

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 currently exist. A consensus definition is necessary to guide youth sport stakeholders on topics associated with sport specialization.

Objective: To develop a consensus definition of youth sport specialization and 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 4 rounds of review. A comprehensive review of the literature and expert input supported our initial proposed umbrella definition that included 6 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 6 elements and then asked to rate each

specific to importance, relevance, and clarity using a 4-point Likert scale.

Results: In 4 Delphi consensus rounds, 17 experts reviewed the umbrella definition and 6 elements before consensus was reached. The umbrella definition and 3 of the initial 6 elements achieved greater than 80% agreement for importance, relevance, and clarity after the fourth round of review. The remaining 3 components did not reach greater than 80% 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 was developed using a Delphi method. This definition has important implications for clinicians and sports medicine professionals who support youth athletes.

Key Words: injury, children, adolescents, scale

Key Points

- A consensus definition is necessary to consistently guide researchers and other youth sport stakeholders on topics associated with sport specialization.
- A consensus-based conceptual definition for sport specialization was developed by a group of multidisciplinary experts using a Delphi method.
- 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.

Youth sport specialization is increasingly common among young athletes and may have significant effects on public health.¹ Extrapolated estimates demonstrated that the United States spends as much as \$5.2 billion per year on injuries related to sport specialization.¹ 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.²

The most common definition of *sport specialization* is year-round participation in a single sport to the exclusion of other sports.³ Although widely used and referenced, it is unclear where this definition originated, and it was most likely not developed through any scientific process, which

is a major limitation. Another concern is that this definition 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 Stern⁴ cited several aspects of early sport specialization, including high volume, intensity, and duration of training at a young age; minimal rest or time off; highly structured training with emphasis on physical development; possible exclusion of other sports; may be initiated by parents, coaches, or trainer; and oriented toward external goals, such as obtaining provincial status. Others use single versus multiple sport participation^{5–8} or the number of sports played before a certain age,⁹ whereas some do not define specialization for research participants but allow

them to answer questions within the context of their sporting background.¹⁰ Finally, the most common method of operationalizing the definition is the 3-point specialization scale, which has been linked with injury.^{3,11–13} Most researchers in sport specialization have used this scale, which is based on an unvalidated definition; thus, the relationships among specialization, injury, and burnout may not be as straightforward as previously described. As is the case in much of the research in this area, these represent methodologic decisions and opinions of the authors, and these result in difficulties aggregating data with those of others who may define, and thereby operationalize, specialization differently.

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 among clinicians and patients, parents, and coaches. This communication may include guidance that could be critical to keeping children in sport or preventing injuries.

Furthermore, a uniform definition allows researchers to study the effects of this trend in a standardized way. To put it more directly, if we cannot uniformly and consistently define what we are trying to study, it is almost impossible to study it. A recent research agenda^{14,15} 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 findings.

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 that the construct is defined and measured accurately. Therefore, the purpose of our 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 the University of Wisconsin–Madison. Expert panel members were identified, per their presence in the sport specialization literature and through existing academic relationships with study team members, as leaders in pediatric sports medicine. The overall selection process emphasized developing a panel with broad multidisciplinary representation in youth sport. We aimed for representation from the following fields: pediatrics, primary care sports medicine, orthopaedic surgery, athletic training, physical therapy, epidemiology, and sport psychology. Ultimately, all areas were specifically represented on the expert panel.

Delphi Procedure

The consensus process used a 4-step Delphi method, which was conducted between April 2020 and August

2020. The Delphi method is a reliable means of determining consensus for an ambiguous clinical term or problem.^{16,17} This iterative process relies on a systematic progression of repeated rounds of review and is effective for determining expert group consensus where there is little or no evidence and where opinion is important. Panel members' responses are anonymous and yet provide crucial expert input.

Phase 1: Collection of Existing Sport Specialization Definitions and Expert Opinions. During this phase, we conducted a comprehensive review of the literature using a systematic search to examine existing definitions of sport specialization. The primary goals were to conduct a concept analysis (under review) and to determine the need for a consensus definition. We reviewed 163 articles, 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 (Microsoft Corp) 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 on this topic, were asked to provide their own definitions of sport specialization and any elements that are 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 authored a combined total of more than 1500 peer-reviewed journal publications (range = 8–376) and held academic or clinical appointments or both; 11 of 19 were involved in daily patient care involving the population of interest for this study.

Phase 2: Developing a Preliminary Definition of Sport Specialization and Its Elements. For phase 2, 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 at the University of Wisconsin–Madison.

