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Advancing the Knowledgebase in Sport-Related Research: The Case  
for Systematic Research Reviews

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**Abstract**

*This article examines the role that systematic reviews can play in better understanding the status of knowledge in sport-related disciplines. The rationale for and procedures used in conducting various types of reviews will be discussed. Advantages and disadvantages of each approach will be presented and examples of reviews from the contemporary sport-related literature are provided throughout the article.*

The need for and importance of primary research studies is undoubtedly obvious to most sport-related researchers. That is, there is a need to empirically investigate informal observations that are made of social phenomena in the discipline. However, the need for and understanding of systematic research reviews and syntheses is often less clear. Although published discussions detailing both the rationale for and importance of systematic reviews date back almost 40 years (see, for example, Chalmers, Hedges, & Cooper, 2002; Cook, 1992; Cooper & Hedges, 1994; Glass, 1976; Grant & Booth, 2009; Hedges & Olkin, 1986), many researchers unfamiliar with these discussions do not fully understand the value of systematic reviews as they relate to advancing the scholarship and knowledgebase in a discipline. As noted by Light (1984):

The need for research synthesis can only be realized when one understands that in order for the gains of scholarship to be cumulative, there must be a link between the past and future research. Often the need for a new study is not as great as the need for the assimilation of already existing studies. Thus the latter is a prerequisite for the former. (pp. 2-3)

The need for systematic research review and synthesis is even more clearly understood in light of common limitations related to single, primary research studies. The overwhelming majority of primary research studies typically lack high degrees of external validity, or generalizability, stemming from the study of specific subjects within specific contexts and settings and following a specific set of procedures (Cook, 1992; Wood, 2000). Furthermore, many primary research studies investigating the same topic, and even considering the same set of research questions, often report findings that are not consistent across the set of studies (Light, 1984; Weed, 2005). Lastly, and perhaps most significantly, these limitations tend to be further exacerbated by an important statistical limitation that appears to be inherent in many primary research studies---a lack of statistical power due to insufficient samples size (Wood, 2000).

Traditionally, researchers have attempted to clarify differences in findings by conducting more research on the same research question under different conditions (i.e., settings, designs, theoretical concepts, and subject populations). This generally results in a research process or line of inquiry that continues to explore the individual facets of a larger research question generally with little regard for how the individual facets “fit together” and generally ignores the sample size or power issues observed in primary research studies. Over thirty years ago Rosenthal (1978) proclaimed “it has become almost obligatory to end ones” articles with a clarion call for further research. Yet it seems fair to say that we are better at issuing such calls than at knowing what to do with the answers.” In his seminal review of primary and secondary analysis, Glass (1976) made a similar observation noting that “we know less than we have proven.” These statements seem to ring true even today for many research contexts.

Research reviews provide a methodological alternative to primary research studies---an alternative which allows a prospective researcher to mitigate the limitations associated with results generated from primary research studies while still contributing to the overall knowledgebase in a discipline. To date, only a dearth of these types of studies have been conducted in sport management however, a plethora exists in the medical, natural, social and sport sciences. The most common types of reviews include systematic reviews, scoping reviews, quantitative reviews, and mixed-methods reviews. The purpose of this article is to examine the role that these various types of reviews can play in better understanding the status of knowledge in sport-related research, thereby shaping the field practices as well as future scientific investigations. Examples of reviews from contemporary sport-related topics are provided throughout the article.

### *Systematic Reviews*

Systematic reviews provide one viable option for sport-related researchers interested in synthesizing the literature related to a particular content area in the discipline. These types of reviews are

considered to be interpretational in nature. Interpretations are drawn from an accumulated set of research studies located in a systematic search intended to discover both the depth and breadth of research on a specific topic (Weed, 2005). It is not uncommon for systematic reviews to consider research studies employing a variety of methodologies (i.e., qualitative, quantitative, etc.) however, all studies included in such reviews would, in fact, be research studies. Commentaries and opinion pieces would not be considered in such reviews.

Systematic reviews are used for many purposes, including the generation of theory, the identification of emerging issues in the field, the examination of controversial or complicated topics, and the explication of “how to” strategies for practitioners. Those employing this method of review to investigate a topic often follow methodological guidelines that are similar to those followed in most other types of reviews. That is, they identify a research context in need of review, identify inclusion criteria for studies, select studies that meet inclusion criteria, conduct an analysis of the findings from the studies, and then draw conclusions (Grant & Booth, 2009; Rumrill & Fitzgerald, 2001; Weed, 2005).

