Practitioner perceptions of evidence-based practice in elite sport in the United States of America

ABSTRACT

Practitioners' perceptions regarding the use and effectiveness of research evidence in sport is not well understood. The purpose of the present study was to examine practitioners' perceptions around the use, implementation, and barriers to evidence-based practice (EBP) in sport science in the United States of America (USA). A survey (28 items) was completed by 67 full-time staff who were a physical performance team member employed by universities and/or professional sporting organisations in the USA. Questions included the use of research, contribution of research areas, barriers to accessing and implementing EBP, and methods of feedback to coach and players. All respondents (100%) stated they used research evidence in their performance/training program, ranking research as contributing most (largest contribution = 1 to smallest contribution = 4) to individualised preparation or recovery recommendations (1.98 ± 1.02). The top three preferred sources of information were 'peer-reviewed research' (100% of respondents), 'conferences/seminars' (76%) and 'practitioners within your sport' (63%). Commonly reported perceived barriers between accessing and implementing research were 'lack of staff' (accessing = 33%, implementing = 46%) 'time' (accessing = 38%, implementing = 48%) and non-applicable research' (accessing = 33%, implementing = 37%), whilst "poor player compliance" was a clear barrier to implementing EBP (56%). Practitioners most preferred, and actual, method of feedback for coaching staff (87% for both) and players (94% and 95%, respectively) was 'informal conversations/speaking'. Improved access to educational and financial resources, increased integration of staff in coach settings and understanding of player/coach contexts may help to alleviate barriers to EBP.

INTRODUCTION

Research within sport science disciplines aims to enhance athlete/team performance via its translation into practice(2). Typically, support staff including (but not limited to) strength and conditioning coaches, sport scientists, nutritionists/dietitians, physiotherapists or athletic trainers and medical doctors apply this research during their day-to-day service provision. The result of this process is commonly termed evidence-based (or evidence-informed) practice (6). Whilst the interest in sport science research along with the financial wealth of professional sports teams has increased in recent years (22), many authors recognise there remains a gap in translating research into practice with key stakeholders (i.e. coaches and athletes (2, 3, 17, 24)). For instance, in a survey of 222 Australian National Olympic sport coaches and 125 registered sport science researchers, the majority of research areas of 'benefit to the coach or researcher' differed significantly between coaches and researchers (33). This is concerning given the proposed long-term benefits of an evidence-based approach for both scientific and applied stakeholders as well as the enhancement of the sport science programme (6).

Evidence-based practice is the collated integration of practitioner expertise, athlete values and research evidence aimed to optimise the decision-making process surrounding sport performance (6). The role of a practitioner (i.e. performance staff) who aims to implement evidence-based practice in sport is to apply scientific principles and techniques that assist coaches and athletes to improve their processes surrounding preparation and performance. Indeed, the dynamic between staff and coaches is viewed as important as it can influence player wellbeing, success and the health of the overall workplace (1, 2)). Incorporating these scientific principles include reducing training errors (e.g. injuries or inappropriate training), helping to balance the benefits and risks in decision making (e.g. tactical assistance, recruiting), challenging subjective, belief-based views with objective evidence, and integrating athlete and

coach preferences into decision making relating to training and performance (6). This process is met with many challenges (i.e. funding available, disseminating and administration ability), but overall is considered the ideal route for optimal outcomes for clients, patients, and athletes (1).

One critical part of integrating sport science research into practice is understanding what resources practitioners' access for information. For instance, Australian sport science researchers report preferences for reading scientific articles, networking and attending conferences to 'keep up to date with the latest developments' in their sport (33). Whilst such research defines the resources used to access information, there is little understanding of how practitioners use, transfer and integrate these external sources of information (e.g. research) into everyday practice. Malone et al. (17) examined the perspectives of 93 researchers and practitioners (predominantly from Europe and Australia/Oceania) on collaborative research within team sports. Respondents placed high importance on research that had a high 'application to performance', typically reflecting research that was embedded within a club/organisational setting. However, despite the perceived importance of applied research, the perceptions of practitioners on the characteristics surrounding the use of research evidence (e.g. preferred research areas, contribution of expertise/experience *versus* research evidence) in sport remains unknown.

