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Consensus Definition of Sport Specialization in Youth Athletes Using a Delphi Approach

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Context: A single, widely accepted definition of sport specialization does not exist. A consensus definition is necessary to guide youth sport stakeholders on issues associated with sport specialization.

Objective: The aim of this study was to develop a consensus definition of youth sport specialization and to identify elements that support the construct of specialization.

Design: Delphi Study

Setting: Directed Surveys

Patients or Other Participants: A consensus panel of 17 experts was created to provide a broad multidisciplinary perspective on sport specialization in youth athletes.

Data Collection and Analysis: The final definition was developed per an iterative process that involved four rounds of review. A comprehensive review of literature and expert input supported our initial proposed umbrella definition that included six additional elements. The study team reviewed the results after each round and changes were made to the definition based on panel feedback.

Main Outcome Measure(s): Panel members were provided with the definition and six elements and then asked to rate each specific to importance, relevance, and clarity using a 4-point Likert scale.

Results: In four Delphi consensus rounds, 17 experts reviewed the umbrella definition and six elements before consensus was reached. The umbrella definition and three of the initial six elements achieved >80% agreement for importance, relevance, and clarity after the fourth round of review. The remaining 3 components did not reach >80% agreement.
agreement even after iterative edits and were removed. The process resulted in a final consensus definition: Sport specialization is intentional and focused participation in a single sport for a majority of the year that restricts opportunities for engagement in other sports and activities.

**Conclusions:** A consensus-based conceptual definition for sport specialization has been developed using a Delphi method. This definition has important implications for clinicians and sports medicine professionals who support youth athletes.

**Keywords:** injury; sport; child; adolescent, scale

**Key Points:**
- A consensus definition is necessary to consistently guide researchers and other youth sport stakeholders on issues associated with sport specialization.
- A consensus-based conceptual definition for sport specialization was developed using a Delphi method comprised of a group of multidisciplinary experts.
- The process resulted in a final consensus definition: Sport specialization is intentional and focused participation in a single sport for a majority of the year that restricts opportunities for engagement in other sports and activities.
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Introduction

Youth sport specialization is increasingly common among young athletes and may have significant impacts on public health. Extrapolated estimates demonstrate that the United States spends as much as $5.2 billion per year on injuries related to sport specialization. Additionally, this phenomenon is perhaps accelerating apparent disparities in the current pay-to-play youth sport model as opportunities for athletes in lower socioeconomic status levels to participate in sports are decreasing.

The most commonly used definition of sport specialization is year-round participation in a single sport, at the exclusion of other sports. While widely utilized and referenced, it is unclear where this definition originated from and it was most likely not developed through any scientific process, which is a major limitation. Another issue with this definition is that it is operationalized in a wide variety of ways throughout the available literature, making the true effects of sport specialization difficult to determine. For example, Ferguson and Stern cite several aspects of early sport specialization including high volume, intensity, duration of training at a young age; minimal rest or time off; high structured training with emphasis on physical development; possible exclusion of other sports; may be initiated by parents, coaches, or trainer; and oriented towards external goals such as of obtaining provincial status. Others use single versus multiple sport participation, the number of sports played before a certain age, while others do not define specialization for research participants but allow them to answer questions within the context of their sporting background. Finally, the most common method to
operationalize the definition is the 3-point specialization scale, which has been linked with injury.\textsuperscript{3,11-13} Most research related to sport specialization has used this scale that utilizes an unvalidated definition, thus the relationships between specialization, injury, burnout may not be as straightforward as previously described. As is the case in much of the available research in this area, these represent methodology decisions and opinions of the authors which result in difficulties in aggregating data with others who may define, and thus operationalize, specialization differently.

\textit{Importance to Clinicians and the Sports Medicine Community.} Uniform definitions are critical for a mutual understanding among youth sport stakeholders and can inform and improve clinical practice. A uniform definition supports consistent communication between clinicians with the goal of improving outcomes. Additionally, it allows for clearer communication between clinicians and their patients, parents, and coaches. This communication may include guidance which could be critical to keeping children in sport or preventing injuries.

