2006

Sports Science Roundtable: Does Sports Science Research Influence Practice?

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10.1123/ijspp.1.2.161

INVITED COMMENTARY

International Journal of Sports Physiology and Performance, 2006;1:161-168

Sports-Science Roundtable: Does Sports-Science Research Influence Practice?

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As sports scientists, we claim to make a significant contribution to the body of knowledge that influences athletic practice and performance. Is this the reality? At the inaugural congress of the Australian Association for Exercise and Sports Science, a panel of well-credentialed academic experts with experience in the applied environment debated the question, Does sports-science research influence practice? The first task was to define "sports-science research," and it was generally agreed that it is concerned with providing evidence that improves sports performance. When practices are equally effective, sports scientists also have a role in identifying practices that are safer, more time efficient, and more enjoyable. There were varying views on the need for sports-science research to be immediately relevant to coaches or athletes. Most agreed on the importance of communicating the results of sports-science research, not only to the academic community but also to coaches and athletes, and the need to encourage both short- and long-term research. The panelists then listed examples of sports-science research that they believe have influenced practice, as well as strategies to ensure that sports-science research better influences practice.

In an analysis of articles published in 6 leading basic-science journals (25,000 articles), it was reported that only 2% contained some potential claims to future applicability, 0.4% resulted in a clinical trial, and only 0.004% led to the development of a clinically useful class of drugs in the 30 years following their publication.[1] Although it is easy to criticize such retrospective studies, even if the authors were to underestimate the frequency of successful translation into applied use by 10-fold, their findings strongly suggest that the transfer rate of basic research into practice is very low.[2] Even though a similar study has not been conducted with respect to sports-science research, it is likely that the conclusions would be similar.

Despite this, sports scientists continue to claim to make a significant contribution to the body of knowledge that influences athletic practice and performance.

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Is this the reality or are we deluding ourselves? At the inaugural congress of the Australian Association for Exercise and Sports Science, a panel of experts with experience in the applied environment, as well as being well-credentialed academics, debated the following question: Does sports-science research influence practice? The discussion was moderated by David Bishop.

Question 1: How would you define sports-science research?

Gabbett: The most common sport-science research is "basic research" that is predominantly performed by academics and usually published. Basic sport-science research may or may not have an applied outcome. "Applied research" may result in a publication but produces an outcome that is relevant to sport or can be applied in the sporting environment to enhance performance or reduce the incidence of injury. Applied research can lead to technology developments relevant to sport. Technology-based research may or may not be published.

Burnett: Put simply, sports-science research is any research that is conducted in the field of sports science that is related to the improvement of sports performance. This may range from applied research through to basic research. Whether it can be termed applied or not, however, is the main contention.

Farrow: Sports-science research is concerned with providing either prospective or retrospective evidence that improves sports performance. Ideally, prospective work would be predominant. However, there is obviously a need to also continue retrospective work. Similarly, a combination of cross-sectional and longitudinal work is required to meet the aims of both coaches and scientists. Most important, sports-science research needs to be concerned with sport and its athletes. Hence, a study about feedback schedules that uses a non-sport-specific task and untrained university undergraduates as subjects is not sports science.

Newton: There is definitely a place for both basic and applied research because they address long- and short-term objectives, respectively. If the research work contributes in some way to our understanding of how the human performs in sporting activities, preparation for participation, or recovery from playing sport, then in my opinion this constitutes sports-science research.

Question 2: Does sports-science research have to be immediately relevant to the coach/athlete? Isn't it the case that the more we know about how basic mechanistic systems work, the better our advice to athletes will be?[3]

Burnett: In my opinion sports-science research, if it is to be considered applied, should be relevant to the athlete and coach and should be immediately applicable. Alternatively, basic sports-science research does not have to be immediately applicable. The test that I believe defines what is applied sports-science research is whether the scientist and/or coach uses the information gained from the research process to realistically intervene in the training and/or performance of an athlete and improve performance.

Newton: I believe this is an emphatic no, and holding to this contention will slow our progression of knowledge in the sports-science field. Sure, there are research questions that are urgent and can have instant application for the coach and athlete,

but there are also more mechanistic questions that deserve equal attention. Clearly, if ankle injuries have suddenly increased in incidence for a football club and this coincides with a change in boot design, then some rapid, in-the-field, and applied research is called for. By the same token, footwear design will only be advanced with more long-term programs of research addressing everything from movement patterns of specific sports to materials science.[4]

Gabbett: Coaches are likely to be more accepting of sport science and sport-science research if the research has direct relevance to their programs and can be applied immediately. Impatient coaches are likely to require immediate outcomes, while patient coaches are more likely to accept long-term research outcomes. For example, I recently worked with a coach who was very accepting of sport science and encouraged creativity and innovation in his program. Unfortunately, he had such an interest in testing new sport-science initiatives that it was a challenge convincing him to stick with a project for an adequate length of time to determine whether the intervention was really successful.