Perceptions on how to best translate research in to practice may differ between regions of the world, with research to date focusing on respondents from the United Kingdom (18), Australia (33), and areas across mainland Europe (17) (e.g. Portugal and the Netherlands (3)). Interestingly, despite the popularity and investment in North American sports (valued at ~$70 billion in 2018 (22)), there is no peer-reviewed evidence detailing practitioners' perceptions of

the characteristics surrounding the use, implementation of, and barriers to evidence-based practice in the United States of America (USA). Although the employment of sport scientists is in its infancy in the USA compared with other countries such as Australia and the United Kingdom (8), there has been an expansion in high performance teams (i.e. number of sport scientists employed) in recent years (8). Given this recent growth, interest, investment and popularity of American sport, it would be appropriate to compare the similarities/differences between the USA and previously researched countries.

Several barriers can affect the implementation of appropriate, valid and applicable sport science research into practice. Such reasons include a lack of 'applied research' (23, 24), research questions that do not align with coaches' needs (26) and characteristics of the coach himself/herself (i.e. 'buy in' (13), communication (8)). In addition, practitioners commonly report 'funding/cost' and 'time to dedicate' as the two greatest barriers to research collaboration in team sports (17). Despite this knowledge, there remains a limited understanding of the barriers that practitioners face in *accessing* research components of evidence-based practice, and subsequently *integrating* these external sources of information (e.g. research) into everyday practice. Furthermore, there is limited research on how practitioners feedback their knowledge, information and data to coaches and players (30). Since coach and player 'buy in' are critical parts to successful implementation of evidence-based practice (4), such information could help practitioners, coaches and players to provide the best learning environment and design interventions to better fit their perceived needs. Such a process is critical, as sport science information can influence player welfare, athlete/team success and workplace health (2). Therefore, the purpose of the present study was to examine practitioner perceptions of the characteristics surrounding the use, implementation of, and barriers to evidence-based practice in sport science within the USA.

METHODS

Experimental Approach to the Problem

A 28-item survey was designed, tested and used to examine practitioner perceptions of the characteristics surrounding the use, implementation of, and barriers to evidence-based practice in sport science within the USA. This survey was filled out once by full-time members/employees of a physical performance team (practitioners) in a sporting organisation in the USA.

Subjects

Sixty-seven subjects (mean ± standard deviation (SD); age: 33.2 ± 7.7 y) who were full-time members/employees of a physical performance team (practitioner) in a sporting organisation in the USA, received an invitation to participate in a voluntary survey between March-November 2018. The invitation to participate was accompanied by a study information package including information regarding that the study was approved by the local Institutional Review Board, and subjects were informed of the benefits and risks of the investigation prior to providing written informed consent to participate in the study.

Subjects were employed in either professional (n = 36), collegiate (n = 27) or 'other' (i.e. Olympic Centres; n = 4) settings, and worked in a range of sports: soccer (n = 15), American football (n = 14), basketball (n = 11), athletics (n = 9), baseball (n = 5), ice hockey (n = 4), winter sports (n = 2), combat sports (n = 2), and military/tactical forces (n = 2). Three further Subjects worked in 'multiple sports'. The majority (42%) of Subjects had 5-10 years of experience in elite sport. Subjects worked as nutritionists/dietitians (n = 19), sport scientists (n = 19), strength and conditioning/fitness coaches (n = 16), athletic trainers (n = 8), physical therapists (n = 3) and other [i.e. consultants (n = 2)]. There was no further details required by

the study but subjects had to be full-time staff who were a physical performance team member employed by universities and/or professional sporting organisations in the USA. The subjects' position was confirmed by the Chief Investigator and approved for inclusion in the study if so.