Researchers in the sport-related disciplines have frequently used systematic reviews for a multitude of purposes. Koh, Cassidy, and Watkinson (2003) used a systematic review to investigate the incidence of concussions in contact various sports. Freudenberger and Bergandi (1994) completed a comprehensive review of the literature concerning the psychological factors operating within the sport of American football. More recently Moran (2009), explored the research on expertise, attention, and mental imagery in athletes from the perspective of cognitive psychology and cognitive neuroscience while Bragaru, Dekker, Geertzen, and Dijkstra (2011) reviewed the literature on individuals with limb amputations and sport participation. Table 1 includes detailed information of recent sport-related systematic reviews.

Table I. Systematic reviews conducted in sport

Authors	Title of Study	Study Topic	Study Outcome	Publication
Barker, J. B., Mellalieu, S. D., Mccarthy, P. J., Jones, M. V., & Moran, A.	A review of single-case research in sport psychology 1997–2012: Research trends and future directions.	The study examined the literature between 1997 and 2012 and located 66 studies that met inclusion criteria of assessing interventions in sport psychology.	Review summarized the body of research, outlined trends, considered the limitations of the extant literature, and identified areas that require further investigation for future single-case research.	<i>Journal of Applied Sport Psychology</i> , 25(1), 4-32. 2013.
Ismail, I., Keating, S. E., Baker, M. K., & Johnson, N. A.	A systematic review and meta-analysis of the effect of aerobic vs. resistance exercise training on visceral fat.	A systematic review and meta-analysis was performed to assess the efficacy of exercise interventions on VAT content/volume in overweight and obese adults.	Data suggested that aerobic exercise is central for exercise programmes aimed at reducing VAT, and that aerobic exercise below current recommendations for overweight/obesity management may be sufficient for beneficial VAT modification.	<i>Obesity Reviews</i> , 13(1), 68-91. 2012.
Langan, E., Blake, C., & Lonsdale, C.	Systematic review of the effectiveness of interpersonal coach education interventions on athlete outcomes.	Study aimed to: (a) describe the non-formal coach education interventions aimed at coaches" interpersonal knowledge base, (b) highlight underpinning theoretical models, (c) assess the methodological quality of articles evaluating these interventions, (d) identify participant	Overall, education interventions based on coach effectiveness training and achievement goal theory produced mixed effects on a variety of athlete outcomes, such as anxiety, self-esteem, fear of failure, and motivational orientation. Conclusions: Due to the diversity in athlete outcomes and intervention design, it	<i>Psychology of Sport &amp; Exercise</i> , 14(1), 37-49. 2013.

		characteristics, and (e) establish the effect of these interventions on athletes' cognitive, affective, and behavioural outcomes.	is difficult to draw firm conclusions around the effectiveness of coach education interventions.	
Smith, C. J., Callister, R., & Lubans, D. R.	A systematic review of strength and conditioning programmes designed to improve fitness characteristics in golfers.	Primary aim of this systematic review was to evaluate the effectiveness of conditioning programmes on measures of golf-related fitness and golf performance.	The findings suggested that strength and conditioning programmes can have a positive effect on the golf swing and fitness characteristics of golfers. The majority of studies in this review evaluated the effects of generic conditioning programmes on fitness characteristics and club head speed.	<i>Journal of Sports Sciences Jun2011, Vol. 29 Issue 9, p933 11p. 2011.</i>

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Although commonly used in most disciplines, systematic reviews are noted for several limitations. First and foremost, interpretations and findings from these types of reviews tend to be quite subjective. Often the determination of which studies to include, and the way in which studies are analyzed, evolves as the review is conducted and because of this it is not uncommon for researchers reviewing a similar set of studies to report quite different interpretations of the aggregated set of findings (Cook, 1992; Hunter & Schmidt, 1990; Rosenthal, 1991). Additionally, differences observed in the interpretation of many systematic reviews are attributed to several commonly observed design flaws including selection bias, subjective weighting of the studies chosen for the respective analyses, failure to include an explanation regarding inclusion criteria, and failure to consider the relationships between

study characteristics and study results (Grant & Booth, 2009; Rumrill & Fitzgerald, 2001; Weed, 2005; Wolf, 1986).