Additionally, a uniform definition is important as it allows researchers to study the effects of this trend in a standardized way. To put it more aptly, if one cannot uniformly and consistently define what you are trying to study, it is almost impossible to study it. A recent research agenda proposed by the American Medical Society for Sports Medicine’s Collaborative Research Network argued that the development of a consensus definition of sport specialization is a key research priority of primary importance in the field to improve the quality of future studies and appropriate synthesis of research.\textsuperscript{14,15}
A single definition of sport specialization is essential to move the field forward. As research into sport specialization grows and evolves, a consistent, consensus-based definition is needed to ensure the construct is defined and measured accurately. Therefore, the purpose of this study was to develop a conceptual and operational consensus definition of sport specialization in youth.

Methods

This study was deemed exempt by the Internal Review Board at *Blinded for peer review*. Expert panel members were identified per their presence in the sport specialization literature, as leaders within pediatric sports medicine, and through existing academic relationships with study team members. The overall composition selection process had an emphasis on developing a panel with broad multidisciplinary representation in youth sport. The study team aimed for representation from the following fields: pediatrics, primary care sports medicine, orthopedic surgery, athletic training, physical therapy, epidemiology, and sport psychology. Ultimately, all areas were specifically represented on the expert panel.

Delphi Procedure

The consensus process incorporated a four-step Delphi method which was conducted between April and August of 2020. The Delphi method is recommended as a reliable means of determining consensus for an ambiguous clinical term or problem. This method is an iterative process that uses a systematic progression of repeated rounds of review and is an effective process for determining expert group consensus.
where there is little or no evidence and where opinion is important. Expert panel members responses are anonymous yet provide crucial expert input.

**Phase 1: Collection of existing sport specialization definitions and expert opinions.**

During this phase, the study team conducted a comprehensive review of the literature using a systematic search to examine existing definitions of sport specialization. The primary goal was to conduct a concept analysis (under review) and to determine the need for a consensus definition. One-hundred sixty-three articles were reviewed but no consensus definition was identified. If an article contained a sport specialization definition (and any important elements of specialization), the data were extracted into an excel database and used to construct our initial definition.

Additionally, the study team reached out to various stakeholders in youth sports and sport specialization. These individuals, regarded as experts in this topic, were asked to provide their own definition of sport specialization and any elements that were essential to the definition of a specialized youth athlete. They were also asked to serve on the expert panel due to their research and clinical expertise. Our experts had a combined total of over 1,500 peer-reviewed journal publications (range: 8-376), held academic and/or clinical appointments, and 11 out of 19 were involved with daily patient care in the population of interest for this study.

**Phase 2: Developing a preliminary definition of sport specialization and its elements.**

For phase two, the committee synthesized the responses gathered in phase 1 and created a working definition of specialization in addition to its’ supporting elements.
The initial definition was developed after substantial discussion and eventual consensus of all members of the study team (authors of this paper) at "Blinded for peer review".

*Phase 3: Delphi Study.*

The final phase refers to the Delphi method which utilized an iterative survey that was completed by the previously identified expert panel of multidisciplinary experts on sport specialization. The same stakeholders/sports specialization experts from Phase 1 participated in this phase. The final expert panel consisted of three certified athletic trainers, two physical therapy researchers, five physicians with expertise in pediatric sports medicine, one family medicine/sports medicine physician, one pediatric orthopedic surgeon, one epidemiologist, two sport psychology researchers, one physician with expertise in pediatrics, and one physician with expertise in Physical Medicine and Rehabilitation. Members of the Delphi panel are listed in Appendix 1. These individuals were invited by e-mail and then were formally included in the study’s Delphi Method after they accepted inclusion and completed an anonymous survey using Qualtrics (Provo, Utah) that contained the proposed umbrella definition and six elements. For each round, experts were asked to rate the overall definition and elements developed by the study team on importance, relevance, and clarity. A 4-point Likert scale was used consisting of Strongly Disagree, Disagree, Agree, and Strongly Agree. An a priori cutoff of >80% of panelists ratings of Strongly Agree or Agree was used to determine if consensus was achieved for each component of the definition. Additionally, panelists could provide comments or suggest specific edits for the overall umbrella definition and elements during all consensus rounds.
The study team evaluated survey results after each round. Quantitative results (scale responses) were examined using proportions to assess for agreement. Additionally, this evaluation used the qualitative approach of structured thematic analysis to examine narrative/ open-ended comments. Members of the study team independently reviewed each comment. Finally, the study team convened to achieve consensus for interpretation of both quantitative and qualitative results. Changes to the definition and/or elements were made based on the expert panel's ratings, narrative comments, and eventual study team consensus. These changes included major and minor revisions to the umbrella definition and elements. Even if the definition or element received >80% agreement during a specific round, the study team considered panelist feedback and attempted to improve the statement and raise consensus agreement even higher. The modified definition, as suggested by the study team, was then redistributed to the Delphi panel for the next round of reviews using the same 4-point Likert scale. Three rounds were required to achieve consensus and a fourth round was added to address a textual change to the umbrella definition.