Procedures

Using opportunity sampling, the survey was distributed to existing networks of sporting associations, advertised through social media channels (Twitter) and available industry contacts including publicly available email addresses. The survey was available online through a web link hosted by the survey tool, SurveyMonkey (SurveyMonkey, California, USA). One hundred and seventeen survey email (weblinks) were initially sent out to interested parties who fulfilled the inclusion criteria (full-time members/employees of a physical performance team (practitioner) in a sporting organisation in the USA)). Reminder emails were sent 60 days later if the survey was not completed. In total, 67 were completed in full (57% compliance). Data were stored on a secure web server and password protected databases/university computers, accessible only by the Chief Investigator to protect subjects' data identity.

Survey Design

We designed a survey consisting of 28 items to assess elite sport science practitioners' experiences of using and implementing evidence-based practice. The survey was specifically designed for full-time practitioners who worked for an Olympic, professional or collegiate-level sporting team, individual or organisation within the USA. The survey was developed by three members of the research team, two of which have previous experience within high performance sport organisations in the USA. Following initial development, the survey was distributed to the remaining members of the research team for critical analysis and feedback. All members of the research team currently work, or have worked, in high performance sport,

research institutes and/or academic settings. Following further refinement, and for content validity, the survey was piloted with five practitioners who currently work in high performance sport in the USA, but who did not participate in the final data collection, for clarity of information, correct verbiage and likelihood of compliance. In addition, answer options (where applicable) were randomised to limit order effects. Further changes were made to the survey including question reduction, language used in multiple choice options and survey presentation before being redistributed for final approval.

Following the collection of general information (age, years of experience, type of practitioner), an established definition (6) of evidence-based practice was provided: *Evidence-based practice in sport can be defined as the "integration of expertise, values and the best relevant research evidence applied to the decision-making process for the day to day service delivery to athletes". Specifically, within this definition we are interested in how you use, and what value you place, on the integration of research in your day-to-day decision making as a practitioner. Please consider this concept when answering the following questions and how such practice is integrated in your organisation*. Following this definition, the survey was provided. The survey focussed on i) use of research ii) contribution of objective evidence *versus* subjective expertise when using a variety of research areas iii) sources of evidence-based practice iv) barriers to accessing and implementing evidence-based practice and v) methods of feedback to coach and players. The "use of research" section comprised of multiple-choice questions (using 5-point Likert scales) to assess the importance of research to practitioners' profession ("Research is important to your profession?"; *strongly disagree*, *disagree*, *neither agree nor disagree*, *agree* and *strongly agree*) and what areas of research are used in their performance/training program.

Evidence-based practice in the United States

The second section of the survey focussed on what contribution scientific evidence and practitioner expertise/values make to a variety of common research areas. As has been utilised previously (17), practitioners were required to use sliding scales (0-100) to indicate this contribution (0 = *all scientific experience*, 100 = *all personal experience*, 50 = *an equal contribution of both*). Following this section, practitioners were asked for their top five sources of information for using evidence-based practice from a range of multiple-choice options. Practitioners then reported and ranked the barriers (most relevant barrier (e.g. 1) to least relevant barrier (e.g. 10)) they perceived existed in accessing and implementing research components of evidence-based practice within their organisation. The final section of the survey focussed on characteristics relating to feedback of player/team health and performance information to coaching staff and players.

Statistical analyses

Data from the survey was coded as descriptive statistics and is presented as such within the results section. Numerical and closed response data derived from the survey were collated and coded as mean and standard deviation (SD), percentages and frequency counts where appropriate. Answers to the open-ended questions were read several times for familiarisation with the concepts, before being organised and subjected to inductive content analysis(21) by the lead (HF) and second author (LH) as per previous research(10). Similar themes were established as general dimensions before second order themes were developed under assigned descriptive labels. The inductive analysis was then continued until data saturation occurred. Together, both authors independently validated the themes before undertaking peer debriefing to ensure a valid representation of the data had been obtained.

RESULTS

Use of research

Nearly all respondents agreed (60% "*strongly agreed*" and 33% "*agreed")* with the statement that research was important to their profession, while one respondent "*strongly disagreed*". All respondents (100%) stated they used research evidence in their performance/training (science and medicine) program. Specific research areas that practitioners report use in their program are presented in Table 1.

