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STATISTICAL PREPARATION IN MASTER'S PROGRAMME OF SPORT MANAGEMENT

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ABSTRACT

Although statistics education is the foundation for a core analytical ability required in many workplaces and in doctoral study, little is known about the preparation of statistics training of sport management graduates enrolled in master's programmes in the United States (U.S.). Technological advances are changing the game experience through the enormous amounts of data produced. The purpose of this descriptive and exploratory study was to examine the current state of statistics requirements for master's programmes in sport management and to make recommendations for students' statistics preparation towards workplace demands and doctoral study. Data was collected from the websites of all 241 sport management programmes that offer master's degrees across the U.S. Each school's website for plans of study and/or graduate curriculum requirements in statistics was examined. Results showed that only 5.8% of programmes require an undergraduate level statistics course as an admission criterion, and 33.2% of programmes require a master's level statistics course for programme completion. Reflecting trends toward the progressive growth of statistical analysis in the field, sport management programmes should improve the statistics preparation of master's students.

***Keywords*:** Evidence-based practice; Post-graduate qualification; Sport Management; Statistics.

INTRODUCTION

The sport management industry has grown immensely. A report by Price Waterhouse Cooper LLP predicted that North American sport-industry revenue would grow to $75.7 billion by 2020 (Heitner, 2016). The multi-billion-dollar profits in the industry have increased job opportunities in many areas, including sports management and marketing, sports media and sports facilities (U.S. Bureau of Labor Statistics, 2015). Since Ohio University in the U.S. founded the first master's programme in sport management in 1966, many others have been established (Jones *et al.*, 2008), and master's programmes are now offered at 241 U.S. institutions (NASSM, 2015). However, this rapid expansion may have come without much attention to the overall structure and quality of programme curricula.

While course work in statistics is increasingly becoming an important part of a liberal education, there is little research outlining either the teaching and learning of statistics, or the practice of requiring statistics at the undergraduate or graduate level in sport management. An extensive search of the sport management and allied sports literature was conducted using subject headings, such as "statistics in sport management" and "statistics education in sport management" to find research describing approaches to teaching statistics and the frequency

of statistics requirements as prerequisites or requirements in master's level sports management education.

Regarding the standards for graduate curriculum in sport management, many researchers have argued that more empirical evidence concerning the status of sport management programmes, is needed (Zeigler, 1979; Parkhouse, 1980; Ulrich & Parkhouse, 1982; Parks & Quain, 1986; Parkhouse, 1987; Desensi *et al.*, 1990). Parkhouse (1980) found that practitioners were not satisfied with how graduates were prepared under existing programmes and later found, there was a lack of consistency in courses across 83 programmes reviewed (Parkhouse, 1987).

The initial curricular guidelines were developed the next year in 1986 after the National Association for Sports and Physical Education (NASPE) established a sports management taskforce (NASPE-NASSM, 1993). The guidelines recommend "Research in Sport" as a core content area for master's programmes and list "statistics" as one of the appropriate content courses. However, despite the existence of guidelines, Petersen and Pierce (2009) documented continued inconsistency in curricula. Jones *et al.* (2008) noted that most sport management programmes were not approved by either NASPE or NASSM and perhaps this lack may explain the inconsistency in what different institutions cover.

As Cuneen (2004:1) points out, "It is important to manage our overall programme excellence as we move from 'potential' to 'merit' if sport management is to thrive as an academic discipline and profession". However, sport management programmes are young compared to other disciplines, so research on preparing future practitioners to meet workplace demands is scarce (Eagleman & McNary, 2010). Sport management as a discipline should "strive to find a proper balance between uniqueness of programme and core courses that reflect the unique nature of the field" (Eagleman & McNary, 2010:1). Analysis of current sport management programmes is important to prepare educated and trained graduates in the sport management industry.

The future of sport management will be complicated by progressive growth in complex media rights, social media and sponsorship arrangements, just to name a few (Nielsen Sports, 2018). Furthermore, the limitless data made available through advanced technology in modern sports management is changing how business is conducted (Fried & Mumcu, 2017). Needless to say, Billy Beane's prioritisation of statistics and data to make professional sport decisions, as illustrated in the book (2003) *Moneyball* by Michael Lewis, changed the views of many on how professional sports as a whole should operate (McClellan, 2015). Decisions on which players to draft and how to coach them in games had been conventionally made through opinions or tradition. However, including the best players in a team no longer guarantees that a sports team will win. The new competitive advantage will now come from the ability to harness quickly and efficiently the vast amount of data related to the performance of both team and players, perform relevant data analyses to obtain the best insights and use the information in the game (Tan *et al.*, 2017; Jayal *et al.*, 2018). In fact, most major professional sports teams have either a professional analyst or even an analytics department as one of the biggest drivers for competitive advantage source (Davenport *et al.*, 2010). Teams such as the Boston Red Sox, New England Patriots, San Francisco Giants and 49ers, Dallas Mavericks, and San Antonio Spurs are good examples of using good analytical teams with more analytical capability to produce better winning records (Davenport, 2014).

