CHAPTER 6

Predictive Timing for Rhythmic Motor Actions in Schizophrenia

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1 Introduction

Time is a common word, used frequently in our everyday language. It appears in many expressions: “I killed time playing cards,” “Let’s take time to talk,” “I did two things at the same time.” However, even if used by all, the word Time refers back to a complex phenomenon that is difficult – even impossible – to define. To this a priori simple question: “What is time?” the theologian Saint Augustin answered: “If no one asks, I well know; but if someone poses me the question, and I try to reveal my thoughts, I realise that I in fact do not know” (Les Confessions de Saint Augustin, Livre xxI, chapitre xiv, traduit de Moreau, 1864, édition 1942).

Time has the ineffable character that reveals its existence only through a construct of the mind (Kant, 1845). Hence, Kant’s understanding of Time infers two distinct phenomena: a physical absolute time and the psychological subjective time, the later being the only one sensitive to a distorted mind.

The physical time, encapsulated in the real number “t,” would correspond to that defined by Newton as Absolute Time: “Absolute time, without reference to anything external, flows uniformly” (1726 (1987), p. 408). Two concepts are here involved: absolute equality of time intervals (“uniform flow”) and less obviously but equal essentially, absolute simultaneity, which is the more pervasive concept that underlies not only physics, but also the notion of past, present, and future. As such, the laws of physics impose to Time the idea of causality with the impossibility to act upon the past (i.e., to modulate events that have already taken place). The causality postulate may be one of the reasons why psychologists have revealed more interest in the study of Subjective time. The question being: “How does a subject experience the passage of Time? What is the experience of my own body as an actor in the past causing the occurrence of an event in the present time? Why can I, under certain situations, lose track of time with
confusions between actions that I am performing and those that are to come in the future?"

It is the case that Time is in the hearts of our daily motor activities. Time helps structure our sensations and thoughts; Time is required for the production of coordinated motor sequences and voluntary interactive behaviours. Because movements involve changes in muscle length over time, motor control and timing are inextricably related. In the present chapter, we will consider the specific case of Motor Timing in Schizophrenia, a pathology affecting the mind and also the subjective experience of the passage of time. We will present a brief overview of the literature on subjective timing in adults suffering from chronic schizophrenia, starting from the patients’ verbatim to the initial empirical data that has been reported. Then, we will present our own work on rhythmic production in schizophrenia to show the importance of developing new paradigms, based on more objective and non-verbal paradigms. We will further try to show that these paradigms have the advantage of providing a better insight on the psychological mechanisms that may be at the origin of the distorted experiences of subjective time and agency in schizophrenia. We will finally conclude on the possible neurocognitive mechanisms that may underlie timing processes required for normalised motor control but that may also be the basis for the emergence of an anchored experience of the present time, psychological experience that is required for the construct of self as a unity of being.

2 Subjective Time in Schizophrenia

The challenge in psychology has been to study the sensation of time, a sensation that has no specific sensory system or organ – contrary to sight, hearing, taste, smell, and touch. A multitude of experimental paradigms have thus been proposed to study temporal processing in mind for: (1) the experience of being through time, (2) perceptual timing, and (3) motor timing. Substantial reviews have been published throughout the years about these diverse approaches (e.g., Bindra and Waksberg, 1956; Grondin, 2010; Repp, 2005). In this section, we will discuss a series of studies that reported the presence of time abnormalities in schizophrenia, with both explicit and implicit measures of temporal processing in the experiential and the sensory domains. But before, we first briefly describe the clinical aspects of the pathology.

2.1 Schizophrenia: The Pathology

Schizophrenia is a chronic, severe, and disabling mental disorder that affects approximately 1% of the population at some point in their lifetime. The