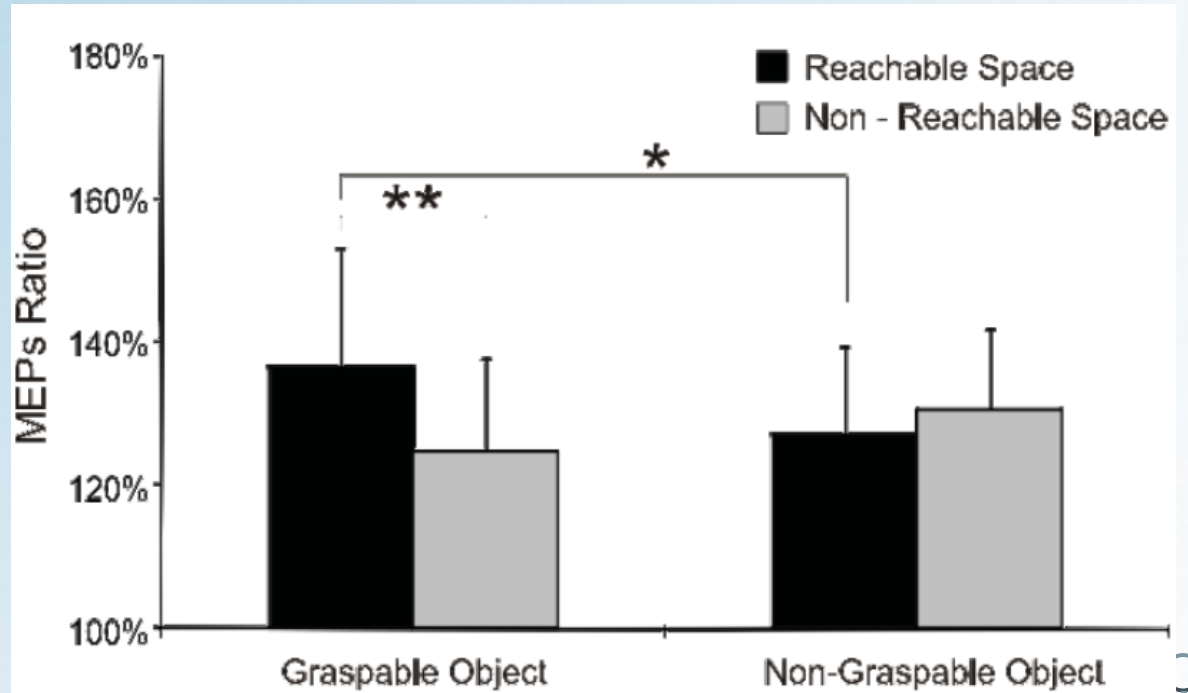
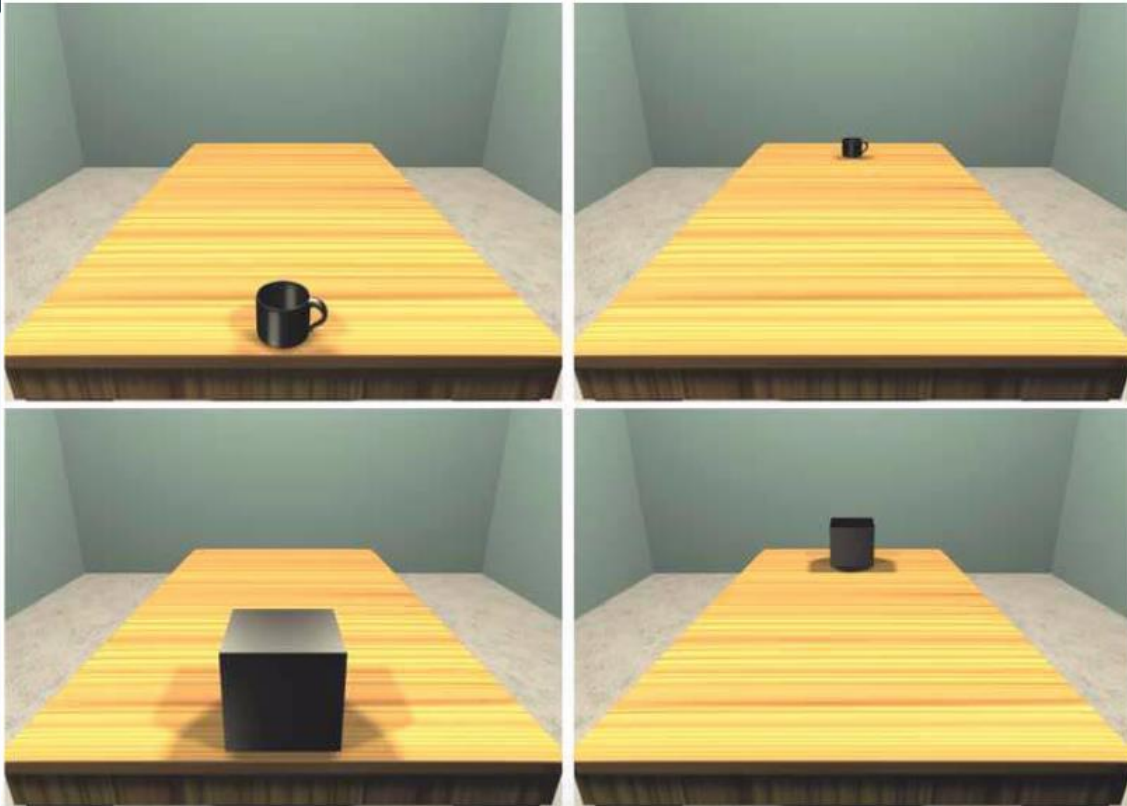
Proposed Affordance Competition Hypothesis Pathways