### *Scoping Reviews*

Scoping reviews represent a second type of review. However, unlike the systematic review strategy, which represents an approach to synthesizing research on a particular topic that addresses both the depth and breadth of a research topic, scoping reviews tend to be somewhat less systematic in nature and tend to focus on breadth of coverage of the literature conducted on a topic rather than depth of coverage (Arksey & O'Malley, 2005; Grant & Booth, 2009). Furthermore, unlike narrative reviews and the other reviews that will be discussed later in this paper, scoping reviews tend to utilize a wide range of research and non-research material within the review (Davis et al., 2009). For example, Covell (1997, 1998 and 1999) conducted a variety of scoping reviews for *Sport Marketing Quarterly*, highlighting information on relevant articles from related sports journals and periodicals. It is not uncommon for scoping reviews to contain information from qualitative and quantitative studies and also include informal and formal commentaries from professional meetings (Rumrill, Fitzgerald, & Merchant, 2010). The most common type of scoping review is exploratory in nature (Arksey & O'Malley, 2005). This type of review examines the range and nature of a particular research area, or determines, by a review of the material on a topic, if a full systematic review is needed. Anderson et al., (2008) describes the processes involved in these exploratory scoping reviews as mapping exercises which can be categorized as literature mapping, conceptual mapping, and policy mapping reviews.

*Literature mapping.* According to Anderson et al., (2008) this is the most common type of scoping study. There are two main objectives of literature mapping studies--to identify the location of the literature on a particular topic and to determine the magnitude of the research on a topic. There is no preconceived plan to systematically review the literature located as part of the study itself. With this approach, a researcher might simply consider a specific

timeframe for the literature that is to be mapped, that is, what research has been conducted in the past ten years. A researcher may consider where the research is being conducted (e.g., the United States, Europe, etc.), who is conducting the research (e.g., practitioners, individual researchers, research centers), or the publishing source of the research (e.g., non-peer reviewed journals, peer reviewed journals, professional conferences, research briefs, etc.).

*Conceptual mapping.* Conceptual mapping seeks to determine how, and to what extent, specific terms are used in the literature. This type of study may also seek to determine who is using specific terms and for what purposes. Thus, conceptual mapping focuses on the terminology, rather than the research being conducted, on a particular topic. Conceptual mapping is very similar to the initial stages of most other systematic reviews where the researcher identifies the terms used to conduct the search for relevant studies. The value of this type of study or activity cannot be overstated. If a researcher is unfamiliar with the terms used to identify key concepts in a research domain he or she is not likely to uncover all the literature on a topic. Furthermore, when locating literature in research databases associated with different disciplines, one must be familiar with differences in the terminology used across disciplines to find all relevant research on a topic that might cross disciplines. If one were conducting a full systematic review of the literature that did not include relevant literature from another discipline, because he or she was not aware of differences in the terms used, this could call into question the validity of such a review.

*Policy mapping.* Anderson et al. (2008) suggest that policy mapping exercises are “scoping studies designed to identify the main documents and statements from government agencies and professional bodies that have a bearing on the nature of practice in that area.” (p. 2). These scoping studies rely much less on the research conducted on a topic and much more on the statements made or positions assumed by agencies that inform both practitioners and researchers in the discipline.



In general, Davis et al. (2009) suggest that scoping studies tend to be policy directed and tend to be used to guide more focused lines of research and development. They further noted that, for most researchers, scoping reviews are generally considered to be “preliminary investigative processes that identify the range and nature of existing evidence and help in the formulation of a research question(s) and the development of research proposals.” (p. 1390). This represents yet another major difference between scoping reviews and the other reviews discussed in this paper. Other reviews, by themselves, represent studies that answer specific research questions or would be considered studies in and of themselves. Despite the basic differences noted here, and the assumption that scoping reviews are simply a preliminary step toward a more in-depth look at a research topic, scoping reviews represent a viable methodological approach that can be employed to examine the breadth of research on a particular topic. Results from a search of several research databases lend support to this contention. Scoping reviews have been published in various sport-related journals over the years.

Minnaert (2010) used a scoping study to investigate the non-infrastructure impact of the Olympic Games on socially excluded groups from 1996 through 2008. Weed (2006) used a variation of a scoping review to study the range of activities that contemporary peer-reviewed sports tourism research has investigated, and the different aspects of the relationship between sport and tourism that have been examined. de Haan and Johnson (2010) used a scoping study to review the research produced with regards to the sport of Eventing since the 1992 Olympic Games. Although not specifically identified as a such, Mahony, Hums, Andrew, and Dittmore's (2010) review of organizational justice literature in sport management provides a good example of what would be classified as a literature mapping scoping review. Table 2 includes detailed information from recent sport-related scoping reviews.