Phase 3: Delphi Study. The final phase incorporated the Delphi method using an iterative survey completed by the panel of multidisciplinary experts on sport specialization. The same experts from phase 1 participated in this phase. The final expert panel consisted of 5 physicians with expertise in pediatric sports medicine, 3 certified athletic trainers, 2 physical therapy researchers, 2 sport psychology researchers, 1 family medicine/sports medicine physician, 1 pediatric orthopaedic surgeon, 1 epidemiologist, 1 physician with expertise in pediatrics, and 1 physician with expertise in physical medicine and rehabilitation (Appendix 1). These individuals were invited by email and then formally included in the Delphi method after they accepted the invitation and completed an anonymous survey (Qualtrics) that contained the proposed umbrella definition and 6 elements. For each round, the 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 greater than 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

Table. Summary of Delphi Process Strongly Agree and Agree Responses

Item	Round, Frequency (%)			
	1	2	3	4
Umbrella definition				
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
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
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
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)	Item 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)	Item removed after round 1		
Relevance	13/17 (76)			
Clarity	13/17 (76)			
Simultaneous participation in other sports				
Importance	12/17 (71)	15/16 (94)	Item removed after round 2	
Relevance	10/17 (59)	15/16 (94)		
Clarity	7/17 (41)	11/16 (69)		

could provide comments or suggest specific edits for the overall umbrella definition and elements during all consensus rounds.

We evaluated the survey results after each round. Quantitative results (scale responses) were examined using proportions to assess agreement. Also, this evaluation used the qualitative approach of structured thematic analysis to examine narrative and open-ended comments. Members of the study team independently reviewed each comment. Finally, we convened to achieve consensus for interpreting the quantitative and qualitative results. Changes to the definition, the elements, or both were made based on the expert panel's ratings and narrative comments and the eventual study team consensus. These changes consisted of major and minor revisions to the umbrella definition and elements. Even if the definition or an element achieved greater than 80% agreement during a specific round, we considered the panelists' feedback and attempted to improve the statement and further raise the agreement level. The modified definition, as suggested by the study team, was then distributed 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

Of the 31 experts invited, 17 agreed to participate in the Delphi study (13 men, 76%; degrees = 8 with PhD or DSc, 9 with MD; Appendix 1). Our panelists had published an

average of 95 publications in the areas of sports medicine and youth sports across their academic and clinical careers or both. One panelist resided in Canada, and the other 16 resided in the United States. The overall results of each round of the Delphi process can be found in the Table. 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):

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 >8 months of the year that includes regular organized practices, competitions, or other structured training.
- The athlete may have limited or ended involvement in other sports to enable focused participation in a single sport. Alternatively, the athlete may have only ever been involved in 1 sport.
- Focused participation in a single sport limits the opportunities or time available for other activities, such as involvement in other sports, academics, extracurricular activities, time with friends, and community engagement.

Sport Specialization

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 & multisport athletes may be considered *specialized* if they meet some or all of the following elements:



Participation in 1 sport for >8 months/year that includes regular organized practices, competitions, and/or other structured training.



The athlete may have limited or ended participation in other sports to focus on a single sport or may have only ever participated in 1 sport.



Focused participation in 1 sport limits opportunities & time available for activities such as other sports, academics, extra-curricular activities, time with friends, & community engagement.

Figure. Definition of sport specialization and its elements.

DISCUSSION

Our process generated 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 athletes and sport specialization stakeholders at the levels of clinical care, research, and advocacy. These elements were 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 per year for single-sport participation. In the survey comments, it was clear that some panel members had strong feelings about the inclusion or exclusion of this cut point. As 1 panelist put it, "We need to draw a line in the sand." However, another panelist argued, "Cut points should be used in instrumentation, maybe not the definition." Several researchers¹⁸⁻²⁰ have noted that organized participation in a single sport > 8 months per year is associated with increased injury risk. 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 the necessary methodologic studies have not yet been conducted. Additionally, creating cut points is often clinician friendly, but they are usually much more complicated in terms of assessing risk. Relationships are probably not linear, such that <8 months per year carries little or no risk, and everything ≥8 months has an increased but similar risk. It seems intuitive that more months equates to more injury risk, but whether this relationship is linear and whether it only holds true for biomechanically repetitive activities (eg, throwing a baseball) is unknown. Nevertheless, we felt it was reasonable to provide some guidance for the number of months, but we chose to use the more generic term *year-round* in the umbrella (eg, conceptual) definition and the 8-month cutoff in our specific elements. We believe this is a logical compromise that offers 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 (ie, parents driving a child to practices and games, purchasing equipment, moving to a new community to belong to a specific team or gym). Ultimately, this element was not supported and was 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. Panelists struggled to arrive at a consensus for whether a specific motivation for sport participation was an inherent part of sport specialization. This item 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 sport participation. This component was removed because the panel felt it was not clear how it 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 participation in other sports or may have only ever participated in a single sport. This element scored greater than 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.³ The scale asks, *Have you ever quit other sports to focus on a single sport?* A critique of this question is that athletes who have only ever participated in a single sport may answer *no* and thus be misclassified. Miller et al²¹ 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 1 sport.*

