

Recent decades have witnessed increasingly rapid technological advancements. Previously available to a select few, and applied exclusively in scientific research and industry, computers have become an almost indispensable part of human life. They are now a tool not only for work but also for entertainment. Increasingly, young people use them to play computer games. For this reason, there are questions about their effect on the cognitive functioning of players. On the one hand, the positive influence of action computer games on the cognitive functioning of players is mentioned (Bediou et al., 2018), on the other hand, the deficits in the cognitive functioning of people with problematic game use are pointed out (Nuyens et al., 2017; Kuss, Pontes, Griffiths, 2018; Pontes & Griffiths, 2015b).

In the context of the cognitive functioning of players, cognitive control is an important cognitive process. Cognitive control is defined as the ability to adapt behaviour flexibly to the requirements of a task, favouring the processing of information that is relevant in a situation where the information comes from a variety of sources, and strengthening behaviours consistent with the objectives of an action over habitual behaviour and dominant reactions (Chiew & Braver, 2017; Braver, 2012). Cognitive control is an emergent phenomenon resulting from the dynamic interaction between the specialised processing systems in the brain. Furthermore, the dynamic interaction is possible when the context in which the task is performed is known. The context is understood here, among other things, as a knowledge of the operation, instruction and requirements given to a person and a knowledge of the effects of already performed tasks (Chiew & Braver, 2017; Braver, 2012).

Therefore, factors that may modify its functioning about the use of new technologies, in particular, computer games, are being investigated. In this respect, special attention shall be paid to factors such as problematic gaming, action computer games and the game context. However, so far, there are not many studies that would consider the problem of their mutual influence on cognitive control on one theoretical framework. Therefore, Dual Mechanisms of Cognitive Control (Chiew & Braver, 2017; Braver, 2012) has been chosen as one of the most modern approaches to cognitive control.

The first study considers examining a group of six hundred active players. The selection criterion for groups of players will be active playing games during the last year and minimum one gaming hour per week. Each participant will perform an AX-CPT task in three versions (baseline, proactive and reactive; see Gonthier et al., 2016). Also, Internet Gaming Disorder Scale–Short-Form (IGDS9-SF; Pontes & Griffiths, 2015a) to assess problematic gaming and, as in previous research (see Cardoso-Leite et al., 2015), a similarly structured questionnaire will be used to assess engagement in games such as action computer games. Also, depression, media multitasking, and working memory capacity will be control and use as covariates in the analyzed model (see. Cardoso-Leite et al., 2015; Chiew & Braver, 2017).

In the first part of the second study, the selection of players will take place by Internet Gaming Disorder Scale–Short-Form (IGDS9-SF) and a questionnaire about engagement in games. The initial selection criteria will be the same as in the first study. The main selection criteria will be based on the results of the questionnaires above. On this basis, four groups (N = 25 for each) will be created about the problematic use of games and the level of involvement in playing action computer games. Each participant will perform an AX-CPT task in the version using in electrophysiological research (see. Cudo et al., 2018b). Also, this approach will allow for an in-depth analysis of the impact of the game context in each group on cognitive control processes. The subject of the analysis includes electrophysiological data, namely the amplitude of P3b and CNV components (proactive control indicators) and the amplitude of the N2 and P3a components (reactive control indicators).

The issue related to the factors modifying cognitive control is critical for modern science. In particular about new technologies. It includes the search for factors explaining the perception and behaviour of every individual with contact with new media such as computer games. Therefore, it is an inspiration to a deeper and comprehensive understanding of the functioning of the cognitive system of each of us. Also, previous studies provide equivocal conclusions about the factors associated with game use which modifying cognitive control. This is an interesting and important issue that must be resolved. This project is focused on the problematic gaming, action computer games and game context, as the factors which could modify cognitive control differently. If the study confirms the mediation role of problematic gaming in the relationship between action computer game use and cognitive control, it will be empirical support the hypothesis that problematic technology use modifies cognitive control. On the other hand, it may also be an explanation for inconsistent results concerning the influence of action computer game on cognitive control.