Table II. Scoping reviews conducted in sport

Authors	Title of Study	Study Topic	Study Outcome	Publication
Allen, M. S.	A systematic review of content themes in sport attribution research: 1954–2011.	Review sought to identify all sport-based attribution research to systematically explore content themes and identify areas for future research. A literature search identified 167 empirical sport attribution papers (encompassing 202 independent samples) published between 1954 and February 2011.	Frequency calculations showed a disproportionate focus on quantitative methodologies (99.4%), outcome attributions (94.6%), and attributions for personal behavior (69.9%), with relatively few intervention studies or longitudinal designs. Findings also showed a good proportion of research conducted on youth sport participants (22.3%) and in naturally occurring competitive sport settings (69.5%). It is recommended that researchers expand their study of attribution in sport to consider those attributions made by coaches and parents, and for diverse events such as athletic injury and dropout.	<i>International Journal of Sport &amp; Exercise Psychology</i> , 10(1), 1-8. 2012.

Heller, T., McCubbin, J. A., Drum, C., & Peterson, J.	Physical activity and nutrition health promotion interventions: What is working for people with intellectual disabilities?	Reviewed studies on physical activity and nutrition health promotion interventions for individuals with intellectual disabilities.	Results indicated some evidence for fitness and psychosocial benefits of community-based physical activity and exercise programs for adults with intellectual disabilities.	<i>Intellectual and Developmental Disabilities</i> , 49(1), 26-36. 2011.
Hoye, R., & Doherty, A.	Nonprofit sport board performance: A review and directions for future research.	A review of research pertaining to nonprofit sport board performance was conducted to identify priorities for further investigation.	Results highlighted that research on nonprofit sport board performance would benefit from the use of quantitative, qualitative, and/or mixed methods designs, and corresponding analyses, that enable investigators to examine and better understand the various correlates of board performance.	<i>Journal of Sport Management</i> , 25(3), 272- 285. 2011.
Moran, A. P., Matthews, J. J., & Kirby, K.	Whatever happened to the third paradigm? exploring mixed methods research	The purpose of this paper is to explore the nature and implications of mixed methods designs for research in sport and exercise	Results highlighted some advantages MMR offers to researchers in sport and exercise psychology. They concluded by	<i>Qualitative Research in Sport, Exercise &amp; Health</i> , 3(3), 362-369. 2011.

	designs in sport and exercise psychology.	psychology.	identifying some barriers to progress in using MMR in this latter field.	
Park, S., Lavallee, D., & Tod, D.	Athletes' career transition out of sport: A systematic review.	The purpose of this study was to provide a systematic review of studies on athletes' career transition out of sport from 1968 until the end of 2010.	Evaluations were reported in three sections: sample characteristics, research designs and correlates of athletes' career transition adjustment. Investigators examined a wide range of competitive levels, both genders and various sports and identified that researchers have used qualitative (44%), quantitative (44%), and mixed-model (12%) designs.	<i>International Review of Sport &amp; Exercise Psychology</i> , 6(1), 22-53. 2013.
Shilbury, D.	A bibliometric study of citations to sport management and marketing journals.	Purpose of this study was to examine the influence of seven sport management and marketing journals on sport-related research published in 20 top tier generic management and marketing journals.	Results identified citation frequency by year, first citations and time taken for the seven sport journals to record first citations, author citation frequency and field of author affiliation and its impact on citation patterns.	<i>Journal of Sport Management</i> , 25(5), 423-444. 2011.

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### *Quantitative Reviews*

*Vote-Counting.* One quantitative alternative to the reviews discussed in the previous sections is the “vote-counting” or “box-score” method of review. Like the aforementioned reviews, interpretations are drawn from an accumulated set of research studies located in a systematic search intended to discover both the depth and breadth of research on a specific topic. However, with these reviews it would be uncommon to include research studies employing a variety of qualitative methodologies as these reviews focus on aggregating findings from quantitative research studies. Unlike scoping reviews, commentaries and opinion pieces would not be considered relevant in such reviews.

Reviews which follow this approach generally identify a research area in need of review, set inclusion criteria for studies, select studies that meet the inclusion criteria, conduct a quantitative analysis of the aggregated findings, and draw conclusions. The quantitative analysis within this approach is simply a “tally” of the significant and non-significant results in a set of studies. The cumulative effect is reflected in the category (i.e., significant, non-significant) that is “tallied” the most.

Goodger, Gorely, Lavalley, and Harwood (2007) used a combined a vote-counting approach and mixed methods review to study the topic of burnout in sport. Quantitative studies included within the review were simply coded as having a positive, negative, or neutral effect depending on how variables related to burnout in each of the studies. These results were later combined with findings from qualitative studies to inform the overall observations. While this method of review and synthesis requires little information from the original studies, and the overall effect of a set of studies is relatively easy to determine, major limitations accompany this method of review. Those who have studied this approach have noted the simple tallying procedure tends to bias results in favor of studies with larger sample sizes, is limited in its ability to assess the effects of various study characteristics on the overall effect reported, and does not allow one to determine an overall effect for a set of studies (Davies, 2000; Fitzgerald, & Rumrill, 2005). Those interested in

more in-depth discussions of these limitations should consult Glass (1976), Hedges and Olkin (1985) and Hyde (1986).

