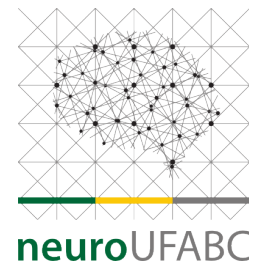


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At the present time, I am 32 years old and an in the Centre for Mathematics, Computation and Cognition at the Federal University of ABC (UFABC) in Brazil. I am one of the founders and leading members of the [Timing and Cognition Laboratory](#). In this research group, our interest is to understand how we perceive and use time in different domains, as perception and action. Our research combines methodologies such as visual psychophysics, computational modelling, single-unit recordings in freely-moving rodents, intracerebral microinjections, and non-invasive electrophysiological recordings (EEG) in humans.

I have a Bachelor's degree in Psychology from the University of São Paulo (2001-2005). During my undergraduate studies I have worked with Prof. Marcus Vinicius Baldo studying a temporal illusion called the flash-lag effect. At the time we used a neural network model to study the basic neurophysiological properties that caused the illusion. We later compared the predictions made by this computational model with behavioural results from visual psychophysics. Our project was awarded with the Juarez Aranha Ricardo award from the Brazilian Society of Neuroscience (SBNc) in 2004 and at the 12th International Symposium of Undergraduate Studies of the University of São Paulo-SIICUSP. Later that year it was also chosen as one of the top ten Undergraduate Studies of the University of São Paulo and was further published in 2008¹.

I kept working under the supervision of Prof. Baldo during my PhD in Human Physiology at the Department of Physiology and Biophysics at the Institute of Biomedical Sciences – USP (2006-2011). During that time, we investigated how causality changes our perception of time. It has been recently shown that events that are causally related are perceived as occurring closer in time. We performed several behavioural studies in humans to understand what were the necessary conditions for this effect to emerge. Briefly, we have found that although causality plays a key role in this effect, others factors also seem to be important, such as temporal predictability and voluntary action². To explain these effects, we started developing a mathematical model to investigate if we use Bayesian statistics to estimate time. Although the model had interesting predictions, we felt, at the time, that it was still too incipient to be published.

¹ Cravo, A. M. A. M., & Baldo, M. V. C. (2008). A psychophysical and computational analysis of the spatio-temporal mechanisms underlying the flash-lag effect. *Perception*, 37(12), 1850–1866

² Cravo, A. M., Claessens, P. M. E., & Baldo, M. V. C. (2009). Voluntary action and causality in temporal binding. *Experimental brain research*, 199(1), 95–9. doi:10.1007/s00221-009-1969-0

Cravo, A. M., Claessens, P. M. E., & Baldo, M. V. C. (2011). The relation between action, predictability and temporal contiguity in temporal binding. *Acta Psychologica*, 136, 157–166. doi:10.1016/j.actpsy.2010.11.005

Cravo, A. M., Haddad, H., Claessens, P. M. E., & Baldo, M. V. C. (2013). Bias and learning in temporal binding: Intervals between actions and outcomes are compressed by prior bias. *Consciousness and Cognition*, 22(4), 1174–1180.

During my PhD I spent one year as a visiting student at the University of Oxford (2009-2010), working under the supervision of Prof. Anna Christina Nobre at the Brain and Cognition Laboratory. During this time, we investigated how we can use temporal information to anticipate upcoming events. There I also had the opportunity to learn how to collect and analyse scalp electrophysiological data (EEG). In our studies we have shown how ongoing brain rhythms are able to entrain to external rhythms and improve perception and action³. After I came back to Brazil, I finished and presented my thesis named [“The cognitive basis of temporal expectations”](#) in January of 2011.

I did a brief post-doc at the School of Medicine at the University of São Paulo (2011-2012) to learn more advanced techniques involved in analysing EEG data. In July of 2012 I was appointed as a Professor at UFABC. In my first year as a professor, I investigated whether we perceive time as continuous or if we perceive it as a discrete sequence of temporal frames. The manuscript reporting the results from this study is now being submitted. Currently, I have a research grant from FAPESP titled [“Neural correlates of temporal learning”](#) where we investigate how we learn new temporal relations between events.

