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Baseless Claims and Pseudoscience in Health and Wellness: A Call to Action for the Sports, Exercise, and Nutrition-Science Community

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1 **Baseless claims and *pseudoscience* in health and fitness: A call to action for the**  
2 **global exercise science community**

3

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11 Running Head: Pseudoscience in health and fitness: A call to action for exercise scientists.

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17

18 **ABSTRACT**

19 The global health and fitness industry has an estimated value of USD ~\$4 trillion. Profits are derived from  
20 health club memberships, exercise classes, diets, supplements, alternative “therapies”, and thousands of  
21 other products and services that are purported to improve health, recovery, and/or sports performance.  
22 The industry has expanded at an alarming rate, far outstripping the capacity of federal bodies to regulate  
23 the market and protect consumer interests. As a result, many products are sold on baseless or exaggerated  
24 claims, feigned scientific legitimacy, and questionable evidence of safety and efficacy. This article is a  
25 consciousness raiser. Herein, we explore implications of the enormous mismatch between extraordinary  
26 health and performance claims and the requisite scientific evidence. Specifically, we explore how  
27 *pseudoscience* and so-called “quick fix” interventions undermine initiatives aimed at evoking long-term  
28 behaviour change, impede the ongoing pursuit of sports performance, and lead to serious downstream  
29 consequences for clinical practice. Moreover, *pseudoscience* in health and fitness, if left unchecked and  
30 unchallenged, may have profound implications for the reputation of exercise science as a discipline. This  
31 is a call to action to unify exercise scientists around the world to more proactively challenge baseless  
32 claims and *pseudoscience* in the commercial health and fitness industry. Furthermore, we must  
33 collectively shoulder the burden of ensuring that the next generation of sports and exercise scientists are  
34 sufficiently skilled to distinguish science from *pseudoscience*, and information from mis- and  
35 disinformation. Better sports performance, population health, and the very reputation of the discipline  
36 may depend on it.

37

38 **Key points**

- 39 • The modern health and fitness industry is characterized by an abundance of baseless or  
40 exaggerated claims and widespread *pseudoscience*
- 41 • This has profound implications for population health, sports performance, and the reputation of  
42 exercise science as a discipline
- 43 • This article calls upon exercise scientists to protect the general public, the individuals and groups  
44 with whom we work, and the reputation of the discipline by proactively opposing absurdity,  
45 falsehood, and error in health and wellness

## 46 1 INTRODUCTION

47 The global health and fitness industry is worth an estimated USD \$4 trillion [1]. Profits derive from the  
48 sale of health club memberships, exercise classes, diets, supplements, alternative “therapies”, and  
49 thousands of other products and services that are purported to improve health, recovery, and/or sports  
50 performance. The industry owes its popularity to several factors, including a cultural emphasis on body  
51 and aesthetic ideals [2], and initiatives to improve population health due to overwhelming evidence  
52 showing physical activity as preventive of lifestyle-related disease [3]. However, this global interest in  
53 health comes at a cost. The industry has expanded rapidly, far outstripping the capacity of federal bodies  
54 to regulate the market and protect consumer interests [4–7]. Consequently, marketing regulations are  
55 disturbingly lax: Many products and services are sold on baseless or exaggerated claims, feigned  
56 scientific legitimacy (i.e., *pseudoscience*), and questionable evidence of safety and/or efficacy [6–9].  
57 Furthermore, there is widespread use of placebos among athletic populations [10]. In exercise and health,  
58 bad science and low-quality advice are pervasive; disseminated primarily via unqualified social media  
59 influencers on unvetted information platforms, where harmful misinformation and disinformation are  
60 commonplace [11]. The growing disparity between commercial health and fitness claims and the requisite  
61 scientific evidence represents a profound problem for exercise scientists working in academia and/or  
62 applied practice.

63

## 64 2 THE WIDESPREAD IMPLICATIONS

65 **2.1 Baseless claims and *pseudoscience* in the health and fitness industry undermine initiatives aimed**  
66 **at evoking long-term behaviour change.** Accomplishing most health and/or fitness outcomes requires  
67 not only logic, reasoning, and long-term planning, but also an awareness of deceptive information  
68 practices that equally challenge affective and cognitive abilities [12–14]. Health and fitness marketing is  
69 designed to exploit innate weaknesses in consumer decision-making by promoting short-term, ‘quick-fix’  
70 products [15]. Such interventions are antithetical to the chronic lifestyle changes, typically advocated by  
71 exercise scientists, that are required for lasting and meaningful benefits. By detracting from effective  
72 interventions, *pseudoscience* in health and fitness may be impinging on the ability of sport, exercise, and  
73 public health practitioners to be successful in their roles. Additionally, by perpetuating the illusion that  
74 health can be obtained without investing a great deal of time or effort, commercial products nullify  
75 opportunities to engage with safe and reliable treatments, thereby increasing the likelihood of harm. By  
76 way of example, consider the commercial diet industry, which has estimated annual revenues exceeding  
77 USD \$150 billion in the U.S. and Europe [16]. The data show that fad diets are largely ineffective [16]  
78 and have little benefit on heart health [17]. By encouraging “yo-yo” dieting (i.e., weight cycling), fad diets

79 can also lead to increased morbidity [18,19] and risk of life dissatisfaction and psychopathology (e.g.,  
80 binge eating, food restriction, anxiety, depression, and sleep disruption) [20–23]. Thus, the ongoing  
81 investment of resources in ineffective (unproven) products is harming population health.

