Special Issue on Psychophysiology and Neuroscience in Sport: Final Thoughts

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Consistent with the *Journal of Clinical Sport Psychology*’s mission, the current special issue on psychophysiology and neuroscience in sport has brought together a variety of timely papers exploring the relationship between physiological processes and both sport performance and personal well-being. These final thoughts observe patterns noted among the papers in this issue, highlight future research directions, and most importantly, clarify where this emerging technology and its associated procedures currently stand in the evidence-based practice of clinical sport psychology.

*Keywords:* evidence-based, psychophysiology, neuroscience, sport, athlete

Fundamental to the development of any health and human service profession that seeks to consider itself evidence based is theoretically informed innovation followed by careful research and development. Sport psychology has struggled with innovation over the years, as its core intervention model of psychological skills training (PST), which evolved directly from the coping skills based cognitive behavior modification approaches of Meichenbaum (1977) over 30 years ago has remained essentially unchanged. Despite a lack of empirical support for the efficacy of PST (Gardner & Moore, 2007; Moore, 2003, in press), it remains the most commonly used set of techniques for many practitioners of sport psychology, and unfortunately, reviews continue to suggest its use for the purpose of athletic performance enhancement while ignoring the dearth of scientific evidence. Importantly, one of the biggest problems that has emanated from this myopic view of sport psychology has been the lack of consideration/acceptance of new theoretical models, innovative approaches, and empirical findings that might lead us to provide better services to our athlete clients.

It is thus notable that in this special issue of the *Journal of Clinical Sport Psychology*, which was organized by special issue Guest Editor, Len Zaichkowsky, we were able to bring together a number of papers that have utilized innovative...
approaches that rely on cutting edge technology in psychophysiology and neuroscience to help us better understand the psychology of human performance, offer new possibilities for performance enhancement interventions, and suggest new and hopefully efficacious approaches for enhanced diagnosis and management of head injury in sport.

The application of cognitive neuroscience, in both research and practice, has evolved rapidly within clinical psychology over the past decade, and we are excited to have the opportunity to bring preliminary research, using a variety of innovative technologies such as fMRI, hormonal measurement, and a variety of biofeedback technologies to the contemporary sport psychology literature.

Reading the collection of papers included in this special issue has suggested a number of important issues requiring careful consideration.

**Issue 1**

What is immediately apparent upon reading this fine collection of papers in this special issue, and what must be clearly stated at the outset of this discussion, is the degree to which the study of psychophysiology/biofeedback in sport is in its infancy. It needs to be understood that the relationships between competitive performance and the physiological processes such as perceptual-cognitive skills, heart rate, skin conductance, electroencephalography, and the variety of cortical processes, all discussed in this special issue, are still essentially theoretical. The connection between these processes and competitive performance outcomes awaits further empirical study. Thus, the preliminary suggestions made in some of these papers, namely that modifying physiological processes could result in competitive performance enhancement, are also open empirical questions (which the authors regularly point out). Perusal of the papers in this issue utilizing various forms of biofeedback as part of a sport psychology intervention program clearly suggests that at present, there are not yet enough compelling data by which to support the use of biofeedback procedures in the day-to-day practice of sport psychology. That is, while the studies included in this special issue certainly provide ample suggestion as to how these technologies might theoretically be related to performance and/or psychological well-being, and certainly provide a guide as to how these interventions might work and might be included in comprehensive sport psychology programs, they do not at present provide empirical data necessary to recommend their integration into the practice of clinical sport psychology at this time. The data that exist at this early stage of study currently lead to the conclusion that the use of these technologies in sport psychology must be considered experimental and not yet evidence based.

This conclusion is not at all a criticism of the fine cutting-edge work that is being done or the papers contained within this special issue. To the contrary, the authors of these papers and their research-practice groups should be commended for bringing innovation and the beginnings of an important line of empirical research to a field badly in need of innovation and applied research. Truly, a field cannot advance without such innovation, and it does take some time to develop a solid new research base that is grounded upon sound theory and begins to make empirical progress. The conclusion noted above should instead be seen as, first and foremost, a present-time caution to the practitioner. It is tempting, especially in a field that has essentially operated in the same way for a prolonged period of time (with very few exceptions), to allow practice to move ahead of the empirical
research, especially when these emerging technologies can have strong sales support and enticing promotional materials intended to sell its products to a hungry consumer-practitioner. It is therefore imperative that sport psychologists resist the temptation buy into technologies ahead of the data.

**Issue 2**

The above comment notwithstanding, the Beauchamp et al., Faubert et al., and Shaw et al. papers included in this special issue certainly make the case that further study and empirical investigation of biofeedback technologies is warranted and can be performed. While there are research issues regarding sample size, control groups, and outcome measurement, these three papers make a compelling case for the need for, and possibilities of, further research regarding psychophysiology and sport. We are very eager to see the evolution of this exciting area!

