

# Houston, We Still Have a Problem

Martin Buchheit

Apollo 13 was initially looking like it would be the smoothest flight ever. After the explosion of an oxygen tank, however, the astronauts were close to spending the rest of their lives in rotation around the planet. This well-known incident is used to further discuss the link, or lack thereof, between sport-science research and current field practices. There is a feeling that the academic culture and its publishing requirements have created a bit of an Apollo 13–like orbiting world (eg, journals and conferences) that is mostly disconnected from the reality of elite performance. The author discusses how poor research discredits our profession and provides some examples from the field where the research does not apply. In fact, the reality is that sport scientists often do not have the right answers. Some perspectives to improve translation are finally discussed, including a rethink of the overall publishing process: promotion of relevant submission types (eg, short-paper format, short reports, as provided by *IJSP*), improvement of the review process (faster turnaround, reviewers identified to increase accountability, and, in turn, review quality), and media types (eg, free downloads, simplified versions published in coaching journals, book chapters, infographics, dissemination via social media). When it comes to guiding practitioners and athletes, instead of using an evidence-based approach, we should rather promote an “evidence-led” or “informed-practice” approach—one that appreciates context over simple scientific conclusions.

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Apollo 13 was launched at 1:13 PM Houston time on Saturday, April 11, 1970. After months of meticulous preparation, highly skilled and experienced commandant J.A. Lovell and his crew were on their way for the third lunar landing in the history of humanity. Apollo 13 was looking like it would be the smoothest flight ever.<sup>1</sup> When the astronauts finished their television broadcast, wishing us earthlings a good evening, they did not imagine that an oxygen tank would explode a few moments later, rendering them close to spending the rest of their lives in rotation around the planet. While the crew eventually reached Earth safely, I wished to use this well-known incident to further discuss the link, or lack thereof, between sport-science research and current field practices.<sup>2,3</sup> My feeling is that failure to rethink the overall research/publishing process will keep us in orbit *ad aeternum*. That is, the sport sciences as a field will remain at the periphery of elite sport practice.

## Sport Sciences in Orbit

The somewhat extreme point I want to make is that there is a feeling that academic culture and its publishing requirements have created a bit of an Apollo 13–like orbiting world (eg, journals and conferences) that is mostly disconnected from the reality of elite performance.<sup>2,3</sup> For example, how many coaches read publications or attend sport-science conferences?<sup>4</sup> These guys are competition beasts, so if they could find any winning advantage, why would they not read or attend these? The reality is that what matters most for coaches and players is outcome, which is unfortunately rarely straightforward with the sport sciences. As an example, the first thing that Steve Redgrave (5-time rowing Olympian) asked Steve Ingham (lead physiologist, English Institute of Sport) was whether

he was going to win more medals with Ingham’s scientific support.<sup>5</sup> Likewise, the first time I offered some amino acids to Zlatan Ibrahimovic (top Swedish soccer player), he asked me straight up, “Are these going to make me score more goals?” Adding to the problem, support staff in elite clubs often have big egos, and, as recently tweeted by R. Verheijen (Dutch football coach), they often cannot distinguish between experience (which they have) and knowledge (which they do not always have). Such workers often do not want to hear about the evidenced-based approach that we endlessly try to promote,<sup>6</sup> and they devalue the importance of sharing data.<sup>7</sup> They perceive personal development courses and research and development departments as a waste of time and money or as trivial undertakings that sport scientists pursue to promote themselves. To justify such an aggressive attitude against sport sciences, they often cite poorly designed, poorly interpreted, and misleading studies. This is, in effect, an argument that we have to accept.

## Poor Research Discredits Our Profession.

Life has told me that people rarely change. However, I believe that sport sciences can (and should). Today, while we, sport scientists, are rarely asked to land on the moon, the majority of us spend our time and energy building the spaceship. We often do not realize that keeping our feet on earth is the only way we can make an impact.<sup>3</sup> When we meet other sport scientists either at conferences or elsewhere, we talk about papers and PhD defenses and complain about idiot reviewers that we just wrestled with. We rarely chat about winning trophies or helping athletes. The reality we have to accept, however, is that most of our studies cannot help coaches or practitioners, and in fact some of our investigations are so illogical that they directly discredit our profession and keep us 36,000 km in the sky. Which conditioning coach working in a club is naïve enough to believe that muscle metabolite contents could predict match running performance, knowing the importance of contextual variables (score line, team formation, and position-specific demands<sup>8</sup>)? Which

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physiotherapist could be bothered to look at the recovery kinetics of fatigue markers after a treadmill run, from which all field-specific muscle-damaging actions have been removed? *British Journal of Sports Medicine* surveys often blame practitioners for not following certain interventions believed to be optimal, when in reality, personnel in the field are often implementing things that are more advanced than what the academic “experts” are trying to advise. In addition, poor use of statistics in research often leads to the wrong conclusions,<sup>9,10</sup> which creates confusion in clubs where such benefits might be expected for individual athletes. Poor research and translation keep us in orbit.