*Combined Significance Test.* A related alternative to the “vote-counting” method of review is the combined significance test. While many different types of combined significance tests have been developed they are all used to determine if a relationship exists for a set of related studies and generally come to similar conclusions (Hedges & Olkin, 1985; Wolf, 1986). The procedures followed by a reviewer using this method of synthesis are the same as those for the “vote-counting” method; however, the analysis of study outcomes is somewhat different. Instead of relying solely on whether or not a study reported significant or non-significant results to determine if an overall relationship existed, this type of review combines the reported probabilities of the individual studies to determine if an overall relationship exists (Hedges & Olkin, 1985).

Although combined significance tests have been proposed as an alternative to the “vote-counting” method of review they suffer from some of the same limitations associated with the “vote-counting” method. Because combined significance tests draw conclusions based on probabilities, and these probabilities are directly related to the sample size used in the individual studies, this method of review can also misrepresent the overall effect of a relationship (Hedges & Olkin, 1985). Hedges and Olkin (1985) concluded further that because effect size estimates in the social sciences are often moderate to small, and most primary research studies often lack the power to detect these effects because of inadequate sample size, most researchers erroneously conclude that there is not a significant relationship or effect. As a result, reviews including many of these small  $n$  studies would also tend to come to the same erroneous conclusion. Lastly, as with the “vote-counting” method of review, combined significance tests do not allow reviewers to estimate the overall magnitude of an effect for a set of studies (Cook, et. al 1992). While not as popular as many of the more “sophisticated,” contemporary quantitative reviews, these types of reviews can be effective in those situations where studies have approximately equal sample sizes and when the primary research

authors have taken into consideration power and effect size measures for the relationship under investigation. However, if a reviewer is interested in determining the magnitude of a relationship, and in determining the influence of study characteristics on study outcomes, these methods would not be appropriate. In these instances reviewers may want to consider a more sophisticated review that could, in fact, effectively assess not only the magnitude of treatment effects but also the degree to which study characteristics influence the effect(s) observed in a study. This type of systematic review is commonly known as meta-analysis---first developed by Glass (1976), some forty years ago.

### *Meta-Analysis Reviews*

Meta-Analysis has been defined by Glass (1976, p. 3) as the “statistical analysis of a large collection of analysis results from individual studies for the purpose of investigating the findings.” Similar to narrative, vote-counting, and combined significance reviews, interpretations from meta-analysis are drawn from an accumulated set of research studies located in a systematic search intended to discover both the depth and breadth of research on a specific topic. With these reviews it would not be possible to include research studies employing qualitative methodologies as these reviews focus on aggregating findings from quantitative research studies. As is the case with other quantitative reviews, commentaries and opinion pieces would not be considered relevant in such reviews.

Meta-analysis can be distinguished from other quantitative reviews on three levels. First, meta-analysis allows the reviewer to determine an effect size estimate which can provide information regarding both magnitude and direction of a relationship (Cook et al., 1992; Durlak, 2000; Glass, et. al., 1981; Wood, 2000). Furthermore, a common effect size estimate can be determined regardless of the type of statistical analysis used in the primary studies being analyzed in the meta-analysis. Second, unlike “vote-counting” reviews or reviews employing combined tests of significance, procedures used in meta-analysis allow for the

investigation of interactions that may exist between study characteristics and treatments, or relationships, under consideration in a review. Third, unlike most other quantitative methods of review, meta-analysis does not require original raw data in order to determine the overall treatment effects for a set of studies (Durlak, 2000; Glass, et. al., 1981; Wood, 2005).

Although a full discussion of meta-analytic procedures is beyond the scope of this article a brief discussion of important procedural aspects of this type of review should assist in helping readers understand the basics. Those interested in more detailed discussions on the development and use of meta-analysis as a review methodology are encouraged to consult the seminal work of Glass, et. al. (1981) or more articles from Chambers (2004), Durlak (2000), Fitzgerald and Rumrill (2003), Higgins and Green (2011), Hunt (1997), or Wood (2005). Hagger (2006) and Weed (2005) discuss meta-analysis as it relates to sport and sport management disciplines. Reviews which follow this approach will follow the same procedural steps as the other quantitative reviews in that they will identify a research area in need of review, set inclusion criteria for studies, select studies that meet the inclusion criteria, conduct a quantitative analysis of the aggregated findings, and draw conclusions). The unique aspect of meta-analysis, relative to other types of quantitative reviews, lies within the procedural step related to the quantitative analysis of study findings.