Principles of TMS

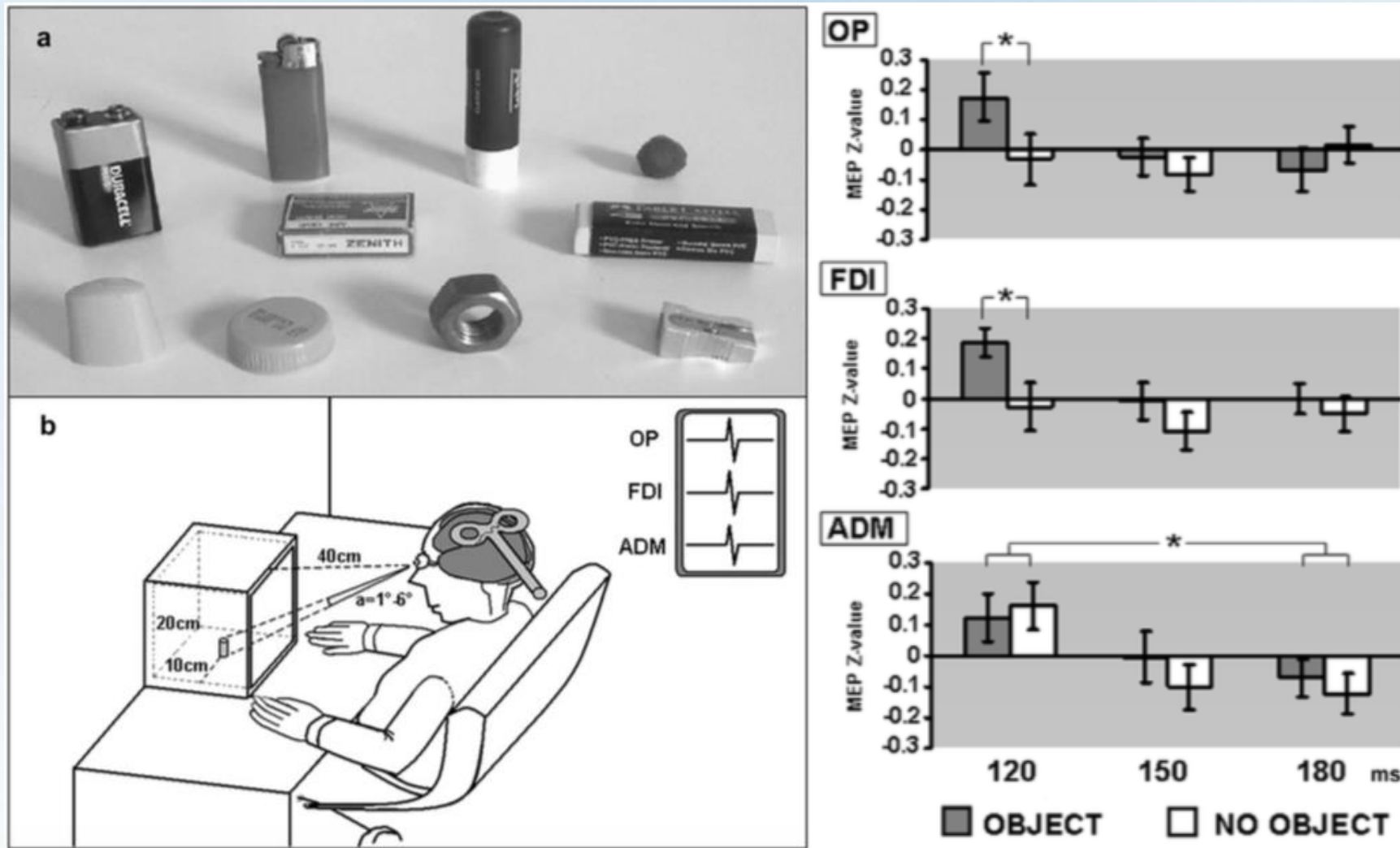


Affordances and Proximity

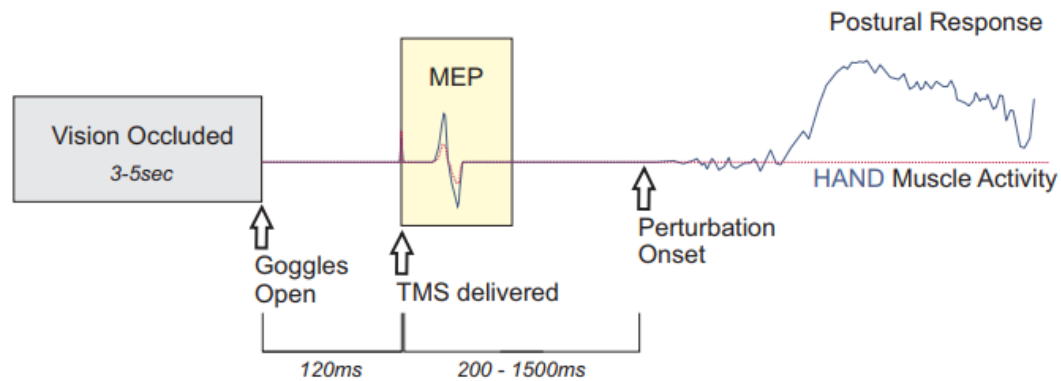


Cardellicchio 2011

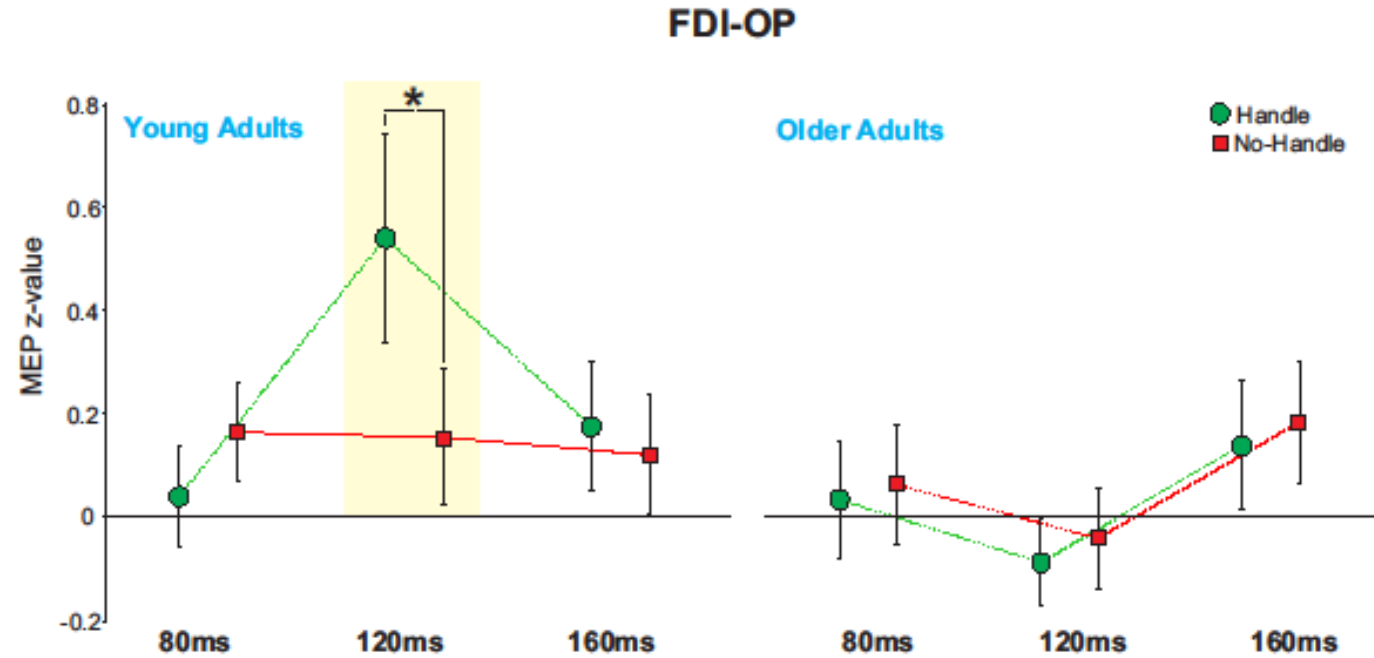
Facilitation Timing During Observation



Our Experimental Conditions



Facilitation Timing During Reach-to-grasp



- Akram, S. B., Miyasike-daSilva, V., Ooteghem, K. V., & McIlroy, W. E. (2013). Role of peripheral vision in rapid perturbation-evoked reach-to-grasp reactions. *Experimental Brain Research*, 229(4), 609–619. <https://doi.org/10.1007/s00221-013-3624-z>
- Bolton, D. A. (2015). The role of the cerebral cortex in postural responses to externally induced perturbations. *Neuroscience and Biobehavioral Reviews*, 57(Journal Article), 142–155. [https://doi.org/S0149-7634\(15\)00232-8](https://doi.org/S0149-7634(15)00232-8) [pii]
- Bolton, D. A., Patel, R., Staines, W. R., & McIlroy, W. E. (2011). Transient inhibition of primary motor cortex suppresses hand muscle responses during a reactive reach to grasp. *Neuroscience Letters*, 504(2), 83–87. <https://doi.org/10.1016/j.neulet.2011.09.001>
- Bolton, D. A., Williams, L., Staines, W. R., & McIlroy, W. E. (2012). Contribution of primary motor cortex to compensatory balance reactions. *BMC Neuroscience*, 13(Journal Article), 102-2202-13–102. <https://doi.org/10.1186/1471-2202-13-102>
- Buccino, G., Sato, M., Cattaneo, L., Rodà, F., & Riggio, L. (2009). Broken affordances, broken objects: A TMS study. *Neuropsychologia*, 47(14), 3074–3078. <https://doi.org/10.1016/j.neuropsychologia.2009.07.003>
- Cardellicchio, P., Sinigaglia, C., & Costantini, M. (2011). The space of affordances: A TMS study. *Neuropsychologia*, 49(5), 1369–1372. <https://doi.org/10.1016/j.neuropsychologia.2011.01.021>