Results

Seventeen out of the invited 31 experts agreed to participate in the Delphi study (n=13 males, 76%; degrees= 8 PhD, 9 MD) (Appendix 1). Our panelists accumulated an estimated average of 95 publications in the area of sports medicine and youth sport across their academic and/or clinical careers. One panelist resides in Canada whereas the other sixteen reside in the United States. The overall results of each round of the Delphi process can be found in Table 1. Complete details for each round of definitions and comments from the entire process can be found in Appendix 2. These details
provide a more comprehensive understanding as to how the definition evolved throughout the process. The final definition with supporting elements follows (Figure 1):

Sport specialization is intentional and focused participation in a single sport for a majority of the year that restricts opportunities for engagement in other sports and activities. Single and multisport athletes may be considered specialized if they meet some or all of the following elements:

- Participation in a single sport for greater than 8 months of the year that includes regular organized practices, competitions, and/or other structured training.
- The athlete may have limited or ended their participation in other sports, or may have only ever participated in one sport, to enable focused participation in a single sport.
- Focused participation in a single sport limits opportunities or time available for other activities such as participation in other sports, academics, extra-curricular activities, time with friends, and community engagement.

**Discussion**

This study successfully resulted in a consensus definition of youth sport specialization using a Delphi approach. The expert panel’s input resulted in a consistent definition and identified supporting elements for defining specialization that could be useful to youth athlete and sport specialization stakeholders at the level of clinical care, research, and advocacy. These elements included timing and intensity of activity, number of sports played, and a relatively new element focused on limiting the time available for other activities of interest.
Timing and Type of Participation. Perhaps the most controversial aspect of this process was including a cutoff value of 8-months for single sport participation. In the survey comments, it was clear that some panel members had strong feelings about the inclusion and/or exclusion of this cut point. As one panelist put it, “we need to draw a line in the sand.” However, another panelist argued that, “cut points should be used in instrumentation, maybe not the definition.” Several studies have identified that organized participation in a single-sport greater than 8-months is associated with increased injury risk.\textsuperscript{18-20} Therefore, 8-months in a single sport seemed to be an appropriate starting point for operationally defining “year-round” sport participation. However, it is unclear if this is the most appropriate cut point as methodological studies on this have not yet been conducted. Additionally, creating cut points is often clinician friendly but are usually much more complicated in terms of assessing risk. It is probable that relationships are not linear, such that less than 8 months has little or no risk, and everything at or above 8 months has an increased but similar risk. It seems intuitive that more months equates to more injury risk, but unclear whether this relationship is linear or not, or whether it is really only true within biomechanically repetitive activities (throwing a baseball, e.g.). However, we felt it reasonable to provide some guidance for the number of months, but we chose to use the more generic “year-round” in the umbrella (e.g. conceptual) definition and used the eight-month cutoff in our specific element. We believe this is a logical compromise that provides flexibility to practitioners and provides researchers with a specific initial cutoff that should be further evaluated by sport and sex.
Direct and Indirect Support of the Athlete. Several statements were considered for inclusion as elements that focused on support for the athlete, simultaneous participation in other sports, and motivation for participation. The statement regarding support for the athlete was focused on the logistical support that might be necessary for specialization (i.e. parents driving a child to practices and games, purchasing equipment, moving to new community to belong to a specific team or gym, etc.). Ultimately, this element was not supported and removed because it was not considered central to the idea of identifying whether an athlete was considered specialized or not.