82

83 **2.2 Short-term, quick-fix interventions may impede the ongoing pursuit of sports performance.** It is  
84 axiomatic that the most meaningful gains in performance will be obtained through evidence-based  
85 interventions with documented efficacy. Nevertheless, placebo-mediated products (i.e., those with no  
86 active ingredients, whose effects can be attributed solely to the expectation of benefit and attendant  
87 psychobiological mediational processes) [24,25] are used widely in sport as ergogenic aids [24–27].  
88 Despite the apparent utility of so-called ‘placebo products’ to enhance psychological outcomes (e.g.,  
89 confidence, satisfaction), many such quick-fix interventions reinforce the notion of treating symptoms  
90 rather than causes. For example, athletes often turn to taping and compression garments to treat their  
91 injuries rather than engaging in long-term re/prehabilitation programs; exercisers may invest in expensive  
92 supplements to facilitate recovery before strategizing to improve their diets through a more sustainable  
93 ‘food-first’ approach; athletes might invest in expensive technologies to fast-track performance  
94 enhancements instead of optimizing their training programs. By using strategies that merely *seem*  
95 scientific, product manufacturers can further exploit the public for profit. Rather than forgo commercial  
96 interventions altogether, it has been proposed that individuals invest in health and performance aids that  
97 are based on established efficacy *and* powerful expectation/belief effects; scientists and coaches can then  
98 optimize health and performance while retaining their ethical standards [24].

99

100 **2.3 Some commercial products and services are not only unproven but also potentially dangerous;**  
101 **this may have serious downstream consequences for clinical practice.** Complementary and alternative  
102 medicine (CAM) (e.g., chiropractic, acupuncture, homeopathy, reiki, cupping) is used widely in health,  
103 fitness, and sport [26,27]. Between 50-80% of athletes have used alternative “therapies” [28–31] and 88%  
104 of physicians have prescribed them for sports medicine pathologies [32]. However, some specific CAMs  
105 may have demonstrably harmful effects, leading to injury and even death [33–35]. When the anticipated  
106 benefits hinge entirely on the placebo effect, the risks become difficult to justify. Of paramount concern is  
107 that it is unrealistic to restrict ‘placebo products’ solely to the domain of sport and exercise. Inevitably,  
108 such widespread use of CAM will extend to the clinical world. Online databases have documented nearly  
109 400,000 deaths and USD ~\$3 billion of economic damages due to the use of unproven and unregulated  
110 alternative “therapies”, often in place of legitimate medical practice [36]. High-level athletes who use  
111 alternative “therapies” may be compounding the problem by inadvertently disseminating misinformation.

112 Indeed, on the basis that they might be perceived as authorities in health and fitness, many revered  
113 athletes with large social media followings are considered to have pioneered population trends in the use  
114 of CAM [30,37,38]. Thus, the broad use of unproven alternative “therapies” in health and fitness may  
115 have critical downstream implications for physicians and clinical exercise professionals working to  
116 implement science-based medicine.

117

#### 118 **2.4 Baseless claims and *pseudoscience* in health and fitness directly affect the reputation of exercise**

119 **science as a discipline.** There is a stark incongruence between the substance of many commercial health  
120 and fitness claims and the evidence cited in support of them; moreover, when studies are presented as  
121 evidence-for-efficacy, they tend to be low quality and at a high risk of methodological bias [9]. Low  
122 standards of evidence in the health and fitness industry reflect poorly on the exercise sciences due to a  
123 perceived interconnectedness between the two entities. It also suggests that the principles, ethics, and  
124 evidence-based practices underpinning exercise science are being poorly translated to the commercial  
125 world. Indeed, in an open letter to science researchers, Nobel Prize-winning psychologist Daniel  
126 Kahneman asserted that being associated with a controversial and suspicious discipline may harm  
127 graduate and professional employment opportunities in an increasingly competitive job market [39].  
128 Researchers, practitioners, and governing bodies have thus far been apprehensive to challenge  
129 *pseudoscience* and misinformation in health and fitness; and have even condoned its use (deliberately or  
130 inadvertently). By opting not to challenge illusory science, the discipline of exercise science commits  
131 ethical or logical errors. The phrase *primum non-nocere* (first, do no harm) is a well-accepted ethical duty  
132 of medical and many scientific professions. The responsibility to act in accordance with this guiding  
133 principle also requires scientists to challenge and prevent bad science and other harmful practices from  
134 entering the public and professional environments. A failure in this regard may partly explain the  
135 reluctance exhibited by some disciplines (e.g., medical science) to take exercise research seriously. This is  
136 a growing problem given the wealth of literature supporting exercise and physical activity as preventive  
137 of all-cause mortality.