- Cattaneo, L., Voss, M., Brochier, T., Prabhu, G., Wolpert, D. M., & Lemon, R. N. (2005). A cortico-cortical mechanism mediating object-driven grasp in humans. *Proceedings of the National Academy of Sciences of the United States of America*, 102(3), 898–903. <https://doi.org/10.1073/pnas.0409182102>
- Cheng, K. C., McKay, S. M., King, E. C., Tung, J. Y., Lee, T. A., Scovil, C. Y., & Maki, B. E. (2009). The moveable handhold: a new paradigm to study visual contributions to the control of balance-recovery reactions. *Gait & Posture*, 29(2), 339–342. <https://doi.org/10.1016/j.gaitpost.2008.08.011>
- Cisek, P. (2007). Cortical mechanisms of action selection: the affordance competition hypothesis. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 362(1485), 1585–1599. <https://doi.org/U80M22400060R56R> [pii]
- Cisek, P., & Kalaska, J. F. (2010). Neural mechanisms for interacting with a world full of action choices. *Annual Review of Neuroscience*, 33(Journal Article), 269–298. <https://doi.org/10.1146/annurev.neuro.051508.135409>
- Ellis, R., & Tucker, M. (2000). Micro-affordance: The potentiation of components of action by seen objects. *British Journal of Psychology*, 91(4), 451–471. <https://doi.org/10.1348/000712600161934>
- Franca, M., Turella, L., Canto, R., Brunelli, N., Allione, L., Andreasi, N. G., ... Fadiga, L. (2012). Corticospinal facilitation during observation of graspable objects: a transcranial magnetic stimulation study. *PloS One*, 7(11), e49025. <https://doi.org/10.1371/journal.pone.0049025>
- Fuster, J. M. (2008). *The Prefrontal Cortex* (Vol. 4th). Academic Press.
- Gage, W. H., Zabjek, K. F., Hill, S. W., & McIlroy, W. E. (2007). Parallels in control of voluntary and perturbation-evoked reach-to-grasp movements: EMG and kinematics. *Experimental Brain research. Experimentelle Hirnforschung. Experimentation Cerebrale*, 181(4), 627–637. <https://doi.org/10.1007/s00221-007-0959-3>