## The Research Does Not Always Apply.

There are many situations where (often successful) practitioners and athletes do not apply what the sport sciences might suggest. Does it mean that these people are all wrong? Shall we systematically blame all practices that are not “evidenced-based”? With the huge quantity of research produced nowadays, it is easy to find contradictory studies. The findings from 1 day are often refuted the next. So what is “the evidence” in the end? Meta-analyses are likely a part of the answer, but the quality of the studies included and the profile of the populations involved can always be discussed. Should we not be more pragmatic and reconsider the importance of “best practice” instead?<sup>11</sup> Here are some examples of clear disconnects between current practices and scientific evidence:

- There is almost no evidence that massage provides any sort of physiological recovery benefit.<sup>12</sup> Fact: Every single athlete in the world loves to be massaged after competition/heavy training.
- Beta-alanine and beetroot juice have both been shown to have clear ergogenic effects on some aspects of performance.<sup>13</sup> Fact: The majority of athletes cannot be bothered using them because of their constraining ingestion protocols (2–3 doses/d for 4–10 wk for beta-alanine<sup>13</sup>) and awful tastes, respectively.
- Load monitoring has been shown to be key to understanding training and lowers injury risk.<sup>14</sup> Fact: Many of the most successful coaches, teams, and athletes in the world win major championships and keep athletes healthy without use of a single load-monitoring system.
- The importance of sleep for recovery and performance is clearly established.<sup>15</sup> Fact: Professional sport teams often train in the morning the day after an away game, which compromises sleep, mainly for social (time with family in the afternoon) and business (sponsors operations) activities. And they still win trophies.
- Training at the same time of the day as matches may help body-clock adjustments and subsequent performance.<sup>16</sup> Fact: Most professional teams train in the morning for the reasons just mentioned.
- The optimal quantity of various macronutrients to be ingested by athletes has been described for decades.<sup>17</sup> Fact: Most elite athletes have actual nutrition practices that are substantially different from what is prescribed,<sup>18,19</sup> . . . and they still win trophies.

## We Do not Have the Right Answers.

Here is a discussion I had with a colleague a couple of years ago while observing their cold-water-immersion protocol after an away match:

MB: Hey buddy, what’s the temperature of the cold bath?

Physio: (*looking busy*) 9°C

MB: Wow! How long do the players immerse themselves?

Physio: 2 minutes!

MB: Hmm . . . , thanks. Two minutes only? Are you aware of the literature<sup>20</sup> suggesting that it might be best if we can get them to stay for 10 to 15 minutes, with the temperature at 11 to 15°C instead?

Physio: (*rolling his eyes over and looking bothered*) THANK YOU. With 2 bath containers and the bus leaving in 35 minutes, how do you want me to deal with each of the 10 players? They’ve got press interviews and selfies with the fans on their plate before we take off. . . . What temperature do you suggest for 2 minutes then? And while you’re thinking of that, pass me my tape, I need to pack!

MB: . . . . (In fact, as far as I know, none of the ~300 studies on cold-water immersion has addressed this specific question yet . . . **he just sent me back into orbit!**)

This discussion, together with the aforementioned examples of when research does not apply, shows that often, instead of a “what is best” type of answer, practitioners need a “what is the least worst option in our context” type of answer. Do we really need to know the effect of total sleep deprivation on performance? Rather, we need to know if there is a difference between sleeping 8, 6, or only 4 hours but with a catch-up nap in the afternoon. Do we really need to know the effect of a 6-week hypoxic training intervention using repeated all-out cycling efforts 3 times/week, while in most soccer clubs conditioning is systematically done with the ball on the pitch? We are more likely interested in the optimal exercise formats that should be used in the specific context of congested training and match situations or in the minimum volume of high-intensity sessions that is necessary to keep substitute players fit. In fact, it is very likely that an academic would shoot himself in the foot (or send himself into orbit) if he decides alone on the topic of a research question, simply because things are way more complex than he may think.

## How Do We Bring Sport Sciences Back to Earth?

One solution might be for us to start where the questions actually arise (ie, in clubs or federations) and then develop the structures required to conduct applied research, through research and development departments.<sup>21–23</sup> Sport scientists who attempt to apply a degree of scientific rigor in a world of beliefs<sup>3</sup> are more than capable of creating relevant knowledge and best-practice guidance in only a few weeks (Figure 1). This model contrasts with academic research that takes years to reach publication, thereafter remaining inaccessible to the majority of coaches, athletes, and practitioners (eg, paper format,<sup>4</sup> cost of journal subscription<sup>24</sup>). However, this type of in-house research cannot be the only research model for at least 2 reasons. First, club scientists do not always have the opportunity (population, materials, skills, funding) to investigate the questions they may be asked (eg, should players sleep for 6 or 4 + 2 hours after games?). Second, the knowledge that club scientists produce, if any, generally remains inside their clubs. While this is sometimes intentional (trying to keep a competitive advantage over the opposition), club scientists often have neither the need