The first step in analyzing data for a meta-analysis requires the researcher to determine a common measure for expressing results across many studies---this common measure is known as an effect size. An effect size estimate provides a standardized indication of the strength of an effect or relationship between two variables and it is an estimate of an effect that is independent of the original measurement unit of the dependent variable for any study (Cohen, 1977). Basic formulas for calculating various effect size estimates can be found in introductory statistics texts, such as Hinkle, Wiersma, and Jurs (2002) or Lomax (2007), or recent articles (see, for example, Ferguson, 2009; LeCroy & Krysik, 2007). It is worth noting that results from any type of study, including quasi-



experimental, pre-experimental, correlational, and causal-comparative designs, and almost any type of statistical test, such as ANOVA, t-tests, Chi-square, and other measures of association, can be considered in a meta-analysis once the basic descriptive statistics are converted to a common metric such as Cohen's  $d$ . Those interested in reading more about how to convert various statistics generated in primary research studies to common effect size estimates should refer to Glass et al. (1981) or Wolf (1986). Once all study findings are converted to a common metric the remainder of the analysis progresses much like that of a factorial analysis of variance where study characteristics are treated as factors that are investigated for their possible moderating effects on the outcome of interest. This would be reflected in the common effect size estimate determined for each study. If the overall analysis suggests that the common effect size estimate generated when averaging all effect size estimates for every study across studies is relatively homogeneous one could reasonably conclude that the overall effect observed represents the relationship investigated. However, if the aggregated set of study effects seems to lack a high degree of homogeneity, one would then begin to investigate the potential moderating effects of the study characteristics that have been coded in the analysis.

While meta-analytic reviews generally offer more information about the aggregated effect size measure than do other types of reviews, and the effects of study characteristics can be determined, meta-analytic reviews are not without their criticisms. The literature on meta analysis is quite extensive and those interested in understanding more about the discussions surrounding limitations related to construct validity, internal validity, external validity, and statistical validity of meta-analytic reviews are encouraged to review appropriate resources detailing these discussions (see, for example, Cook, 1992; Durlak, 2000; Glass, et al., 1981; Grant & Booth, 2009; Hagger, 2006; Wood, 2000).

These types of reviews, although not as prominent in sport management literature, are quite common in the sport and health-related disciplines as well as the social sciences. For example,

Carron, Colman, Wheeler, & Stevens (2002) used meta-analysis to investigate the impact of team cohesion on team performance in several sport areas. Hudson (2001) used meta-analysis to study the use and misuse of economic impact analysis in professional sports. More recently Martin, Carron, and Burke (2009) analyzed the literature related to team building interventions in sport using a meta-analysis and Martinez, Stinson, and Minsoo-Kang (2010) applied meta-analysis to investigate the influence of intercollegiate athletics on private, individual giving to higher education institutions. Table 3 presents detailed descriptions of more recent meta-analyses used in sport-related disciplines.

Table III. Meta-analysis reviews conducted in sport

Authors	Title of Study	Study Objective	Study Outcome	Publication
Avugos, S., Köppen, J., Czienskowski, U., Raab, M., & Bar-Eli, M.	The "hot hand" reconsidered: A meta-analytic approach.	A quantitative review of the effects of requisite responses and methods of stimulus presentation for assessing decision-making expertise in sport.	Study considered 111 effect sizes in studies involving 882 expert and non-expert participants. Conclusions highlighted that future empirical work on expertise and decision-making needs to consider task representativeness in considering requisite responses of participants in simulating performance environment conditions.	<i>Psychology of Sport &amp; Exercise</i> , 14(1), 21-27. 2013.
Hagger, M.S.	Meta-analysis in sport and exercise	Study sought to provide overview of the principles	The review examined the importance of	<i>European Journal of Sport</i>

research: Review, recent developments, and recommendations and practice of conducting quantitative psychometric analytic reviews in sport and exercise sciences highlighting the conduct and validity of meta-analytic methods. meta-analysis in sport and exercise research. The study highlighted some recent controversies and illustrated some innovative methods on how they have been resolved by researchers using meta-analysis. The study recommended that meta-analytic researchers provide an a priori rationale as to the level of inference they wish to make regarding the hypothesized effect of interest. *Science*, 6(2), 103-115. 2006.