Farrow: Sports-science research does not have to be immediately relevant. However, if the completion of a research series does not result in an applied outcome that either changes or confirms coaching (training) or playing behavior, then I would consider this *not* to be valuable sports-science research. A good example is cricket research examining the cause of high injury rates in fast bowlers.[5] While the preliminary studies that determined the etiology of the issue were not immediately relevant, it was a necessary first step before continuing with research that coaches may consider of more *immediate* relevance (ie, using elite athletes to address questions interesting to coaches and those trying to make athletes perform better).

Question 3: Could it be possible that much sports-science research is in fact relevant to coaches or athletes and that the problem lies more with the ability of sports scientists to communicate the significance of their findings to the athletic world? Eminent physicist Ernest Rutherford reportedly sent a junior researcher to the local pub with the instructions to explain his thoughts to the barmaid and reputedly said "And if you can't do that, it is not worthwhile." Should sports scientists be spending more time talking to barmaids?

Farrow: I believe communication is at the heart of all good sports-science research and involves a 3-step process. First, a strong relationship needs to be formed between a sport's key stakeholders (coach, athletes, administrators, etc) and scientists before potential research topics of relevance will be either identified or accepted. Second, once a direction has been identified, a scientist has to be able to clearly detail what the project will involve (time frame, demands on coach or players, limitations, outcomes) for it to be executed successfully. Finally, once a project is completed the results need to be articulated to the key stakeholders at an appropriate level of detail/language so that all understand it.

Burnett: In my opinion, a sports scientist must have the ability to communicate his or her findings to anyone. My emphasis would be on the keep-it-simple philosophy. The best sports-science research is no good to anyone if it cannot be applied to the audience it is meant to be directed toward.

Newton: I prefer a model of a team approach to sports-science research in which the key researchers are left to do what they do best while others act as liaisons gathering research questions from the field and disseminating knowledge at the grassroots. I think this is working fairly well here in Australia. In all university departments of sports science I am familiar with, there are certain academics who are predominantly research scholars but also very effective at relaying their latest knowledge to postgraduate and undergraduate students, as well as colleagues who are more teacher/scholars. This provides a rapid path for information spread as these students then graduate to become coaches or sports scientists in their own right and so the information disseminates. At the academies and institutes the conduit between coach and scientist is shorter, and so even greater exchange occurs.

Gabbett: Sport scientists should be able to communicate their ideas to the lay population. However, an inability to communicate scientific ideas to a "barmaid" (or other lay people) may not necessarily mean that the research is not worthwhile. Communication not only involves the ability to convey ideas, but it also involves the ability to actively listen and show a level of interest in a topic. If a barmaid is not interested in sport-science research, then communicating the significance of sport-science research findings will pose a considerable challenge. On the other hand, coaches and athletes are generally extremely interested in research if the findings are likely to be beneficial to their performance. In this context, the ability to communicate research findings to coaches and athletes in a clear and succinct manner is imperative.

Question 4: There is a big difference between being able to "simplify your ideas" and having "simple ideas." Do you see any dangers in the "quick-fix" mentality that some see developing in sports-science research, with many granting bodies calling for research that has immediate outcomes, rather than a long-term plan (which coaches have for their athletes)?

Newton: Absolutely! Groundbreaking findings rarely come out of the blue, but rather from years of dedicated inquiry. To be recognized as an important science we must continue with programs of basic research if we are to answer the "big questions."

Farrow: I do believe funding agencies need to encourage both short- and long-term research objectives by funding both types of research, and yes, there does seem to be a reluctance to fund longitudinal work. However, in many instances the scientists' track records in completing and communicating short-term projects that they have been funded for is poor and most likely deters the granting agency from trusting them with more money over longer time frames. A critical issue often overlooked is that if a group of scientists interested in a particular issue collaborated more proactively, some longer term research problems could be addressed in a shorter time frame, for example, the cricket fast-bowling injury research.

Gabbett: A major limitation of most research is that it employs a cross-sectional research design. As a result, very limited information exists on the long-term development of athletes. The pressure placed on academic sport scientists to publish in scientific journals results in an increased number of cross-sectional studies, while the applied sport scientists working with high-performance athletes and

coaches generally do not have the time to publish or receive appropriate rewards for publishing data (although quite often they have access to several years worth of training data on elite athletes). There is a great need for sport-science research to investigate the factors associated with the long-term development of athletes (including talent-identified athletes through to elite athletes).

Burnett: Conducting sports-science research with a long-term plan of how it will be implemented is certainly the ideal situation. However, in the vast majority of cases this tends not to happen. The reasons for this are way beyond the scope of this roundtable.

Question 5: Can you give one example of how you believe your (or your colleagues') research has influenced practice?

