A Future Portrait of the Athletic Brain: Animal Neurophysiology of Motor Behavior for Mechanistic Understanding of Human Sport Performance.

Ramses Thivierge

Editorial office, Journal of Neurology & Neurophysiology, Brussels,Belgium

Corresponding Author:
Ramses Thivierge, Editorial office, Journal of Neurology & Neurophysiology, Brussels, Belgium

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ABSTRACT

Sports performances typically serve as examples of adept motor control. In a similar way to how research on neurological patients has influenced early work in cognitive neuroscience, efforts to recognise the brain strategies supporting such manoeuvres might likewise educate us about prevalent conceptions of behaviour. While research on non-human animal models offers invaluable information on the brain dynamics of skilled motor control that is still difficult to obtain in people, recreation sciences have given these mechanisms remarkably little attention.

Similarly, knowledge gained from studying game play may inspire ground-breaking animal neurophysiology investigations, however they have only been partially carried out. Here, we propose that encouraging collaborations between these two seemingly unrelated fields—animal neurophysiology and video game sciences, may also result in mutual benefits. For example, studying the motor control computations in acting animals' neurons by recording and manipulation offers a unique perspective that is undoubtedly relevant to improving athletes' motor skills. In the current article, we also discuss steps for the reverse translation of recreation sciences findings to animal models and the assessment of comparability between animal models of a certain activity and athletes in order to further encourage such transdisciplinary discussion. In the final section of the article, we envision that some techniques created for animal neurophysiology should translate to activity sciences as soon as possible (for example, improved tracking methods) or in the future (for example, novel intelligence stimulation techniques) and should be used to screen and manipulate motor skills.with implications for human performance that go well beyond sports.

INTRODUCTION

Many recreational performances appear aesthetically pleasing and surprisingly easy. Such achievements are driven by complex dynamics involving cerebral control and body mechanics. Here, we make the case for a more favourable interaction between game neuroscience and non-human (henceforward, animal or basic) neurophysiology, to provide benefits for both fields, i.e., behavioural effect in activity and cell mechanisms in animal studies, towards a more in-depth understanding of the nature of motor performance [1].

Considering the Central Nervous System (CNS) as a computer unit creating flexible movements, many sporting gestures can be seen as remarkable examples of expert motor control. This makes them extremely relevant for a range of disciplines, including cognitive neuroscience.

Unsurprisingly, research on the brain underpinnings of gaming performance has increased interest in biomedicine and human physiology. Traditional physiological research concentrated on processes like tiredness, with the long-held idea that it was a muscular limit. This belief is now somewhat challenged by research suggesting that, in addition to physical tiredness, the nervous system is also worn down. In the past, games were extensively evaluated in biomedicine as interventions that either promoted or harmed health. In the first scenario, games model increased levels of physical activity with the typical intervention goal being the avoidance of non-neural illnesses linked to sedentary lifestyle, whereas the present focus has been on using recreation as a way to market "brain health."

In the second instance, recreational activities (especially contact sports like boxing or American football) have increased risks for stressful CNS accidents, and it is possible to predict the severity of behavioural impairments based just on the intensity of the head effects. Additionally, epidemiological data support the hypothesis that some athletes, particularly soccer players, are more likely to develop beneficial neurodegenerative disorders like amyotrophic lateral sclerosis [2].

The establishment of activity neuroscience has been aided by the discovery of behavioural and neurological differences between novice and expert athletes as part of a more recent research line that seeks to understand the brain roots of motor performance. This new field heavily draws from the norms and practises of cognitive neuroscience and activity psychology. , and the incorporation of concepts and/or tactics emerging from neurophysiological research will most likely provide a ground-breaking stimulus towards a mechanistic perception of the neurological underpinnings of human performance.

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