The rise (and fall) of decision-making during increasing physical exercise Wim Notebaert^{1,} Leslie K. Held¹, Marie Van de Walle¹, Ayala Denul¹, Alessandro Colosio² and Jan Boone²

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Background

Yerkes and Dodson's law¹ is at odds with findings in the literature widely reporting benefits of physical exercise (PE) on cognitive performance, primarily in perception, action and working memory tasks. However, protocols widely differ in how they define intensity domains.²

Do we observe the inverted U-shape when using more precise definitions of moderate to heavy intensity domains³ and studying more indirect parameters?











Participants are significantly faster with increasing intensities, but there was no effect on accuracy, in line with previous research.⁵

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Methods N=32





Participants showed the inverted U-shape function in the drift rate parameter, reflecting the highest evidence accumulation at the medium intensities. There was also a linear decrease in boundaries, reflecting less cautiousness at higher intensities. This decrease is not exercise-specific.

Outlook: n-back task with higher intensities (counterbalanced)



Preliminary results (n=15)

GENERAL CONCLUSION

With increasing physical exercise, evidence accumulation (drift rate) initially increases but starts to decrease from VT1 on. Accuracy in an updating task (n-back) also initially increases but decreases above VT1. Can we relate this to poor decision making in high intensity zones/pressure in sports (e.g., crashes in cycling, penalty misses in soccer,...) and can we prevent this?

See <u>www.notelab.be</u> for more

1., Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. 2., Basso, J. C., & Suzuki, W. A. (2017). Brain Plasticity, 2(2), 127-152., 3. Anselmi, F., Cavigli, L., Pagliaro, A., Valente, S. Valentini, F., Cameli, M., ... & D'ascenzi, F. (2021). Scand J Med Sci Sports., 31(9), 1796-1808., 4. Vermeylen, L., Braem, S., Ivanchei, I. I., Desender, K., García-Román, J. M., González-García, C., ... & Notebaert, W. (2023). bioRxiv, 2023-09., 5. McMorris, T., & Hale, B. J. (2012). Brain and cognition, 80(3), 338-351., 6. Ren, M., Xu, J., Li, Y., Wang, M., Georgiev, G., Shen, L., ... & Shan, C. (2023). Neural signatures for the n-back task with different loads: an event-related potential study. Biological Psychology, 177, 108485.