



Comment on “Biological Background of Block Periodized Endurance Training: A Review”

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Dear Editor,

In his book *‘The Demon-Haunted World: Science as a Candle in the Dark’*, eminent astronomer and philosopher Carl Sagan advocates for the maintenance of healthy levels of scientific scepticism, and promotes the necessity of unbiased critical thinking. Within this text, Sagan also proposes his, politely labelled, ‘Baloney Detection Kit’, a collection of guidelines protecting us from the pitfalls habitually confounding our interpretations of reality [1].

Prominent amongst these pitfalls are:

- *Observational selection*—the acceptance of favourable findings for a low threshold of evidence, while unfavourable findings are diminished or ignored.
- *Non sequiturs*—the construction of superficially rational chains of reasoning, which on closer inspection are missing critical links.
- Violations of the principle of parsimony, better known as *‘Occam’s razor’*—the heuristic urging us to always select the least speculative hypothesis adequately explaining a given set of observations.

Here, we apply Sagan’s lens of scientific scepticism to the rationale supporting “Block periodization’s (BP) superiority as an endurance planning model” in Prof. Issurin’s *Sports*

Medicine review [2]. As word count is limited, we confine our comments to five BP claims.

- Is BP Supported by Training Studies?

In the article’s Introduction [2], BP is specifically characterised as the “... sequencing of specialized block mesocycles (accumulation, transmutation, realization) directed at developing a minimal number of compatible targeted abilities”, and that the “Methodological aspects of BP preparation have been considered in several publications that have verified its effectiveness”. Yet the publications cited as verifying BP’s effectiveness are both previous books by the author.

Later, in Sect. 3, a number of studies are offered as validating the efficacy of BP. On closer inspection, however, it seems these studies investigated a different phenomenon; specifically, the sudden introduction of clusters of high-intensity training (HIT) sessions into habituated training schedules [2]. In citing such studies as supporting BP, the assumption seems to be that HIT and BP are equivalent concepts; yet this is clearly not the case. As noted in the review, BP is a planning methodology characterised by the specific sequencing of distinctly focussed block mesocycles. High-intensity training, in contrast, is a training modality that has, since Nurmi and Zatopek and until Radcliffe and Kipchoge, been an ever-present ingredient of elite endurance training programmes [3, 4]. Crucially, however, although HIT is a key feature of endurance programmes, how it is integrated into planned training patterns varies widely. Accordingly, the observation that HIT benefits endurance performance seems indisputable; how HIT is best organised to optimise endurance improvements, in contrast, is far from clear. So does evidence demonstrating the benefits of HIT (a specific training tactic) verify the superiority of BP (a generalised planning strategy)? Your answer depends, we suggest, on whether or not you impartially apply Occam’s razor.

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- Does Current Molecular Science Support BP?

The references provided in Sect. 5 discuss general findings relating to molecular-level exercise adaptations and do not, with one exception [5], specifically address the molecular underpinnings of BP [2]. Importantly, this singular BP-specific citation explicitly concludes that “at this stage, *BP provides an alternative strategy to train (and not a superior alternative)* [our italics] that can be used to complement traditional models” [5]. Thus, the only review to specifically examine the worth of BP as an endurance-training planning model, from a molecular perspective, expressly states that it provides an alternative, but not a superior, method of training. Thus, when we read “this practice has found strong support in molecular biology”, and that “BP provides a rational solution ... for an *optimal* [our italics] improvement rate for targeted athletic abilities” (statements supported by the citation of two books and a 1988 paper in Russian, all by the author), it is difficult not to interpret these as overly enthusiastic conclusions based on the preferential observational selection of a limited evidence base.

- Is the Efficacy of BP Supported by Theories of Biological Adaptation?

In Sect. 2, the concepts of homeostatic regulation, stress adaptation and supercompensation are highlighted as “fundamental theories of human adaptation” determining the content of block mesocycles [2]. These theories, however, do little more than capture the obvious, informing us that imposed stress induces an adaptive compensation and that some stress is good, whereas too much or too little is bad [6]. These theories are too vague to provide specifically actionable guidelines; they do not appear to justify any particular periodisation approach and have, in fact, been variously interpreted by different periodisation theorists as validating their personal planning philosophies [7–9].