Several studies have noted that analytical skills are one of the most demanded skills in the eyes of both industry managers and current students (Won *et al.*, 2012; Hayat *et al.*, 2013; Gupta *et* al, 2015; O'Rourke, 2019) and its importance has gained much more attention with

ever more data available now. Bringing statistics into sport management programmes has numerous benefits, such as measuring and analysing player and team performance and predicting a win or loss based on previous game data. In reality, graduates who are prepared with analytical skills are in high demand since they can provide rare and invaluable insights to the organisation (McLaughlin, 2016). Statistics coursework is a crucial avenue for preparing graduates to think analytically. Statistics education at a university should prepare students with the ability to comfortably deal with data in support of educated decision making (Kim & Hayat, 2015). Therefore, to prepare capable graduates to make more effective business decisions in such complex work environments, sport management training programmes should train graduates to acquire strong analytical problem-solving skills. One required competency in such core analytical skills is an understanding of how to view, evaluate and draw meaningful insights out of the data, in other words, a thorough understanding of statistics. While preparation in statistics is important, little is known about how well sport management programmes at a master's level prepare students with a foundation in statistics.

PURPOSE OF RESEARCH

The purpose of this study was to examine the current state of statistics requirements for master's programmes in sport management as a first step toward formulating recommendations for students' statistical preparation for workplace demands. Specific research questions that guided this study were bifold: (a) What is the current state of statistics requirement for master's programmes in sport management in the U.S.? (b) Is there an association between statistics requirements and institutional characteristics, such as the region in which the programme is located, type (public vs. private), the size of the institution, programme format (online vs. on-campus) and whether a thesis is required for programme completion.

METHODOLOGY

Design and sample

A descriptive and exploratory research design was utilised to examine the current state of statistics requirements for master's programmes in sport management and to formulate conclusions about students' preparation in statistics to meet industry's analytical demands. Through the North American Society for Sport Management (NASSM, 2015), all sport management programmes that offer master's degrees (n=241) were identified. To determine whether the sample size was sufficient, power calculation was made for a chi-square test of independence using G*Power 3.0.10 (Faul *et al.*, 2007). The sample size of 89 is suggested for the desired power of 0.80, level of significance (0.05), degrees of freedom of 2, and a moderate effect size (0.33). Therefore, it was determined that the 241 programmes in the data sample were sufficient for the analysis.

Instruments

Items to outline statistics requirements in master's programmes in sport management were developed and included the following: (a) the state in which the programme resides; (b) the Carnegie Classification (CCIHE, n.d.); (c) programme format (online vs. on-campus); (d) whether a thesis is required for programme completion (yes vs. no); (e) whether an undergraduate level statistics course is required as an admission criterion (yes vs. no); (f)

whether a master's level statistics course is required for programme completion (yes vs. no); (g) and what topics are covered in the master's level statistics course.

Ethical considerations

This study used secondary analysis of freely available data available on public websites so formal ethical clearance was not required. No human participants were contacted as part of this research. The institutional review board at a large Midwestern university approved the study before its initiation.

Procedure

For data collection in this study, websites of both the institutions and the Carnegie Foundation were visited where the answers for the seven questions above were obtained. Institutions' websites also provided information on whether the programme requires undergraduate statistics course as an admission requirement, and whether the programme requires master's level statistics course for the programme completion and whether the college offers the master's level statistics course. Topics covered in master's level statistics courses were examined through course descriptions, course catalogues and/or course syllabi available on the institutions' websites.

Data analysis

The IBM Statistical Package for Social Sciences (SPSS) Version 22.0 (IBM SPSS, Armonk, New York) was used to analyse the descriptive and quantitative data. Descriptive statistics such as frequencies and percentages were used to examine the current state of statistics requirements in master's programmes in sport management. Chi-square tests of association were utilised to examine an association between statistics requirements and the following: (a) the region where the sport management programme was located; (b) the institution type; (c) the size of the institution; (d) programme format; and (e) whether a thesis is required for programme completion. All statistical significances were reported at $p \leq 0.05$.