- Gibson, J. J. (1979). *The Ecological Approach To Visual Perception*. Boston: Houghton Mifflin.
- Hasbroucq, T., Osman, A., Possamai, C.-A., Burle, B., Carron, S., Dépy, D., ... Mouret, I. (1999). Cortico-spinal inhibition reflects time but not event preparation: neural mechanisms of preparation dissociated by transcranial magnetic stimulation. *Acta Psychologica*, 101(2), 243–266. [https://doi.org/10.1016/S0001-6918\(99\)00007-4](https://doi.org/10.1016/S0001-6918(99)00007-4)
- Jacobs, J. V. (2014). Why we need to better understand the cortical neurophysiology of impaired postural responses with age, disease, or injury. *Frontiers in Integrative Neuroscience*, 8(Journal Article), 69. <https://doi.org/10.3389/fnint.2014.00069>
- Jacobs, J. V., & Horak, F. B. (2007). Cortical control of postural responses. *Journal of Neural Transmission (Vienna, Austria : 1996)*, 114(10), 1339–1348. <https://doi.org/10.1007/s00702-007-0657-0>
- Kammer, T., Beck, S., Thielscher, A., Laubis-Herrmann, U., & Topka, H. (2001). Motor thresholds in humans: a transcranial magnetic stimulation study comparing different pulse waveforms, current directions and stimulator types. *Clinical Neurophysiology : Official Journal of the International Federation of Clinical Neurophysiology*, 112(2), 250–258. [https://doi.org/S1388-2457\(00\)00513-7](https://doi.org/S1388-2457(00)00513-7) [pii]
- Kantak, S. S., Wittenberg, G. F., Liao, W.-W., Magder, L. S., Rogers, M. W., & Waller, S. M. (2013). Posture-related modulations in motor cortical excitability of the proximal and distal arm muscles. *Neuroscience Letters*, 533, 65–70. <https://doi.org/10.1016/j.neulet.2012.10.048>
