**Resumo do capitulo de Otta, E. & Bussab, V. (2021).**

**“Empatia, Altruísmo e Comportamento Pró-social”**

This book chapter is an introduction to a psychoethological view on prosocial behaviors. A prosocial behavior is defined by the authors as any behavior realized by an individual A that benefits an individual B, without benefiting the individual A and even sometimes incurring some costs. In order to express the nature of prosocial behaviors, the authors relate to the concepts of empathy and altruism, and present the Perception-Action Model (PAM). The cognitive, afective, developmental and evolutionary perspectives are addressed throughout this chapter. Regarding empathy, the authors distinguish a cognitive perspective from an affective one. They define cognitive empathy as our ability to know how others may feel and what they may think, whereas affective empathy corresponds to the emotional response we have to the emotional states of others. Regarding altruism, it is defined as a behavior that is costly to the agent and beneficial to the target, in terms of consequences that affect direct fitness, in the lifetime of individuals. Besides, to understand how a seemingly detrimental behavior at the individual level could have evolved in line with Dawin theory of natural selection, the authors briefly describe conceptual mechanisms such as the kinship selection, focusing on the gene level and extended kin, reciprocal altruism, considering future benefits and reputation gains at the individual level, and group selection, considering that selective pressure at the group level would benefit altruistic ones. Then, the authors introduce the PAM which allows the integration of both cognitive and affective empathy with the evolutionary and developmental perspective of altruism. The model is developed on three layers: Motor Mirroring and Emotional Contagion where the observation of a behavioral change in an individual automatically activates the same process in the observer; Empathic Concern and Consolation where the physiological state of an observed individual is transferred to the observer; and Adoption of Perspective and Directed Help where an individual consider the state of another and adjust the behaviors accordingly. The authors adopt a comparative approach with non-human primates and domesticated canines to explore the natural evolution of empathy in relation to the three layers of the PAM. Thus, affective empathy is understood as a bottom-up process involving motor imitation, physiological resonance, and emotional contagion, and cognitive empathy as a top-down process involving reasoning about the state of the other based on conceptual knowledge. Finally, the authors consider the impact of parenting on the development of empathy, reflecting on the multiple neuropsychobiological levels of prosocial behaviors.

**Questões sobre o artigo de Gallese, V., Eagle, M. N., & Migone, P. (2007).**

**“Intentional attunement: Mirror neurons and the neural underpinnings of interpersonal relations.”**

 The first interrogation that came to my mind throughout the reading of this article was “what about experiments on babies?”. In this article, the author expresses the possibility to visually assess anticipation, inference of motor consequences even for third person behaviors. However, I remember articles tracking the eyes movements of babies in order to evaluate their understanding of a situation and suggesting if they had or not a theory of mind. Maybe the methodology impedes the investigation of mirror neurons on babies. Maybe the experimental design actually does not fit, with mirror neurons not indicating which bucket the baby expects to be upturned depending on the third person knowledge of a reward under a specific bucket…

I wonder what would happen if there is such a situation with a false belief of a reward under a green bucket, whereas it is in fact under a blue one, and that we show alternatively one bucket to the baby, using a video experiment for instance. Would the mirror neurons of “reaching for the bucket” would fire by just showing a bucket with an expected reward hidden? If yes, in the case of the false belief, would the baby have mirror neurons firing when she thinks the third person will upturn the bucket, or only when the bucket with the reward appears on screen? Then we may be confused by what mirror neurons firing for the third person expected to upturn the green bucket, and mirror neurons firing in anticipation of the baby’s action that wishes to upturn the blue bucket with hidden reward. If neuron firing from observation and neuron firing from self-anticipation can be differentiated, such as in intensity for instance, it would seem interesting to investigate further babies' anticipation.

More generally, upon the conclusion of the article, it makes me wonder how subjective our perception of the world may actually be? If we perceive others' experiences by simulating it with ourselves and analyzing the embodied simulation, striking biases appear. First, our simulation may, and certainly is not a fidel replication of the observed individual. When observing someone in pain, it is counter-intuitive to think that we simulate the same level of pain. It would most probably not be adaptive as well. Thus, it seems more that we replicate the nature of the observed experience, such as simulating pain for pain, joy for joy, etc, at expected lower levels of intensity. Just to have a taste, not the full dish. But the second bias occurring would be the cognitive interpretation of the simulated experience. Typically, one could attribute very different intensities or valances to emotions or experiences from what the observed individual experiences. For instance, upon cutting the tip of a finger, one can have a reaction that would be interpreted as strong pain by some observers and as low pain by others. I mean to say that our empathetic experience seems strongly impacted by our personal experience. It seems an obvious consideration but the environment passes through the filter of the self and we appear to perceive realities depending on how we constructed this self. I previously thought that at least some environmental stimuli like light, pressure, heat,... would be straightforward information, without filter and directly analizable. Now I perceive better the complete subjectivity of the representation of realities and its obvious limits such as we only can perceive what we know. Consequently, poorer is our variety of experiences in the world, less accurate will be our interpretation of other states. The most we have felt, and the best we can approximate third person experiences. But besides expanding our interpretative repertoire throughout our previous personal experiences, it remains that we may perceive as we want to. I mean to say that a depressed person may only consider a limited set of her own repertoire to interpret observed experiences through embodied simulation. It really occurs to me that perception is at least a two-level filter with additive limitations. This mental state filter, or mood filter for a lighter version, seems indeed quite limiting our interpretative repertoire. Do we perceive the world how we feel? From a personal experience, it does feel like my perception of the world evolves depending on my mood or my mental state. Yet, third person interpretations appear much less impacted by my personal state than physical experience such as sunheat on my skin. In a good mood I will feel the intense heat and brightness of the sun whereas in a bad mood I would not. However, even if I seem able to perceive sadness in a third person, this perception may be minimized by a good mood or even misinterpreted in anger if I am in an angry mood. It could be that the embodied simulation informs our self on the *nature* of the observed stimuli while the cognitive interpretation will allow us to infer the *intensity* through contextual and declarative information. Nevertheless, the interpretation of embodied simulation is suggested to be mistaken with our personal feelings and body state. The influence of how we feel on how we perceive the world is even more obvious in this sense.