Since I was appointed as a professor at UFABC I have tried, in companion of my colleagues, to study and promote the study of time. In 2013, I was chair of a Symposium named “Rhythms and the brain: How neural oscillations can bias cognition and perception” at the Brazilian Neuroscience Society Conference. Also, I am chair of a mini-symposium entitled “Temporal organization of perception and action” that will take place at the [9th World Congress International Brain Research Organization](#).

As you can see, I have been interested in the study of time for my whole academic career. Apart from experimental papers, I have also had the opportunity to publish a paper and an upcoming chapter discussing methodological approaches of how we can measure our sensation of time⁴. Also, I have co-authored a paper in Scientific American Brazil discussing how physical time relates to subjective time⁵.

³ Cravo, A. M., Rohenkohl, G., Wyart, V., & Nobre, A. C. (2011). Endogenous modulation of low frequency oscillations by temporal expectations. *Journal of neurophysiology*, 106(6), 2964–72.

Cravo, A. M., Rohenkohl, G., Wyart, V., & Nobre, A. C. (2013). Temporal Expectation Enhances Contrast Sensitivity by Phase Entrainment of Low-Frequency Oscillations in Visual Cortex. *Journal of Neuroscience*, 33(9), 4002–4010.

Rohenkohl, G., Cravo, A. M., Wyart, V., & Nobre, A. C. (2012). Temporal Expectation Improves the Quality of Sensory Information. *Journal of Neuroscience*, 32(24), 8424–8428.

⁴ Baldo, M. V. C. , Cravo, A. M., & Haddad, H. (2007). The Time of Perception and the Other Way Around. *The Spanish Journal of Psychology*, 10(2), 258–265.

Cravo, A. M. & Haddad, H. (in press). When is now: Measuring how we perceive instants in time. In L.M. Simão, D. S. Guimarães and J. Valsiner, *Temporality: Culture in the Flow of Human Experience*, Information Age Publishers

⁵ Baldo, M. V. C., Cravo, A. M., & Haddad, H. (2006). Máscaras do Tempo. *Scientific American Brazil*

Ever since my first contact with this field, it has been clear to me that time is an intrinsically interdisciplinary object of study. Therefore, I have been trying to collaborate with researchers from other fields. During my PhD I have proposed, together with two colleagues, a session during the 5th North - Northeast Conference of Psychology (in Brazil) named “Reflections upon the notion of time”. In this session, we discussed different conceptions of time in philosophy, neuroscience and arts. Currently, in our research group, we have members from different areas, as mathematicians, physicists, psychologists and computer scientists. Recently, a new professor have joined our group and will study how perception of time is modulated in visual arts.

I believe I can contribute to this initiative with my previous knowledge in psychological and neurophysiological studies of time and with an incipient experience in studying time from an interdisciplinary approach. Because of my previous experience in neuroscience and experimental psychology I am familiar with several manipulations that can change our perception of time. I believe this can help the discussion of how our subjective notion of time can be changed in different cultures and in different arts. Moreover, I am currently investigating whether our sensation of time is discrete or continuous. I believe this can be a subject of interesting discussions with researchers from fields as physics and mathematics. Finally, I have been interested in how our brains can use oscillations as a mechanism to estimate time. I think this view would benefit greatly with conversations with engineers and computer scientists.

Thus, I have a great interest in being part of the Intercontinental Academia for the study of time and in being able to learn from even a larger number of fields. I am confident this initiative will be of great value for the field and I would be pleased to be a part of it. I will do my best to contribute with my previous experience in neuroscience and experimental psychology.

If you need any further information, please let me know.

Thank you for your time and attention. I look forward to hearing from you in the near future.

Sincerely,

Andre M. Cravo