- Klein-Flügge, M. C., & Bestmann, S. (2012). Time-Dependent Changes in Human Corticospinal Excitability Reveal Value-Based Competition for Action during Decision Processing. *Journal of Neuroscience*, 32(24), 8373–8382. <https://doi.org/10.1523/JNEUROSCI.0270-12.2012>
- Klomjai, W., Katz, R., & Lackmy-Vallée, A. (2015). Basic principles of transcranial magnetic stimulation (TMS) and repetitive TMS (rTMS). *Annals of physical and rehabilitation medicine*, 58(4), 208–213.
- Kujirai, T., Caramia, M. D., Rothwell, J. C., Day, B. L., Thompson, P. D., Ferbert, A., ... Marsden, C. D. (1993). Corticocortical inhibition in human motor cortex. *The Journal of Physiology*, 471(1), 501–519. <https://doi.org/10.1113/jphysiol.1993.sp019912>
- Lakhani, B., Mansfield, A., Inness, E. L., & McIlroy, W. E. (2011). Characterizing the determinants of limb preference for compensatory stepping in healthy young adults. *Gait & Posture*, 33(2), 200–204. <https://doi.org/10.1016/j.gaitpost.2010.11.005>
- Macpherson, J. M., & Horak, F. B. (2013). Chapter 41: Posture. In E. R. Kandel, J. H. Schwartz, T. M. Jessell, S. A. Siegelbaum, & A. J. Hudspeth (Eds.), *Principles of Neural Science* (Vol. 5, pp. 935–959). New York: McGraw-Hill.
- Maki, B. E., & McIlroy, W. E. (1997). The role of limb movements in maintaining upright stance: the “change-in-support” strategy. *Physical Therapy*, 77(5), 488–507.
- Maki, B. E., & McIlroy, W. E. (2007). Cognitive demands and cortical control of human balance-recovery reactions. *Journal of Neural Transmission (Vienna, Austria : 1996)*, 114(10), 1279–1296. <https://doi.org/10.1007/s00702-007-0764-y>
- Maki, B. E., McIlroy, W. E., & Ferris, C. B. (2002). Changes in support reactions for balance recovery. *IEEE Engineering in Medicine and Biology Magazine : The Quarterly Magazine of the Engineering in Medicine & Biology Society*, 22(2), 20–26.