Simultaneous Participation in Other Sports

The final element included in the proposed consensus definition focused on whether an athlete could be considered specialized if he or she participated in more than 1 sport (ie, exclusivity). Anecdotally, this is a common scenario in team sports (ie, 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 al²² 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 those in the soccer-only group were less likely to report an injury in the previous 12 months compared with the nonspecialized group. However, this definition was limited in that both groups participated in soccer for >8 months/year. The panel debated how to best weigh year-round play in a

single sport compared with year-round play in a single sport while also participating in other sports. This item was considered important and relevant but lacking in 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.” Another panelist thought exclusivity with minimal time in other sports was acceptable: “Exclusivity: plays only 1 sport OR plays 1 main sport with very limited amount of time being spent on any other sports.” This item was removed after the second round when it became evident that consensus among panelists was unlikely. This topic may need to be revisited in the future.

Time Available for Other Activities

The final component supports the notion that specialization restricts the opportunities or time available for activities other than sports. Overall, this component received greater than 80% support for importance (94%), relevance (94%), and clarity (88%) from the panel in the first round. Still, 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 concern is to schedule breaks 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 we identified several limitations in applying this definition across different sports and populations, this process ultimately resulted in a strong consensus regarding the umbrella definition of specialization and its primary constituent elements. Future examination is needed to help improve the definition of sport specialization as youth sporting opportunities continue to evolve. Research related to intensity (months/year, hours/week, and age) will be particularly valuable. Several panelists commented about intensity: for example, “Intensity: plays that sport year-round (which we need to agree on and define in terms of number of months/year, but also should include minimum number of hours per week—since a kid who plays 1 sport 1–2 times/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 possible limitation is that the Delphi panel assembled for this process consisted mainly of individuals with sports medicine backgrounds in North America. Our panel was multidisciplinary with a strong history of publication in sports medicine and youth sport policies and coaching. Additionally, several panelists were physicians and were able to provide clinically relevant expertise to our definition. This was important for our group as we strived to develop a definition that not only furthers research in sport specialization but also aids sports medicine clinicians in their practice. Yet a limitation is that our panel consisted primarily of individuals residing in

the United States (16/17 [94%]) and did not include public stakeholders who might have helped to improve the clarity of some of the components. The final limitation is that we had a small response for the final round. However, this focused only on a wording change.

CONCLUSIONS

A consensus-based conceptual definition for sport specialization has been developed using a Delphi method in which a group of multidisciplinary experts participated. 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 about the growing trend of sport specialization in youth.

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Appendix 1. Delphi Panelists

Panelist, Credential(s)	Expertise or Background
1, MD	Pediatric orthopedic surgery
2, MD	Pediatric sports medicine
3, PhD, ATC	Athletic training, researcher
4, PhD, ATC, FNATA	Athletic training, researcher
5, PhD	Epidemiology
6, MD, FAAP	Pediatric sports medicine
7, MD	Pediatric sports medicine
8, PhD, ATC	Athletic training, researcher
9, MD	Family medicine, sports medicine
10, PhD	Sport psychology researcher
11, MD	Physical medicine and rehabilitation and sports medicine
12, DSc, MPT, ATC, PT,	Physical therapy, researcher
13, PhD, PT	Physical therapy, researcher
14, PhD	Sport psychology researcher
15, MD	Pediatric sports medicine
16, MD, MPH	Pediatric sports medicine
17, MD	Pediatrics

Appendix 2. Individual Results and Panel Comments of Delphi Panelists^a

ROUND 1

Full Definition:

Sport specialization is intentional/focused participation in a sport that limits similar engagement in other sports and

activities. A specialized athlete may be identified through some or all of the following elements:

