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Letter to the Editor

Looking into Central Governor Theory

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Some philosophers of science make distinction between researchers who put emphasis on experiments (empiricists) and those who try to propose theories (rationalists).[1] Even though the great majority of the scientists look for evidence to support their theories, that is impossible because of the induction logic failure.[1] This failure happens because, through this kind of logic, it is impossible to talk about absolute truth, the only thing that can be talked about is statistical probability. What the scientists should do is demonstrate theory mistakes with empirical tests. Those theories, which could be refuted through evidence, are in agreement with the demarcation criterion between science and metaphysics.[1]

The scientific knowledge evolution occurs by correcting those theoretical mistakes, or by replacing that theory for another one with more complete and/or precise predictions.[1] Sometimes several researchers cannot correct those mistakes, thus they use the relativism to explain their failure. For them, science is built with a deal among scientists to accept one theory or "paradigm". Sometimes a crisis happens, because these paradigms do not work for all scientific community. Because of such crisis, those paradigms must be changed. That is Kuhn's scientific revolution.[2] In this case, those scientists are being pessimistic with the possibility to reach the objective truth. Unhappily, that strategy is used to support the Central Governor Theory (CGT).[3]

One very important issue to help us choose the best theory is about its informative content. It is important to remember that the whole probability of one theory is equal to the product of each enunciate probability.[1] In this case, if the scientist makes good previsions with an extensive theory, that must be quite similar to the truth. This is because such theory has a very low probability to happen at random. That means, this theory must have a high truth content, low false content or both.[1]

Instead of this, Noakes[4] proposed one theory with more information, testable hypothesis and better previsions, he interpreted the literature evidence to rebuttal Hill's theory.[5,6] He based his reasoning on oxygen uptake plateau ($VO_{2plateau}$) occurrence or absence.[4,7] First, he wrote against the ergometric protocol used by Taylor et al[8] to show the $VO_{2plateau}$. For him, that treadmill protocol didn't reproduce the suitable motor recruitment that happens while running on the field.[7] But this motor recruitment didn't test directly Hill's theory.[5,6] When Noakes[4] did his literature review, he didn't choose compatible protocols with the previous theory. These protocols needed to use large muscular groups, during steady state and independent effort loads, at sea level, to show in the inhaled air what happens in muscle metabolism. The graduated continuous effort test was created to save time. On the other hand, there was no direct evidence of CGT occurring[4,7] during fatigue with or without $VO_{2plateau}$, but the fatigue always happened few moments after this last phenomenon.[8] The 2nd evidence that he used was about the opiate-inhibitor (malaxones), which increased the sense of the effort and interrupted the exercise.[7] Even though it could happen, that was a different situation and didn't refuse directly the previous theory. The 3rd evidence was about muscle partial oxygen pressure (PO_2) during maximal effort. Noakes[4] affirmed that was continuously higher than mithocondrial critical PO_2, even during the maximal effort.[7] He forgot to discuss the great variation in those data caused by the place, depth and reliability of the muscular biopsy or near infra-red spectroscopy (NIRS). The next evidence that he proposed was about the brain oxygenation measured by NIRS.[7] But that exam addressed a little and superficial area in the brain and there was difficulty to link this

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brain blood perfusion during the fatigue with and without $VO_{2plateau}$. The lactate paradox was the 5th evidence.[7] This phenomenon could not refute the previous theory because lactate production could be stimulated even by epinephrine or by isquemia. The last evidence that he proposed was about the low integrated electromyogram activity during maximal effort at high altitude.[7] That exam didn't address central nervous system (CNS) and that evidence should be interpreted like a peripheral fatigue.

In conclusion, the CGT cannot propose more previsions and/or previsions with more precision than Hill's theory. The first theory doesn't give an hypothesis directly tested. Its author does not propose one statement incompatible with CGT and creates one experiment to check if it happens. Until now, there has not been new equipment or procedure to give evidence that truly refuses previous theory and CGT can resist. Finally, there are no advantages to change from Hill's theory to Central Governor Theory, because the last one has a lot of epistemological problems and that is supported by skeptical or pessimistic views about the truth and knowledge.

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