Motivation for Participation. The other construct that was somewhat controversial in this process was motivation. The panelists struggled to arrive at a consensus for whether or not a specific motivation for sport participation was inherently part of sport specialization. This parameter focused on whether an athlete was motivated by short-term or long-term success such as making a specific club or team or aspiring to achieve financial benefit for sports participation. This component was removed because the panel felt it was not clear how this related to defining a specialized athlete.

Quit other Sports. One element that was not controversial was the idea that an athlete who is specialized may end their participation in other sports or only ever participated in a single sport. This element achieved >80% for importance, relevance, and clarity in the first round. This element is similar to the most commonly used definition that has been operationalized by the advent of the 3-point sport specialization scale. The scale asks, have you ever quit other sports to focus on a single sport? One critique of this question
is that athletes who have only ever participated in a single sport may answer “no” to this question, thus being misclassified. Miller et al.\(^2\) recently observed that this question is particularly problematic in individual sport athletes such as gymnasts. Overall, the panel agreed with the second clause in the statement, “or may have only ever participated in one sport.”

**Simultaneous Participation in Other Sports.** The final element included in the proposed consensus definition focused on whether or not an athlete could be considered specialized if they participated in more than one sport (i.e. exclusivity). Anecdotally, this is a very common scenario that occurs in team sports (i.e. an athlete plays a single sport year-round but also participates in another sport). This idea has also been reflected in the recent literature.\(^8\) For example, Frome et al.\(^2\) divided soccer athletes into specialized (played soccer \(>8\) months/year and no other sports) and nonspecialized (played soccer \(>8\) months/year and played other organized sports) and observed that the soccer only group were less likely to report an injury in the previous 12 months compared to the nonspecialized group. However, this definition is limited in that both groups were participating in soccer for \(>8\) months/year. The panel clearly debated how to best weigh year-round play in a single sport compared to year-round play in a single sport while also participating in other sports. The panel considered this item as important and relevant but lacked clarity. One panelist noted, “I think this applies to a lot of team-oriented ball sports such as baseball, soccer, and basketball. However, for some sports such as gymnastics, tennis, and dance, they don’t have an opportunity outside of the sport club.” While another comment thought exclusivity with minimal time in other sports was acceptable, “Exclusivity: plays only one sport OR plays one main
sport with very limited amount of time being spent on any other sports.” This parameter was removed after the second round when it became evident consensus amongst panelists was unlikely. This parameter may need to be revisited in future definitions.

**Time Available for other Activities.** The final component supports the notion that specialization restricts opportunities or time available for other activities besides sports. Overall, this component received >80% support for importance (94%), relevance (94%), and clarity (88%) from the panel in the first round. However, efforts were made to improve the clarity in each subsequent round. Theoretically, missing time with friends may be a consequence of the travel associated with specialization and may lead to burnout. One way to combat this issue is to schedule breaks in order to allow athletes to regroup and relax. However, in competitive youth athletics this can be very difficult. For example, club tryouts often occur the week after state high school championships. This scenario does not allow for breaks between seasons.

This is the first scientifically-derived definition of youth sport specialization. Although several limitations in applying this definition across different sports and populations were identified, this process ultimately arrived at a strong consensus regarding the umbrella definition of specialization and its primary constituent elements. Future research is needed to help improve the definition of sport specialization as youth sporting opportunities continue to evolve. Research related to intensity (months/year and hours/week and age) will be particularly valuable. There were several comments related to intensity that were reflected by the panel, “Intensity: plays that sport year-round (which we need to agree on and define in terms of # of months/year, but also should include minimum # of hours per week -- since a kid who plays one sport 1-
2/week for 12 months is probably not training intensively enough to be called specialized). Ultimately, we did not see enough consensus to include specifics related to intensity beyond “regular organized practices, competitions, and/or other structured training.”