Farrow: Collaborative research I completed with the support of Australian Institute of Sport (AIS) netball coaches and players has resulted in the development of a netball-specific skill-testing battery.[6,7] This battery is now completed annually by netball players in Under 17 and 19 talent-identification squads, AIS, Australian Under 21 squads, and the Australian open team. The results of such testing have provided coaches with objective evidence concerning the specific strengths and weaknesses of the players that has allowed them to refine/further individualize their coaching of these players. It has also created an evidence-based database that can be used in the selection, recruitment, and monitoring of up-and-coming talent. Further research is required to verify that this research is actually influencing performance.

Gabbett: I was recently employed as a performance coordinator for a semiprofessional rugby-league club. Prior to my arrival, the club was experiencing a high incidence of preseason training injuries, which were resulting in significant direct (eg, medical expenses) and indirect (eg, wages lost) costs. Using an injury database, it was determined that the majority of the injuries (37.5%) were sustained in high-volume running activities, while game-specific conditioning activities (skill-based conditioning games) resulted in a low incidence of injury (10.7%). As a result of this research, we changed the way we trained from a traditional, high-volume training program to a game-specific conditioning program. Injury rates were decreased by 50%, and aerobic fitness was improved to a greater extent. In addition, the change in training resulted in increased regional, state, and national representation; a greater number of finals appearances; and a greater number of premierships.[8,9]

Burnett: Professor Bruce Elliott at the University of Western Australia I believe is better than most in sports biomechanics at influencing practice. I was involved with him as a PhD student in the area of low-back injuries in fast bowlers in cricket. The research in this area has been conducted since the late 1980s and has evolved from a series of studies[10-12] that has certainly come up with very concrete recommendations that have influenced policy makers of grassroots cricket. A follow-up study, using an educational process aimed at reducing the mechanical features previously linked to back injury, reported a decreased incidence and/or progression of lumbar-spine disk degeneration in young cricketers.[13]

Newton: There had been a persistent emphasis on maximal strength training using traditional heavy-resistance training, but our work demonstrated significant

improvement in on-field performance by implementing ballistic resistance training with loads of 30% to 50% of 1RM. Interestingly, the research base to this was a series of highly controlled laboratory experiments involving electromyography, biomechanics, and histochemistry to understand the mechanisms that contrast high-power versus high-force movements both acutely and chronically. However, the findings have direct practical applications that have been adopted by many strength-and-conditioning programs for elite athletes.[14-17]

Question 6: What strategies would you suggest to ensure that sports-science research better influences practice?

Gabbett: Before designing a sport-science research project, the researcher should ask whether practice is influencing the sport-science question being asked. Collaboration between academic sport scientists and applied sport scientists working in the elite sporting environment on a day-to-day basis should be encouraged. Researchers must be focused on the performance outcome, rather than the publication outcome. Finally, strategies are required to develop a coordinated national research agenda, and increased efforts should be made to lobby governments for funding of applied sport-science research projects.

Newton: Position stands from professional organizations such as the Australian Association for Exercise and Sports Science can be very helpful in this regard. Such published documents are generally very well read and represent the opinions of several experts in the field. Scientific journals should continue to support and promote the publication of literature reviews. For research reports, a section at the end of the paper called "Practical Applications" would be useful for 2 purposes. First, coaches and athletes can receive practical advice, and second, this helps the scientists to think more about the practical implications of their research. Sports organizations could place greater emphasis on advisory boards and ensure that there is adequate representation on these boards by sports scientists. The greatest difficulty is often funding for sports-science research. Equipment companies, sporting organizations, and government could be much more innovative in how they support such projects.

Farrow: Research should examine participants with a defined skill level. Currently, most skill-acquisition research has been completed with untrained participants, whereas there is limited work completed with intermediate and high-skilled performers. Actual sports skills should be the experimental task of interest rather than non-sports-specific tasks generalized to sport. Likewise, realistic training/practice conditions should be adopted rather than again attempting to generalize from nonspecific or unrealistic (laboratory) environments that do not exist in the actual sports setting. Ensure that the communication strategies outlined in question 3 are adhered to.

Burnett: To close this gap between the sports scientist and the coach we need the sports scientist to get better educated about matters of coaching, and conversely we need the coach to understand more about sports science. The latter is done through the coaching-accreditation process and the increased tertiary training of coaches. Some sort of mentoring system with a sports scientist would also help. On the other hand, I feel that sports scientists having to coach some sport early in their careers

is an important part of their education. This way they see the bigger picture of coaching an athlete and can relate to everything a coach has to go through.

Summary

Sports-science research was generally agreed to be concerned with providing information that directly or indirectly improves sports performance. This might range from basic to applied research and also includes research that leads to technology developments relevant to sport. When practices are equally effective, sports scientists also have a role in identifying practices that are safer, more time efficient, and more enjoyable. Sports-science research does not need to be immediately relevant to coaches or athletes but should address questions that have the potential to improve performance. There is a need to encourage both short- and long-term research. It is important to communicate the results of sports-science research not only to the academic community but also to coaches, administrators, and athletes. Although most sports scientists can describe research that they believe has influenced practice, there is little evidence that this is actually occurring.

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