

Sport Specialization and Lower Extremity Injury Incidence: A Retrospective Pilot Study among Female Collegiate Soccer Players

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ABSTRACT

OBJECTIVES To assess the relationship between single sport specialization and lower extremity injury incidence among female collegiate soccer players.

METHODS Five participants (5 females; age 19.6 ± 0.9 years) were recruited from a Division I college soccer team. No other inclusion criteria were included. Injury incidence was recorded on a dichotomous scale. Presence of a lower extremity injury that resulted in greater than 2 days of missed practice indicated a 'yes' for injury incidence. Zero reported injuries and injuries resulting in less than 2 days of missed practice indicated a 'no' for injury incidence. Sport specialization level was categorized on self-report questionnaire results. Participants were categorized as highly, moderately, lowly, or non-sport specialized.

RESULTS Each participant was highly sport specialized (100%) and age of specialization ranged from 3 to 16 years old. Of the group total, three participants sustained a previous LEI that resulted in time-loss. An average of four days were lost due to injury.

CONCLUSIONS A sample of five, highly sport specialized, female soccer players lost an average of four days due to lower extremity injury.

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Introduction

Intensive training in a single sport at the exclusion of other sports, termed sport specialization, remains a heavily debated topic [1-3]. Despite recent evidence that demonstrates an association between specialization and injury risk, rates of specialization and early specialization continue to rise [1-6]. The American Academy of Sports Medicine (AAOSM) [2] and

American Medical Society for Sports Medicine (AMSSM) [3], among other organizations [3], discourage specialization and cite the potential of burnout [7], sports withdrawal [7], decreased motivation for participation [7], and increased rates of overuse injuries [7,8] as cause to refrain. Prior to recent publications [9], conclusive data investigating the risks of specialization, specifically increased rates of overuse injury risk and/or incidence were limited [2,4].

A study evaluating the dose-response relationship between sport activity and musculoskeletal pain revealed that for each hour per week of sports activity, there was a 3% greater probability of development of musculoskeletal pain [10]. Although

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this study didn't specifically evaluate for the effects of sport specialization, it notes that excessive sport participation yields greater risk of pain development and potentially injury [10]. In another study, sport-specialized athletes experienced 12.1% more overuse injuries and 11.8% more serious injuries than non-specialized athletes [5]. McGuine et al. [9] found a direct association between specialization and lower extremity injury rates among co-ed high school athletes. Per stratification of specialization (high, moderate, low), the incidence of lower extremity injuries was highest for highly specialized athletes, followed by moderately specialized athletes [9].

Although prospective research was published, more retrospective sport-specific data is needed to begin determining which, if any, restrictions should be set for specialization degree and age. This study investigated the association between sport specialization and lower extremity injury incidence among collegiate Women's soccer athletes.

Methods

Study Design and Setting

Data were collected retrospectively at a Division I college during the 2017-2018 school year. A retrospective study (pilot) design was used to measure the incidence rate of lower extremity injuries (LEI) among non-, low, moderate, and high level sport specialized athletes. Each level of sport specialization, including non-specialized, were compared by LEI incidence rate. The sublevels of SS was low (LSS), moderate (MSS), and high level specialization (HSS). No inclusion or exclusion criteria were set for selecting the research setting.

Participants

A total of five female soccer players (5 female; age 19.6 ± 0.89 years, height: 172.5 ± 5.4 cm, mass: 67.7 ± 5.5 kg) were recruited from a Division I college during a mid-season team meeting. Female soccer players medically cleared to play at the university during the 2017-2018 school year were eligible to be included. Potential participants needed to sign the informed consent document and HIPAA authorization form in order to participate. No exclusionary parameters were set for this study. All five of the recruits met inclusionary and exclu-

sionary criteria. This study was approved by the Institutional Review Board (IRB ID#1107457-1) at the given institution, and informed written consent was obtained from the participant prior to participation.

Procedures

Researchers scheduled a date and time to attend a mid-season team meeting to recruit participants. Recruits were informed of purpose of the research, time requirements for participation and potential risks and provided the emails of the researchers. Those interested were instructed to email the researchers for more information. The email included a brief overview of the study purpose, time requirements for the questionnaire, the Human Subject Informed Consent, and available dates and times to meet with researchers on campus, in the student-athlete center, to complete the questionnaire. The informed consent was provided for the athletes to read, they did not need to complete any portions prior to meeting with researchers. During the questionnaire completion meeting, researchers obtained signatures on two copies of the Human Subject Informed Consent and the HIPAA Authorization form. Signed informed consent, authorization forms, and questionnaires were scanned and saved onto a dual-password protected laptop and the original documents were shredded. Researchers read the questionnaire aloud and recorded participant responses on paper. The participant was able to review their answers prior to the conclusion of the meeting. Participants were assigned a code which was written atop the questionnaire. The coding system was memorized by the researchers, and therefore not written down in any location.

Medical history and physical examination information pertinent to lower extremity injury were obtained via pre-participation examination records on the NextGen Electronic Medical Record software utilized by the university sports medicine department. Researchers completed HIPAA training modules through the university health services department to obtain username and password access to the software. Data including age, weight, height, sport, previous lower extremity injury records, and time loss were ascertained from NextGen (Quality Systems Inc. Irvine, CA, Unit-

ed States) and documented in an encrypted Excel spreadsheet. All information was coded, encrypted, and stored on a dual-password protected laptop.