Another potential limitation is that the Delphi panel assembled for this process consisted mainly of individuals with backgrounds in sports medicine from North America. Our panel was multi-disciplinary with a strong history of publication in sports medicine and youth sport policies and coaching. Additionally, several of our panelists are physicians and were able to provide clinically relevant expertise to our definition. This was important for our group as we strived to provide a definition that not only aids the furthering of research in sport specialization but also aids the sports medicine clinician in their practice. However, a limitation is that our panel consists primarily of individuals residing in the United States (16/17 [94%]) and does not include public stakeholders who may have helped improve the clarity of some of the components. The final limitation is that we had a small response for the final round. However, this was a wording change.

Conclusions

A consensus-based conceptual definition for sport specialization has been developed using a Delphi method comprised of a group of multidisciplinary experts. The final consensus definition is as follows: Sport specialization is intentional and focused participation in a single sport for a majority of the year that restricts opportunities for engagement in other sports and activities. This definition provides an opportunity for researchers, clinicians, and other youth sport stakeholders to apply a consistent
definition of youth sport specialization to clinical guidance, research, and policy. In summary, this consensus definition supports important discussions around the growing trend of sport specialization in youth.

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Table 1. Summary of each round of the Delphi process. Values represent frequency (percent) of “Strongly Agree” and “Agree” responses.

| Umbrella Definition | Round 1 | Round 2 | Round 3 | Round 4 |
|--------------------|--------|--------|--------|--------|
| Importance         | 15/15 (100%) | 14/15 (93%) | 16/16 (100%) | 7/8 (87%) |
| Relevance          | 15/15 (100%) | 14/15 (93%) | 16/16 (100%) | 8/8 (100%) |
| Clarity            | 12/15 (80%)  | 12/15 (80%)  | 13/16 (81%)  | 7/8 (87%)  |

Timing and type of participation

| Importance         | 15/17 (88%)  | 16/16 (100%) | 16/16 (100%) | Not evaluated in round 4 |
| Relevance          | 15/17 (88%)  | 16/16 (100%) | 15/16 (94%)  |                      |
| Clarity            | 14/17 (82%)  | 15/16 (94%)  | 16/16 (100%) |                      |

Quit other sports

| Importance         | 16/17 (94%)  | 15/16 (94%)  | 16/16 (100%) | Not evaluated in round 4 |
| Relevance          | 15/17 (88%)  | 16/16 (100%) | 16/16 (100%) |                      |
| Clarity            | 14/17 (82%)  | 15/16 (94%)  | 16/16 (100%) |                      |

Time available for other activities

| Importance         | 16/17 (94%)  | 16/16 (100%) | 16/16 (100%) | Not evaluated in round 4 |
| Relevance          | 16/17 (94%)  | 16/16 (100%) | 16/16 (100%) |                      |
| Clarity            | 15/17 (88%)  | 16/16 (100%) | 15/16 (94%)  |                      |

Motivation for participation

| Importance         | 15/17 (88%)  | 11/16 (69%)  | 15/16 (94%)  | Parameter removed after round 2. |
| Relevance          | 12/17 (71%)  | 11/16 (69%)  |                |                      |
| Clarity            | 15/17 (88%)  | 9/16 (56%)   |                |                      |

Direct and indirect support of the athlete

| Importance         | 13/17 (76%)  |                |                | Parameter removed after round 1. |
| Relevance          | 13/17 (76%)  |                |                |                      |
| Clarity            | 13/17 (76%)  |                |                |                      |

Simultaneous participation in other sports

| Importance         | Round 1 | Round 2 |                | Parameter removed after round 2. |
| Relevance          | 12/17 (71%) | 15/16 (94%) |                |                      |
| Clarity            | 10/17 (59%) | 15/16 (94%) |                |                      |
| Clarity            | 7/17 (41%)  | 11/16 (69%)  |                |                      |