nor the skills and time to publish papers. For club practitioners, the mission is to improve club practices. A better use of their time than writing papers is to multiply in-house data analysis/research projects. In addition, given the heavy requirements of peer-reviewed research (obtaining funding and ethical approval, need for balanced study designs, control of external variables, large sample sizes, submission processes, and review battles), only tip-of-the-iceberg work ends up being published. In order for the rest of the iceberg to be disseminated outside the club in the name of science, an option might be to offer shorter submission formats that are more accessible for busy club scientists, that is, extended abstracts with figures, which is more or less what most people only have time to read anyway. Case studies, which more reflect the type of data and interest of club practitioners, should also be promoted. In addition, editors should encourage authors to adjust their data for confounding variables when possible, which can help account for the noise related to real-life data collection. For larger-scale projects, clubs must strengthen their links with universities so that their data can be analyzed appropriately, and full papers can be written by academics with the time, experience, and club-level understanding. Similarly, experiments that cannot be conducted at the club level can be continued and refined in the laboratory environment. Only the latter “academic” studies may find their relevance in the real world of applied sport. Nevertheless, even such a club–university partnership may not be as smooth as it looks. The “most rejected paper,”<sup>25</sup> which was only published because we paid for it (with 7 rejections, despite the elite population, the robust study design, the data analysis, and variables measured, including hemoglobin mass and performance) illustrates the failure of the overall publishing process<sup>26</sup> and the difficulties of publishing 100% club-driven research. It is also worth noting that by the time a “club paper” is published, the coaching staff have likely already been replaced, a fact that may limit return on investment.

## Conclusion

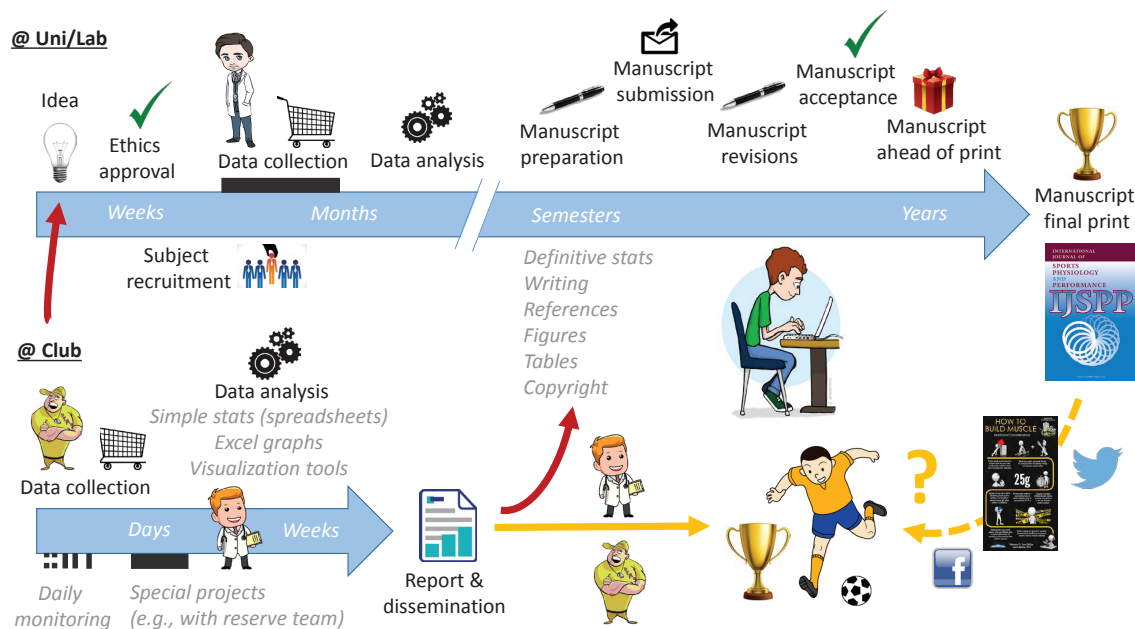
To conclude, if we as sport scientists want to have anything to say about the game that matters, we need to work toward keeping our feet on the earth and produce *better* research—research tailored toward practitioner needs rather than aimed at being published per se. For such research to find its audience, we probably need to rethink the overall publishing process, starting with promotion of relevant submission types (eg, short-paper formats, short reports, as provided by *IJSP*, or the new Web platform “Sport Performance & Science Reports”<sup>27</sup>), improving the review process (faster turnaround, reviewers identified to increase accountability and, in turn, review quality), and media types (eg, free downloads, simplified versions published in coaching journals, book chapters, infographics, dissemination via social media).<sup>24</sup> Once these first steps are achieved, and only after that, club sport scientists may then be in a better position to personally transfer research findings to staff and/or educate athletes.<sup>3</sup> When it comes to guiding practitioners and athletes, instead of using an evidence-based approach, we should rather promote an “evidence-led” or “informed practice” approach, one that appreciates context over simple scientific conclusions.<sup>11</sup>

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**Figure 1** — Possible research processes in both universities/laboratories and clubs/federations. In addition to its likely increased relevance, the “delivery time” is much faster for club/federation- than university-driven research.

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