Later, when this section concludes that “Powerful stress reactions suppress and disrupt homeostatic regulation and have a deleterious effect on the development of basic athletic abilities”, few would disagree. The next sentence, however, subsequently suggests that, “Thus, implementing extensive and sport-specific intensive training programs in appropriate block mesocycles, as proposed by the BP concept, helps avoid such conflict” [2]. Is the conclusion of the second sentence supported by the logic expressed in the first? Or, alternatively, is this an unsubstantiated conceptual leap (in Sagan’s terms, a *non sequitur*) extending beyond the rationale and evidence provided (specifically, two books by the author, two papers over 90 years old and unrelated to athletic training, one paper in German and another in Russian)? The observation that the persistent misapplication of training stressors ultimately leads to some form of maladaptation

seems irrefutable; why this realisation specifically supports BP over and above other reasonable training schemes, however, remains unexplained.

- Does Contemporary Understanding of Hormonal Exercise Responses Support BP?

The intertwining genetic and environmental legacies underpinning exercise-induced hormonal responses are undeniably complex [10–12]. This complexity is not, however, reflected in the rationalisation of evidence presented in Sect. 4 [2]. For example, the primary support for the pivotal claim that accumulation block mesocycles “leads to a pronounced secretion of testosterone and increased androgen sensitivity in targeted muscles” is a single reference to a 1977 publication. Implicit in this claim is the presumption that increases in this lone hormone will automatically promote beneficial athletic outcomes. This claim, however, when contextualised against contemporary evidence, seems both speculative and simplistic [13–15].

This section concludes with the sentence, “Apparently, that BP approach proposes strong differentiation between programs of appropriate block mesocycles, which makes endocrine reactions of athletes more predictable.” [2]. The implicit assumption here is that endocrine ‘predictability’ is possible, desirable and promoted by BP. However, given that contemporary evidence demonstrates that training-induced hormonal responses are extremely sensitive to both inter-individual and context-dependent modulating influences [15–18], are these assumptions, based on a narrow slice of predominantly outdated evidence (14 of 21 cited references are pre-1995), logically sustainable?

These may appear petty disputes. We highlight them only to exemplify a seeming readiness to accept and promote supportive rationalisations of existing research for a low threshold of evidence, while simultaneously neglecting to consider the bulk and breadth of available scientific insights.

- Does Concurrent Training Negatively Impact Endurance Development?

A summarising statement in the Conclusion section suggests “It is important to note that the widely used practice of concurrent development of aerobic and anaerobic glycolytic abilities provokes conflicting physiological responses ... and suppress(es) the impact of an aerobic program” [2]. Although the concept of ‘interference’ is a key pillar of BP doctrine, the only supporting citation offered is a 1995 textbook. More recent publications, however, while confirming that ‘interference’ effects can happen, illustrate that they are clearly not inevitable and can be avoided, while also demonstrating that appropriately managed concurrent training can provide endurance benefits [19–23].

Is concurrent aerobic and anaerobic training inherently antagonistic, or is this a flawed assumption founded on a *non sequitur* rooted in an observational selection? Can concurrent training be non-interfering and even synergistically additive? Current evidence suggests that the answer to this question is highly context dependent. In short, *it depends*.

- Applying the Sagan Standard to BP Science

None of these arguments are intended as slights on Prof. Issurin. We respect his contributions and congratulate him on another high-profile publication. Similarly, we are not arguing against the potential practical utility of BP, or any other periodised model. We are, however, reminded of the aphorism 'extraordinary claims require extraordinary evidence' (also known as the 'Sagan standard'), which firmly places the burden of proof on those who *propose*. In this instance, we feel the academic narrative presented to support BP does not stand up to robust scrutiny, and that the extraordinary claims made remain unsubstantiated by the less than extraordinary level of evidence provided.

Finally, as a community, we rely on the peer-review process to filter out narratives not offering rational arguments founded in balanced consideration of contemporary evidence. As science-literate practitioners, however, we should not abdicate responsibility and *believe* simply because the narrative is attractive and delivered by an authority in an eminent journal. Ultimately, it is our responsibility to impartially calibrate and maintain healthy standards of scientific scepticism. If not, then we will always be vulnerable to, in Sagan's terms, sports science baloney.

Compliance with Ethical Standards

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