RESULTS

Descriptive breakdown by region, state, institution type and institution size are summarised in Table 1. The majority of the sample came from the South (41.5%, n=100) and Midwest (24.9%, n=60). Of the 44 states offering master's programmes in sport management, the top six states were Florida, Texas, New York, California, Ohio, and Pennsylvania. Sixty-two percent (n=149) of schools were public institutions. About half (51.9%, n=125) were classified as large 4-year institutions, followed by medium 4-year (29.5%, n=71), small 4-year (14.9%, n=36), very small 4-year (3.3%, n=8), and unknown (0.4%, n=1), per the institution's profile from the Carnegie Foundation for the Advancement of Teaching website (CCIHE, n.d.). Twenty-nine programmes (12.0%) offer their programme online, while 44 (18.3%) offer their programme via both online and on-campus study. Eighty-eight (36.5%) require a thesis for programme completion. Of the 241 sport management programmes that offer a master's degree, 71.8% (n=173) offer bachelor's programmes and 13.3% (n=32) offer PhD programmes in sport management.

Of the 241 programmes, only 5.8% (n=14) require an undergraduate level statistics course as an admission criterion, and 33.2% (n=80) require a master's level statistics course for

programme completion. Of those with a master's level statistics course requirement, about half (55%, n=44) offer the course within the department.

Table 1. **SAMPLE BREAKDOWN BY REGION, STATE, SCHOOL STATUS AND SCHOOL SIZE** (n=241)

Characteristics	**N (%)**
Region	
West	36 (14.9)
Northeast	45 (18.7)
Midwest	60 (24.9)
South	100 (41.5)
Institution Type	
Private	92 (38.2)
Public	149 (61.8)
Institution Size [a]	
Very small 4 year	8 (3.3)
Small 4 year	36 (14.9)
Medium 4 year	71 (29.5)
Large 4 year	125 (51.9)
Unknown	1 (0.4)

[a] Classification per the institution's profile from the Carnegie Foundation for the Advancement of Teaching website

Results from a series of chi-square tests revealed consistent patterns with respect to region, institution type, institution size, programme format, and whether a thesis is required for programme completion suggesting no association with statistics requirement (Table 2).

Table 2. **ASSOCIATION BETWEEN INSTITUTIONAL CHARACTERISTICS AND STATISTICS REQUIREMENT**

Requirement	**χ^2-statistic (*df*)**	**p-value**	**Phi / Cramer's V**
Whether undergraduate statistics is required			
Region	2.04 (3)	0.564	0.093
Institution type	0.46 (1)	0.500	0.044
Institution size	1.27 (3)	0.736	0.074
Programme format	1.76 (2)	0.424	0.085
Whether a thesis is required for programme completion	0.03 (1)	0.863	0.011
Whether a master's level statistics is required			
Region	0.41 (3)	0.937	0.042
Institution type	0.67 (1)	0.413	0.054
Institution size	4.33 (3)	0.228	0.137
Programme format	2.02 (2)	0.364	0.093
Whether a thesis is required for programme completion	1.14 (1)	0.285	0.071

These results suggest that these institutional characteristics were not associated with whether an undergraduate and/or master's level statistics course is required.

Of the 80 programmes that require a master's level statistics course, the data regarding topics covered in the statistics course from a total of 66 programmes with useable data on their websites could be collected. Table 3 presents the frequency of statistics topics covered in those 66 master's level statistics courses. All 66 courses teach descriptive statistics, probability, sampling, normal distribution, hypothesis testing, correlation, regression, t-test, ANOVA and Chi-square. Some courses also cover confidence intervals (34.8%, n=23), decision trees (15.2%, n=10), nonparametric statistics (10.6%, n=7) and Multivariate statistics (9.1%, n=6). A complete list is provided in Table 3.

***Table 3*. STATISTICAL TOPICS COVERED IN MASTER'S LEVEL STATISTICS COURSES** (n=66)

Topic	**N (%)**
Descriptive statistics	66 (100.0)
Probability	66 (100.0)
Sampling	66 (100.0)
Normal distribution	66 (100.0)
Hypothesis testing	66 (100.0)
Correlation	66 (100.0)
Regression	66 (100.0)
t-tests	66 (100.0)
Analysis of Variance (ANOVA)	66 (100.0)
Chi-square test/Fisher's exact test	66 (100.0)
Confidence interval	23 (34.8)
Decision tree	10 (15.2)
Nonparametric tests	7 (10.6)
Multivariate procedures	6 (9.1)
Measurements (reliability and validity)	4 (6.1)
Modeling	4 (6.1)
Statistical process control	4 (6.1)
Factorial ANOVA	3 (4.5)
Visual display	2 (3.0)
Analysis of Covariance (ANCOVA)	1 (1.5)
Data management	1 (1.5)

DISCUSSION

The results of this study reveal that a large percentage (91.7% and 63.5%) of the colleges in the sample does not require an undergraduate level statistics course as an admission criterion nor require a master's level statistics course for programme completion, respectively. Recent trends toward higher standards for analytical skills and critical thinking suggest that master's students should acquire more advanced statistics preparation than what is presently being offered (Pedersen & Thibault, 2014).