INSERT TABLE 1 ABOUT HERE

Contribution of evidence versus expertise

The contribution of scientific evidence and practitioner personal experience/expertise make to the various research areas are presented in Table 1. The areas of recovery, injury prevention, nutrition, rehabilitation (return to play), strength and conditioning/fitness and training load monitoring showed preferences for scientific evidence rather than using own personal experience when using it in practice (Table 1). Practitioners ranked research as contributing most (largest contribution = 1 to smallest contribution = 4; Figure 1a) to individualized preparation or recovery recommendations (1.98 ± 1.02), followed by optimizing individual player performance (2.16 ± 0.97), confidence in delivering key messages to the coach/athlete (2.60 ± 1.10) and increasing chances of team success (3.25 ± 0.95).

INSERT FIGURE 1A AND B ABOUT HERE

Evidence-based practice in the United States

Sources of evidence-based practice

The preferred sources of information for practitioners when using evidence-based practice are presented in Figure 1b. The top three most preferred sources of information were 'peer-reviewed research' (100% of respondents), 'conferences/seminars' (76%) and 'practitioners within your sport' (63%). General dimensions and second order themes with quotes to support which development(s) in the last 10 years in sport science and medicine research that have had the greatest influence on the applied work respondents have performed at their organisation are presented in Table 2.

INSERT TABLE 2 ABOUT HERE

Barriers to accessing and implementing evidence-based practice

The perceived barriers to *accessing* and *implementing* research components of evidence-based practice are presented in Figure 2. General dimensions and second order themes with quotes to support which (feasible) strategies practitioners suggest could help overcome the barriers which exist that impede optimal access and implementation of research into practice within their respective organisation are presented in Table 3.

INSERT FIGURE 2 AND TABLE 3 ABOUT HERE

Methods of feedback to coach and players

The preferred and actual methods of feedback to coaching staff and players are provided in Figure 3a-b. Practitioners most preferred and actual method of feedback for coaching staff (87% for both) and players (94% and 95%, respectively) was 'informal

conversations/speaking' whilst the least preferred was 'shared access of databases' (coaches: 35% and 19%; players: 24% and 17%, respectively).

INSERT FIGURE 3A AND B ABOUT HERE

DISCUSSION

The purpose of the present study was to examine practitioners' perceptions surrounding the use, implementation, and barriers to, evidence-based practice in sport science in the USA. In general, the majority of practitioners who participated in this survey see value in, and commonly use, research in their performance/training programs, especially for individualized athlete recommendations. Interestingly, the research used in practice arises from different areas and sources, although it appears there are preferences for peer-reviewed evidence in areas such as recovery and injury prevention and rehabilitation, nutrition, general physical preparation and training load management. However, practitioners report several barriers to accessing and implementing evidence-based practice including lack of staffing, time, non-applicable research and poor player compliance and coach buy-in.

Research within applied sport science disciplines aims to enhance athlete/team performance through its uptake by support staff into practice (2). However, practitioners' perceptions regarding the use and effectiveness of research evidence in sport is not well understood. The present study showed that all practitioners use research evidence within their performance programs and 93% thought that research was important to their profession. Interestingly, there is a limited understanding of whether practitioners use and/or value research in other countries or sports. Approximately 80% of Turkish coaches believe research contributes to new ideas relative to their sport (16). These results combined with our study highlight the majority view

of surveyed respondents' belief and use of research, which may be due to various benefits proposed by evidence-based practice including improvements in injury prevention (27) and perceived benefits to improving team health and performance (17). The reason most pertinent to respondents in our study was individualised preparation or recovery recommendations; having important implications for conducting and reporting of future research outcomes in the field of sport sciences (12). Understanding further reasons behind these preferred research views, and cultural contexts which help form these, may help to develop better research questions and strategies applicable to performance in the future (1).