As with any other psychological intervention, (a) there must be a clear theoretical connection between the intervention and the anticipated outcome; (b) the intervention must demonstrate efficacy when compared to a control group and ultimately an alternative intervention; and finally, (c) there must be some empirical identification of the precise mechanism by which the intervention works. The papers by Beauchamp, Harvey, and Beauchamp (2012), Faubert and Sidebottom (2012), and Shaw, Zaichkowsky, and Wilson (2012), provide preliminary efforts to include and evaluate a variety of biofeedback approaches in real-world practice situations. While the data presented is equivocal, albeit interesting, what is of greater importance is that clear theoretical models and practical applications for integrating biofeedback into sport psychology practice are described. It is hoped that these studies will be extended and expanded in future research to help determine (a) if the promise of psychophysiological (i.e., biofeedback/neurofeedback) interventions for athletic performance can be empirically demonstrated; (b) how best to utilize these interventions in the competitive sport context; and (c) the specific processes by which these technologies, strategies, and techniques may work, with the goal of ultimately developing “best practice” guidelines for use by the sport psychologist. While the studies in this special issue demonstrate exciting promise, it is clear that these three goals for future research in this area are as yet unrealized. As the authors note throughout, there is much work to be done. Their work is a fantastic first step in the process of educating professionals about these emerging areas of science and practice and calling upon researchers to continue investigating these new technologies so that efficacy can eventually be determined.

In essence, it is the conclusion here that the importance of these preliminary intervention papers lies not in the initial findings presented herein, but rather, in the authors’ descriptions of theoretical value along with detailed and systematic methodologies for the use and study of biofeedback/neurofeedback. It is hoped that these papers might serve to promote further empirical evaluation of these exciting technologies.

**Issue 3**

The study by Davis and colleagues (2012) utilizing fMRI and hormone measurement technology provides a fascinating approach to the systematic neuroscientific study of the athletic performance from an integrated psychophysiological perspective,
which may in time offer important implications for the practice of clinical sport psychology.

The use of fMRI as a technology for investigating psychological processes has increasingly been utilized in clinical psychology over the last decade. It is very encouraging to see this technology now being utilized in the study of psychological aspects of sport performance. While there are a number of important aspects to the study by Davis et al., there seem to be several particularly noteworthy aspects of this line of research. First, it is noteworthy that watching self-referenced video of past performances can in fact engage the cortical system to such a measurable degree. Second, it is also noteworthy that the logically anticipated mood states that follow from watching films of better or worse performances can be empirically corroborated. Of course, while the research possibilities going forward are endless, the third noteworthy take-away message from this study is that we must be careful not to draw conclusions beyond the available data. By way of example, we do not know that any particular mood state, and its physiological correlates that precede competitive performance can actually predict performance outcomes. The fact that watching post-competition performance videos results in mood states that can be identified suggests no specific prediction about the relationship between precompetitive mood and performance. A recent review of the literature with regard to mood and performance suggests the lack of clear and consistent relationship (Gardner & Moore, 2006). This technology would, however, help us to understand if in fact there is a precompetitive mood and performance relationship, or as suggested elsewhere, if it is the manner in which the athlete responds to his or her mood state, whatever it may be, that is most important (Gardner & Moore, 2006, 2007). In fact, research suggests that mindfulness interventions have the capability of modifying neural activity and structures without any effort toward or goal of change in experienced emotion (see Marks, 2008, for a review).

In addition, the technology and approach used by Davis and colleagues (2012) may allow us to study the psychophysiological impact and processes of a variety of PST techniques. The psychological processes involved in imagery in particular could be studied using this technology, as this common intervention has been theorized to work in a variety of ways (Vealey, 2007) without offering clear empirical support for the theoretical assumptions (Gardner & Moore, 2006; Moore, 2003, in press).

Importantly, this technology might also allow us to engage in empirical study that would provide information as to how best manage the psychological well-being of high-stress competitive athletes, in that we might better understand the mood changes and psychophysiological responses that athletes have before, during, and after competition and how they might best respond to a variety of intervention approaches. In essence, the Davis et al. paper provides a blueprint for further study and cutting edge neuroscience technology by which psychological processes related to competitive performance can possibly be better and more fully understood.

**Issue 4**

Finally, the paper by Thompson and Hagedorn (2012), along with a portion of the paper by Faubert and Sidebottom (2012) that focuses on cognitive-perceptual assessment and head injury offer timely and intellectually stimulating discussions of a variety of possible psychophysiological tools for head injury diagnosis and management.
The importance of careful consideration of assessment of head injury in sport along with the related issues of rehabilitation and return-to-play decision making can be readily seen by even a casual perusal of recent sports news, which has been filled with stories of high profile head injuries and reports of long-term, often devastating effects of multiple concussions. It is clear that more sensitive, evidence-based assessment procedures for what has become a major problem in the sports world are needed. The head injury segment of the Faubert paper (2012), and in particular the entire paper by Thompson and Hagedorn (2012) in this issue, provide a compelling and coherent argument for the need to consider an expansion of the currently accepted procedures for head injury diagnosis and management. These two papers offer the reader some fascinating possibilities for the future of head injury diagnosis and management in sports. Once again, I stress that the proposals for consideration of new diagnostic and/or rehabilitative procedures for head injury are at this point more theoretical than data based. However, considering the importance of this issue for the long-term well-being of athletes and the positive results of some exciting preliminary studies discussed by Thompson and Hagedorn, the value of this seminal paper lies in its innovative theoretical suggestions and clear guide to future research and development.

We have been pleased to bring the readers of the Journal of Clinical Sport Psychology this interesting and timely special issue and hope that its contents will spur discussion and promote further research and development of what clearly constitutes a promising area for the future of clinical sport psychology. It is our hope that these papers expand the possibilities for the future of clinical sport psychology and reinforce these and other innovative works within our field.

References