Similarly, Jones *et al.* (2008) noted that one of the top four cited issues in the sport management field by a sports management faculty was the lack of PhD candidates. As master's students move to doctoral programmes in sport management, master's curricula must prepare students for success in these doctoral programmes. The issue is not simply whether the field can produce more sports professionals with a doctorate or even fill vacant sport management positions. It is a matter of ensuring that future sport leaders, whether in doctoral programmes or management positions, are prepared to use research competently, create new evidence and knowledge and effectively practice evidence-based decision-making.

While understanding statistical concepts is essential, the results of this study clearly show that only a few master's programmes in sport management require an undergraduate level statistics course as an admission criterion, and those that do, are not consistently requiring a master's level statistics course for programme completion. In this study, none of the variables of the region, institution type, institution size, programme format, or whether a thesis is required for programme completion were associated with whether an undergraduate and/or master's level statistics course is required.

Interestingly, it was expected that programmes of sport management from larger institutions and those that require a thesis for programme completion would be more likely to require statistics courses than smaller institutions, because students who design a quantitative study must use some form of hypothesis testing. Logically, it follows that knowledge of statistical concepts would be necessary to successfully complete their thesis. However, this was not the case. Evidence-based decisions by sport management educators are needed regarding statistics requirements for programme completion.

Close to half (41.5%) of the programmes are located in the South, followed by the Midwest (24.9%), Northeast (18.7%) and West (14.9%). The trend was similar to that found by Eagleman & McNary (2010) concerning the undergraduate programmes of sport management in their study. They noted that only 4.4% of all undergraduate sport management programmes were located in the West and recommended increasing the number of programmes to meet the demands of the many amateur and professional sports organisations in the region. The number of undergraduate programmes in the West has since increased to 7.7%, but more colleges and universities in the West could consider offering more programmes in sport management.

The list of statistics topics covered in the master's level statistics courses, focusing mostly on basic statistical concepts shown in Table 2, was not consistent from one programme to another and does not seem to reflect workplace demands (Discover Data Science, 2010; Kim & Park, 2017). Modern sports data need analytical techniques, such as data visualisation, creating a storyboard, decision analysis and predictive modelling, which should be included in master's level statistics courses. It may not be possible to cover everything in one course. However, the careful planning of how many weeks to spend on basic statistics concepts, the use of guest lecturers for advanced topics, and the emerging sport analytic concentration with more courses in statistics could prepare graduates better. The goal is not to make sport management graduates into statisticians, but to prepare students to meet the challenges of rigorous doctoral programmes and workplace demands (Derry *et al.*, 2000). As revealed in this study, many master's programmes in sport management have not rigorously embraced statistics as a necessary prerequisite to programme completion. Much can be learned from the research evidence regarding statistics preparation, and more research is recommended to make efficient curriculum decisions (Hayat *et al*., 2013).

While this study lays out the groundwork to establish the need for more rigorous statistics education to meet the demands of both academia and industry, it has several limitations. Firstly, data regarding topics covered in master's level statistics courses from all programmes of sport management could not be obtained, so the list of topics covered may not be complete. However, the objective of this research was not to characterise relationships or differences, but rather to validate descriptive features of the current state of statistics preparation of master's students in sport management. Secondly, this study did not investigate sport analytics programmes that are increasingly offered with the abundance of data available and the growth of the sports industry, so that the findings of the current could potentially be biased. Thirdly, data obtained may not capture all statistics topics taught in master's level statistics courses, as the majority of them were collected from course descriptions and course syllabi, which often include a minimum outline to which instructors are free to add as time or class interest allows. Any given instructor may discuss other topics in lieu of explaining the topics stated in the description.

Future research should investigate the nature of workplace settings and expectations for the use of statistics in practice and leadership. Determining appropriate statistics preparation for entry into doctoral study in alignment with practice and original research design is also essential. Exploration of pedagogical practices for ensuring that graduates are able to comprehend and apply statistics will be important to inform teaching practices in graduate sport management education.

CONCLUSION

Master's programmes in sport management are expected to prepare future sport management professionals to engage in core analytical practice and/or to ready them for doctoral study. Findings from this study suggest that students may be underprepared and that additional research is needed to determine best practices in statistics education for graduate sport management.

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