In terms of the areas of research used in their performance/training program, practitioners reported a high prevalence for using research evidence in recovery, injury prevention and nutrition. A similar preference for using research evidence to inform injury prevention and recovery strategies was also reported by Williams and Kendall (33). These authors surveyed 125 Australian sport science researchers with a preference shown towards research dedicated to technique/efficiency of athletes, recovery techniques and reducing the incidence of injury (33). A survey of 93 researchers and practitioners (predominantly from Europe and Australia/Oceania) on collaborative research within team sports showed that both groups considered research that focused on 'application to performance' of greatest importance (17). It is likely practitioners are drawn to the aforementioned areas as they represent populous areas of research (e.g. those with established freely accessible International Olympic Committee consensus statements; nutrition (19), recovery/injury risk (28)) or areas of strong historical context in their sport or country (1). Indeed, results from our study showed that practitioners prefer to use scientific evidence in these areas rather than personal experience, representing an evidence-based (led) approach whereby practitioners seek research evidence to guide what they do in practice rather than implementing strategies without any scientific basis for doing so.

The least used research areas by practitioners in our study were team building/leadership, tactical/strategical components and talent development/recruiting. This is interesting since the use of team building and recruitment strategies has strong historical context in the United States (1). The most plausible reason for the lack of research-based evidence in these areas is that these do not typically fall within an applied practitioner's skills and tasks within these areas may be instead be conducted by a coach, analyst or scout (4). For instance, an important responsibility of coaches in sport is to lead and design a programme which strategically guides their athletes/teams through their careers toward success (15). An alternative view may be that given the increased competitiveness for sport science positions (7) as well as developments in technology and data science (8), applied practitioners may need to expand their skills to cope with the demand from coaches and the industry. An example would be increased role of high-performance managers and the leadership expected in these roles (4). In addition, research shows coaches place more importance on mental training, preparation and team building rather than nutrition and supplementation practices. For instance, 205 Canadian coaches report 'tactical/strategy' and 'mental training and preparation' as the two most likely areas they would look for new ideas (23). Since a practitioners role is to ultimately serve the coach, practitioners would do well to develop skills in these areas (i.e. attending tactical coaching courses or spend additional time in team meetings) to optimize the practitioner-coach dynamic (8). Whilst polymathic sport science practitioners would be advantageous to an organization, having an inter-disciplinary team may also allow for a better quality of delivery and service support in areas such as leadership and tactics that typically fall outside the remit of the sport scientist.

For practitioners to effectively communicate and implement practice within applied environments, they first need to collect relevant information and acquire knowledge.

Practitioners in our study reported preferences for peer-reviewed research, conferences/seminars and learning from practitioners within their chosen sport. Our results provide insight, given they are more akin to perceptions of the preferred learning strategies of sport and university researchers in Australia who place the highest importance on "reading scientific journals" followed by "networking" and "attending conferences"(33). Collectively, these results are surprising since practitioners may be expected to report preferences for alternative methods such as one-on-one, infographics and/or small group conversations given their time demands (17). In our study, many practitioners reported open answer responses that focused on the increased availability of open access to journals and social media/sharing as large influences on their ability to transfer scientific theory to practice. Given part of a researchers role (at least when collaborating with elite sport) is to answer questions that align with coaches' needs (26), our results may have important implications for how research is disseminated and transferred from the academic to the applied setting.

Integrating research into practice is difficult, with several factors influencing implementation (17, 29, 32). In our study, the most commonly reported barriers to both accessing and implementing sport science research into practice was time, lack of staffing, poor player compliance and non-applicable research. These identified barriers concur with research that showed practitioners and researchers perceived time as an impediment to research collaboration and athlete monitoring in elite sport settings (17, 30). Interestingly, coaches perceive time as less of a barrier and rather conservatism in clubs and lack of funding as a larger barrier (3). These perceived dysfunctions in collaboration between science and practice are not uncommon (9). To alleviate this issue, sports organisations could embed research and development (R&D) departments to provide scientific expertise in assessing long-term performance solutions, as well as build new ideas that promote player health and welfare (20).

For example, this could help with commonly reported issues handling and attempting to use large data sets (personal communication). In addition, collaborations between elite sporting teams and universities could help increase the effectiveness, in addition to the efficacy, of research-derived interventions and the uptake of sport science information by coaches (14, 20). Integration of sport science research from the university setting to elite sport could be achieved through direct collaborations (i.e., the shared costs of hybrid research students and practitioners), or the utilisation of qualitative research (i.e., interviews and focus groups) to better ascertain the priorities of coaches and create mutually developed research questions (11).