138

#### 139 **3 A CALL TO ACTION**

140 Clearly, baseless claims and *pseudoscience* in health and fitness are not benign phenomena. They are  
141 significant barriers to applied practice [40], education and literacy [41], and a healthy society [42].  
142 Moreover, there are numerous and direct implications for the exercise sciences. If allowed to continue  
143 unchallenged, *pseudoscience* will most likely gain further influence and acceptance in both science and

144 popular culture. Crucially, this is a problem that can only be fixed from the inside. We envisage three  
145 ways that exercise scientists can help remedy this critical issue.

146 First, scientists, academics, and practitioners must be more proactive in vigorously challenging  
147 baseless claims and *pseudoscience* in the commercial health and fitness industry. This means adopting a  
148 more vocal stance in print and digital media (e.g., in scientific journals, mainstream press articles, blog  
149 posts, and podcasts), on social media, and holding vendors and marketers of health, fitness, and sports  
150 products accountable in the "public square" for disinformation (i.e., making claims that are deliberately  
151 misleading and designed to deceive) and misinformation (i.e., inadvertently disseminating false or  
152 inaccurate information). In turn, vendors may be incentivized to provide better evidence for efficacy.  
153 Exercise scientists must also challenge misinformation when it is unwittingly proliferated by consumers  
154 of health products and services. It is important to differentiate between disinformation and misinformation  
155 because addressing the latter requires a more sophisticated and subtle approach [7].

156 Second, the next generation of sports and exercise scientists must be trained (at school, college,  
157 university, and in applied practice) to be better at distinguishing science from *pseudoscience*, and  
158 information from mis- and disinformation, and not just in the domains of health and fitness. While most  
159 undergraduate programs teach classes in Research Methods and elementary statistics (designed for future  
160 *producers* of scientific information), there are few courses specifically structured to critical thinking and  
161 decision making (designed for future *consumers* of scientific information). This is despite research  
162 showing that critical thinking classes that addressed *pseudoscience* produced large and significant  
163 reductions in false beliefs, whereas classes in Research Methods did not [43]. Indeed, studies show that  
164 there is no relationship between pseudoscientific beliefs and understanding of scientific concepts [44,45],  
165 and only a weak negative correlation between pseudoscientific beliefs and science facts [45], suggesting  
166 that improvements in critical thinking are unlikely to occur merely as a by-product of an exercise science  
167 or kinesiology education alone. More specific and targeted approaches are, therefore, required. Given that  
168 critical thinking relies on a set of skills that can only be acquired and honed through extensive and  
169 laborious study and practice (perhaps under expert tutelage), optimal outcomes will only be obtained with  
170 explicit and independent vertical integration of critical thinking and critical appraisal into exercise science  
171 education [46]. This must begin at school, progress through college, and continue throughout professional  
172 development so that graduates and professionals will be better equipped to navigate the world regardless  
173 of their field of study or chosen career.

174 Unfortunately, this may be more difficult than it first appears. Critical appraisal as a requisite skill  
175 for kinesiology professionals is notably absent from the core undergraduate curriculum developed by the  
176 American Kinesiology Association [47], despite it being a key component of training in other health-

177 related fields [48]. In addition, there is a relative disregard for critical thinking in the school curriculum  
178 [49], perhaps because education is often considered a zero-sum game in that there is finite time and  
179 resources to teach a pre-determined program. Convincing governing bodies and universities of the  
180 importance of independent instruction in critical thinking is, therefore, a priority. Current educational  
181 priorities must be reassessed.

182 Finally, it is proposed that exercise scientists increase their awareness and vigilance of, and  
183 engagement with, consumer-based health and fitness products. Thirty-five years ago, Petr Skrabanek, a  
184 physiologist at Trinity College Dublin, noted that the rise of CAM was a reflection that medicine was  
185 lacking a clear “*demarcation of the absurd*” [50]. Certainly, the aim of science is not only to pursue  
186 discoveries and be amendable to new ideas but also to engage in ongoing error-detection and challenge  
187 absurdity and falsehood [50–52]. Given that there are strong links between the dissemination of mis- and  
188 disinformation and unhealthy or harmful behaviours, it is our professional duty to prevent or remove  
189 possible harms in order to protect the general public and the individuals or groups with whom we work.  
190 This can be achieved by fostering a culture in which it is commonplace to engage in critical analysis of  
191 scientific and commercial claims and services. We, the exercise-science community, must shoulder the  
192 responsibility of challenging existing paradigms on which the health and fitness industry is based. In turn,  
193 this may inform better decisions and policies at all levels therein. Better population health, sports  
194 performance, and the very reputation of the discipline may depend on it.

195

## 196 **DECLARATIONS**

### 197 **Ethics approval and consent to participate**

198 Not applicable

199

### 200 **Consent for publication**

201 Not applicable

202

### 203 **Availability of data and material**

204 Not applicable

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207 Nicholas B. Tiller, John P. Sullivan, and Panteleimon Ekkekakis declare that they have no competing  
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214 NBT conceived the manuscript idea. NBT, JPS, and P.E. drafted and edited the manuscript. NBT, JPS,

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