Questionnaire

With the assistance of the research administrators, participants completed a paper questionnaire consisting of questions regarding sport participation, specialization classification and LEI history. Questionnaires were completed on campus and took approximately 10 minutes to complete. Researchers read the questionnaire aloud and recorded participant responses on paper. Each participant was asked to recall their age upon beginning sport, previous and current sport participation, months spent training and competing in those sports, and whether they quit other sports to focus on one. Athletes were categorized by degree of sport-specialization based on a specialization score they received from the following three self-reported questions: (1) ‘Was one main sport more important to you than any other(s)?’; (2) ‘Did you quit other organized and competitive sport(s) to focus on one main sport?’; and (3) ‘How many months per year did you train for that sport?’ A ‘yes’ response received 1 point, and ‘no’ responses received 0 points. Participants that reported >8 months of training for one sport in a year received 1 point, and those that reported less than 8 months training received 0 points. The points were summed to represent a participant’s degree of sport-specialization, with ≤ 1 , 2 and 3 representing low, moderate, and high degree of specialization, respectively. These three questions were chosen to stratify athletes by specialization degree; however, this questionnaire has not yet been validated. Although the questionnaire used in this study has not been validated, components regarding sport specialization identification have been utilized in various studies and settings [6-9]. Researchers also individually reviewed each question with the participant and injury reports were confirmed via electronic health records to make sure information was accurately recalled and recorded. For this study, LEI was defined as a musculoskeletal injury that occurred during sport participation and caused the athlete to seek treatment from a medical provider. LEI’s were categorized according to the following extremity regions: upper leg,

knee, lower leg, ankle, and foot. Information regarding date of occurrence, days missed, injury description and mechanism of injury were ascertained for each LEI. The mechanism of injury was classified as acute contact, acute noncontact, or overuse injuries.

Statistical Analysis

Raw data were recorded and analyzed in Microsoft Excel (Microsoft Excel, Version 15.0). Statistics including means and standard deviations, proportions (%), was calculated. Mean and standard deviation were calculated for participants’ age, age starting primary sport, and days lost due to injury.

Results

A total of five participants (5 female; age 19.6 ± 0.89 years) completed the questionnaire. Participant demographics are listed in Table 1. Each participant was highly sport specialized (100%) and age of specialization ranged from 3 to 16 years old. Of the group total, three participants sustained a previous LEI that resulted in time-loss. An average of four days were lost due to injury among the group. The distribution of sport specialization level, age, and criteria of stratification are included in Table 2.

Discussion

Dialog concerning sport specialization is of great importance for athletes, adolescents in particular. Whether sport initiation is on behalf of the child, parent, coach, or other party, the reason for initiation should be discussed. Research shows most are under the impression that engaging adolescents in a single sport early on will increase the opportunity for upward progression, recognition, scholarship, and elite/

Table 1. Participants’ Demographics Mean and Standard Deviation

Age (yr)	Height (cm)	Mass (kg)	BMI
19.65 (± 0.89)	165.97 (± 7.79)	61.48 (± 4.71)	22.31 (± 2.64)

Table 2. Sport Specialization Stratification

Participants	Sport initiation age (years)	Did you quit another sport to focus on your primary sport? (Y/N)	Quitting age (years)	Did you consider your primary sport more significant than others? (Y/N)	Did you train and/or compete in your primary sport for greater than 8 months in a year? (Y/N)	Overall sport specialization level (HSS, MSS, LSS, NSS)
1	5	Y	13	Y	Y	HSS
2	3	Y	13	Y	Y	HSS
3	12	Y	16	Y	Y	HSS
3	10	Y	18	Y	Y	HSS
3	4	*	*	*	Y	HSS

* = Participant 5 began participation in a single sport at a young age and was not required to quit

HSS = High Sport Specialization

MSS = Moderate Sport Specialization

LSS = Low Sport Specialization

NSS = Non-Sport Specialization

professional status [10,11]. However, evidence exists to refute that proposal [11]. Additionally, research regarding long-term psychosocial and physical effects suggest that the practice may, in fact, be detrimental rather than beneficial [7,11]. Young athletes are required to dedicate significant amounts of time to year-round practicing, limiting their social interactions and potentially hampering scholastic achievements [4].

As the body matures, year-round, intense participation in a single sport can have negative physical effects; up to 50% of all pediatric sports injuries are due to overuse [7,8]. Our research indicated an average of four days were lost due to common overuse conditions. Conditions such as patellofemoral pain, Osgood-Schlatter Disease, and Sinding-Larsen-Johansson Syndrome are three common overuse conditions experienced by sport specialized athletes [6]. Researchers note a four times greater occurrence of these conditions in specialized athletes compared to multi-sport athletes [6]. Varying sport participation allows younger athletes to gain a variety of motor skills that can be applied across many sports and promote neuromuscular adaptation [12]. We recommend sport sampling in early athletic years to potentially

counteract the occurrence of overuse injuries associated with early sport specialization. Well-rounded practice and conditioning programs can be used to incorporate various skills and movements for athletes.

Our results do not indicate a relationship between injury incidence and specialization, however, previous researchers with greater sample sizes found strong correlations [9]. There are limitations to the current study. The final sample size was only five total participants. The study was limited to female collegiate soccer players and therefore inference to other sport teams is limited. The stratification of sport specialization was based on self-reported answers to a standardized questionnaire, which may include misremembered information, omitted details, and response bias. Also, the specific type of injury was not collected in the current study due to the institution's regulation.

Conclusions

Intense, year-round participation in sport poses risks of injury. Sport specialization is a continued practice, and one that is initiated earlier in athletic careers than ever. Research

analyzing potential long-term effects of sport specialization are needed to inform athletes, parents, and coaches as well as promote preventative measures for risks introduced through specialization.

Conflicts of Interest

The authors declare no conflict of interest. All authors indicate that no benefits in any form have been received or will be received from a commercial party related directly or indirectly to the participant of this article.

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