Ismail, I., Keating, S. E., Baker, M. K., & Johnson, N. A. A systematic review and meta-analysis of the effect of aerobic vs. resistance exercise training on visceral fat. The study sought to evaluate the independent and synergistic effect of aerobic exercise and progressive resistance training. A systematic review and meta-analysis was performed to assess the efficiency of exercise interventions on VAT. Study found that there was a significant pooled size for comparison between AEx therapy and control. Data suggested that aerobic exercise is central for exercise programs aimed at reducing VAT. *Obesity Reviews*, 13(1), 68-91. 2012.

		content/volume in overweight and obese adults.		
Jamieson, J. P.	The home field advantage in athletics: A meta-analysis.	The study examined home-field advantage in athletics. The goal was to quantify the probability of home victory.	A significant advantage for home teams was observed. It was also found that length of season mediated the effect of sport such that difference between could be attributed to season length.	<i>Journal of Applied Social Psychology</i> , 40(7), 1819-1848. 2010.
Lee, H., Sullivan, S. J., & Schneiders, A. G.	The use of the dual-task paradigm in detecting gait performance deficits following a sports-related concussion: A systematic review and meta-analysis.	The purpose of this systematic review was to determine the viability of the dual-task paradigm in the evaluation of a sports-related concussion.	Results indicated that GV and ML-ROM are sensitive measures of dual-task related changes in concussed patients and should be considered as part of a comprehensive assessment for a sports-related concussion.	<i>Journal of Science &amp; Medicine in Sport</i> , 16(1), 2-7. 2013.
Martin, L. J., & Carron, A. V.	Team attributions in sport: A meta-analysis.	The purpose of the study was to determine whether team-oriented attributions in sport are team-serving.	Results indicated (a) the presence of team serving bias, (b) no temporal change in pattern of results from studies using operational	<i>Journal of Applied Sport Psychology</i> , 24(2), 157-174. 2012.

			definitions, and (c) significant difference between the internal composite dimension and internal dimensions	
Pelletier, D. M., Lacerte, G., & Goulet, E. D. B.	Effects of Quercetin supplementation on endurance performance and maximal oxygen consumption: A meta-analysis.	A meta-analysis was performed to determine quercetin supplementation's (QS) ergogenic value on endurance performance and maximal oxygen consumption.	Results indicated that QS is unlikely to prove ergogenic for aerobic-oriented exercises in trained and untrained individuals.	<i>International Journal of Sport Nutrition &amp; Exercise Metabolism</i> , 23(1), 73-82. 2013.

Meta-analysis represents a method for quantitatively synthesizing a large volume of related research. It is a superior method of review because it can efficiently “tie” results together in a manner that is not possible in either narrative or other quantitative literature reviews. By comparing effect sizes of different groups or conditions across a number of studies, meta-analysis provides the most compelling means for determining the overall effects of a set of interventions or stimuli. However, although meta-analytic reviews address some of the limitations of primary research studies and other types of reviews, it is important to realize that all types of research are necessary if we are to advance our scientific knowledge base in any research domain. Glass (1976), commenting on the interrelatedness of different types of research, proposed that meta-analysis be thought of as the culminating process of an exhaustive, all-inclusive, multi-faceted research study whereby three levels of descriptive assessment and evaluation evolve. These interrelated levels of assessment and evaluation include the original analysis of data in primary research studies (primary analysis), the re-analysis of

the same data using statistical methods superior to the original to test the same hypotheses or to test new hypotheses (secondary analysis), and the holistic analysis of the pattern of results that emerged from a variety of related investigations (meta-analysis).

### *Mixed-Methods Systematic Reviews*

It is reasonable to assume that the literature base in most sport-related research areas contains studies and reports that can be qualitative, quantitative, or mixed-methods in design. As such, any systematic review of the literature in this domain should utilize methods which address the diverse nature of these studies if reasonable and accurate conclusions about the literature base are desired. Mixed-methods systematic reviews are different than their qualitative (e.g., narrative, scoping, meta-ethnographic) and quantitative (e.g., meta-analysis) counterparts in that these types of reviews allow for the synthesis and analysis of multiple types of studies (i.e., qualitative, quantitative, mixed methods studies). In general, these reviews combine the findings from different types of studies within a single systematic review to address the same, overlapping or complementary review questions (Harden, 2010). According to Harden and Thomas (2005), mixed-methods systematic reviews provide investigators an opportunity to preserve the integrity of the findings of the different types of studies, integrate „quantitative“ estimates of effects or relationships with „qualitative“ interpretations of meaning, and facilitate a critical analysis findings from the studies on a particular topic. Standard procedures for conducting mixed-methods reviews parallel those of other reviews discussed in this paper. The initial stages include the searching, screening, and mapping of the studies in the research domain. In the analysis stage separate syntheses of qualitative studies and quantitative studies are conducted and then are “blended” into a combined synthesis of both types of studies.