Practitioners' most preferred and actual method of feedback for coaching staff and players were 'informal conversations/speaking' whilst the least preferred was 'shared access to databases (software)'. Indeed, building relationships with players and coaches present several potential challenges such as context of success, team development and cohesion, the increased drive for sport as entertainment and the financial power of the players and primary sports organizations in the US (1). A preference towards verbal communication methods was expected, since coaches have been shown to prefer informal learning and communication methods as they can acquire information more quickly and efficiently compared to more formal methods (23, 24, 31). In addition, providing data feedback where delivery is flexible (25), visualised in a meaningful way (28) with effective timing and clarity (32) should all help to establish a parsimonious data communication system (5). Given practitioners' general line of reporting is directly to the coach, they will often be best served to deliver immediate information (30) in a manner that suits the coach (e.g. building trust and rapport (11)). Indeed, getting "buy-in" from the coach and other staff is a well-recognised barrier to implementation of evidence-based practice (4, 6, 13, 17).

Whilst we believe our study shows important characteristics of practitioners' perceptions regarding evidence-based practice, there are several limitations. There is a possibility for self-selection bias with regards to subjects, as well as a lack of ability of to compare between sports due to a low sample size from each sport represented. Since player compliance was seen as such a large barrier for implementing practice, collecting a range of data from key stakeholders (i.e. coaches and players) would strengthen the study and help further understanding in relation to implementing practice. Our study was delimited to a sample of one country; therefore, conducting similar surveys in other countries would allow a cross-cultural comparison of how coaches from different countries translate sport science research into practice within elite sport. Indeed, this study provides useful preliminary information regarding sport science practitioners' learning strategies and the challenges faced to implementing evidence-based practice within the USA, however, studies using a larger cohort from multiple stakeholders are required to yield more detailed results regarding the challenges practitioners face when implementing EBP globally. In addition, the subjects were derived from different performance teams, thus their role may have been configured differently depending upon the situation, organisational context, role expectations and funding.

In conclusion, the majority of USA practitioners who participated in this survey see value in, and commonly use, research in their performance/training programs, ranking research as contributing most to individualised preparation or recovery recommendations. Respondents preferred information from sources such as peer-reviewed research, conferences/seminars and practitioners within their sport. Practitioners most preferred and method of feedback for coaching staff (87% for both) and players (94% and 95%, respectively) was 'informal conversations/speaking' whilst the least preferred and used was 'shared access of databases' (feedback to coaches: 35% and 19%; feedback to players: 24% and 17%, respectively).

Respondents reported using research in practice from a variety of areas and sources, although it appears there are preferences for peer-reviewed evidence in areas such as recovery, injury prevention and rehabilitation, nutrition, general physical preparation and training load management. Improvements in education, research applicability, relationships and resources were reported as methods for overcoming barriers to implementing evidence into practice.

PRACTICAL APPLICATIONS

- Understanding practitioners' preferred methods of feedback and barriers to implementing research into practice could help towards implementing strategies to optimise coach, staff and player integration with shared goals. Furthermore, since player compliance is a large barrier to implementation, facilitating an environment that encourages player understanding and buy-in towards sport science initiatives is important, albeit a potentially challenging objective to achieve.
- Applied practitioners rely on access to peer-reviewed journals, industry conferences and peer-to-peer networking to keep their knowledge up to date. Senior hierarchical members of sporting organizations (i.e. head coaches, general managers and board directors) should implement procedures whereby these activities are supported.
- Improved access to educational and financial resources, increased integration of staff in coach settings and understanding of player/coach contexts may help to alleviate barriers to EBP.

448 **FIGURE LEGENDS:**

449 Figure 1: Practitioners' rank of research contribution (Figure 1a) and preferred sources of
450 information when using evidence-based practice (Figure 1b)

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452 Figure 2: Practitioners' perceived barriers to accessing and implementing research components
453 of evidence-based practice

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455 Figure 3: The preferred and actual methods of practitioners' feedback to coaching staff (Figure
456 3a) and players (Figure 3b)

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