Synthesis of quantitative studies involves two primary steps--data extraction or coding of data from primary research studies and the statistical meta-analysis of results or findings from those studies. As mentioned in the previous section, the statistical meta-analysis

includes several basic steps beginning with the determination of effect sizes and concluding with sub-group analysis based on study characteristics assumed to influence the overall observed effects. Synthesis of qualitative studies also includes two similar steps---data extraction from studies and the thematic synthesis of findings from those studies. According to Harden and Thomas (2005) data analysis begins once all textual data are extracted from the qualitative studies and entered into one of the commonly used qualitative data analysis software packages, such as QSR"s Nvivo. Once entered, the thematic synthesis evolves in stages beginning with the "breaking down" and coding of text and development of descriptive themes from the qualitative studies (data from these studies will come from the author"s descriptions of their study finding). Using the data analysis software, line-by-line coding of the data is completed and then followed by an analysis of similarities and differences among the codes in order to group them. Once grouped, analytical themes are then developed.

The final stage of mixed-methods synthesis requires the use of a constant comparative analysis whereby the themes developed in the qualitative synthesis are placed side-by-side with the quantitative findings from the meta-analysis and a constant comparative analysis is used to understand the set of studies more holistically than either a qualitative or quantitative analysis could do separately (Harden & Thomas, 2005). A complete description of how this complex phase of analysis is accomplished is beyond the scope of this article. Readers interested in learning more about this review approach are encourage to consult Harden (2010), Harden and Thomas (2005), or Oliver et. al. (2005).

While this review approach is relative new to many disciplines several good examples of such studies do exist. Goodger, Gorely, Lavallee, and Harwood (2007) combined a vote-counting approach and mixed method review to the study of burnout in sport. Babakus and Thompson (2012) used a systematic mixed-methods review to assess the levels of physical activity and sedentary time and to contextualize the behaviors for South Asian women with an immigrant background.

### *Conclusions*

Although many different types of reviews have been advanced, both qualitative and quantitative in nature, the meta-analytic approach to synthesis appears to be the most widely used. This may be true for several reasons. First, meta-analysis allows the reviewer to determine an effect size estimate which can provide information regarding both magnitude and direction of a relationship. Second, unlike “vote-counting” reviews or reviews employing combined tests of significance, those using meta-analysis have developed statistical techniques to investigate interactions that may exist between study characteristics and treatments, or relationships, under consideration in a review. Third, unlike other types of quantitative reviews meta-analysis has few formal assumptions, low informational requirements, and does not require original raw data in order to determine the overall treatment effects for a set of studies. Table 4 provides a summary of various types of reviews that can be used in sport-related disciplines along with a brief description of the type of documents that can be included as well as the advantages and disadvantages of each approach.

This article addressed some of the promises and pitfalls of various types of reviews that have been utilized in sport-related disciplines. Although these studies do address some of the limitations of primary research, it is important to realize that both types of research are necessary if we are to advance the scientific knowledge base in any research domain. Whether previous articles are analyzed in narrative fashion or using statistical procedures, investigators must demonstrate that they have a thorough understanding of the literature in their respective fields of study. By understanding the methods by which scholars make sense of published research and writing, it is hoped that readers will function as fully informed consumers of the professional literature.



Table IV. Summary of Reviews Classifications with Range of Documents Included Advantages, and Limitations.

Review Type	Documents Included	Advantages	Limitations
<i>Systematic</i>	Primary research studies	Effectively informs if subjective evaluations kept to a minimum	Can be subjective. Cannot assess study characteristics or magnitude of effect
<i>Scoping</i>	Quantitative primary research studies and other documents	Can examine a wide range of topics in and nature of a particular research area	Generally considered as preliminary studies to more sophisticated reviews
<i>Vote Counting</i>	Quantitative primary research studies	Quick/simple process to objectively assess an effect or relationship observed	Sample size concerns. Cannot assess study characteristics or magnitude of effect
<i>Combined Significance</i>	Quantitative primary research studies.	Quick/simple process to objectively assess an effect or relationship observed	Sample size concerns. Cannot assess study characteristics or magnitude of effect
<i>Meta-Analysis</i>	Quantitative primary research studies	Objectively assesses effect or relationship observed and influence of study characteristics	Statistical independence, representativeness, inclusion criteria
<i>Mixed-Methods</i>	Quantitative and qualitative primary research studies	Provides opportunity to more fully investigate all the empirical research on a topic	Limitations in combining results of qualitative and quantitative results

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