- Year-round participation in a sport (greater than 8 months of the year) that includes regular organized practices, competitions, and/or other structured training.
- The athlete may simultaneously participate in multiple organized sports (eg, club sport participation while still participating in interscholastic sport seasons).
- The athlete may have quit other sports to enable focused sport participation or have only ever participated in 1 sport.
- The motivation for participation is performance or outcome oriented and is related to short-term (eg, making club or team, making an interscholastic team, participating on an all-star/elite team, regional/national championships, etc) or long-term (eg, college/professional/international/Olympic aspirations, financial benefit, etc) success.
- Sport participation may restrict opportunities or time available for other activities (eg, extracurricular activities, peer socialization, community engagement).
- Individuals supporting the athlete encourage intentional/focused participation in sport (directly and indirectly) through logistical, emotional, or financial support and deliberate planning.

Round 1, Element 1. Please score the following element of our proposed definition, referring to the scoring elements defined below, if needed. Sport specialization is intentional/focused participation in a sport that limits similar engagement in other sports and activities. A specialized

athlete may be identified through some or all of the following elements:

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	14	1	0	0
Relevance	11	4	0	0
Clarity	5	7	3	0

Note: only 15/17 respondents answered this element.

Panel Comments:

- I wonder if “year-round” should still be included in this definition as only a portion of the year (like 1 season) would not necessarily classify much of the risk (or benefit) of specialization. Similarly, I wonder if “intensity” of participation is also necessary for the same reason (ie, intentional sport training without intensity or year-round participation carries much less risk or even benefit).
- How would we define “limits”?
- What is intentional participation in a sport? Does that mean they intend to be playing that sport (I think that’s everyone, right?) or that their intent is to play sports to receive something? I guess what I’m getting at—is it necessary to say both intentional and focused? They seem to be overlapping and making the first sentence more complicated than it needs to be.
- I think it is good and well articulated. I do not want to make things more complicated, but here is my thought: specialization often happens when the athlete is very young when they even don’t know things well. I feel coaches, parents, and other friends are very influential in this process. Not sure how you want to put those aspects in here or later parts.
- Using intentional/focused with the slash seems to make those terms interchangeable. However, the definitions of those terms are different. Suggest revising to intentional AND focused to include both terms on their own.
- There needs to be some kind of “time” reference and a developmental perspective.
- Unclear: which following elements?
- I think the “intentional” aspect is really important to include, as is the “focused” aspect, but I’m not sure that they’re similar enough to include together; maybe something like “is intentional participation focused within a single sport that limits”?

Round 1, Element 2. Year-round participation in a sport (greater than 8 months of the year) that includes regular organized practices, competitions, and/or other structured training.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	15	0	2	0
Relevance	14	1	2	0
Clarity	10	4	3	0

Panel Comments:

- How was 8 months chosen as definition for “year-round”?
- This is well stated.
- I think this statement is a strong component of what specialization is.

- What about athletes who train/practice on their own during this time, but it is not organized or structured? This should be included. Baseball players batting in their backyards, dancers practicing at home, etc.
- Eight months was originally proposed, and this is still most commonly used, but I am wondering if this was developed based on evidence.
- Year-round = 12 months. Suggest removing and just using the 8 or more months as your defining term. Participation in a sport for greater than 8 months of the year that includes...
- You can participate in sport for 8 months but 2 hours per week which may not be classified as specialization. Similar to my previous comments, a number of hours per week (or month) is probably necessary.
- Why 8 months versus 7 or 9?

Round 1, Element 3. The athlete may simultaneously participate in multiple organized sports (eg, club sport participation while still participating in an interscholastic sport season).

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	8	4	5	0
Relevance	9	1	7	0
Clarity	3	4	9	1

Panel Comments:

- I’m not sure that the participation in simultaneous other sports in the way it is stated is clear. Perhaps stating while an athlete “may” do this, it actually makes them less specialized (however could still have effect on injury risk due to total volume/load).
- I am not sure how this relates. Is this saying “participate in organized sports of a different kind,” such as playing rec basketball while doing tournament baseball or playing intramural baseball while playing travel baseball. The statement is not clear.
- It should clarify whether these other sports teams are from the same sport or a different sport or either.
- 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. Their training level is usually advanced, and practice time tends to be longer. So, I am not disagreeing with this, but it is challenging to comprehend all sports in 1 sentence like this.
- I feel this needs clarification, I did not want to answer but had no choice. Do you mean that they can play their “specialized” sport as a club, while concurrently playing a different sport at the high school level? Perhaps my point is not relevant, but I am a little unsure.
- Unclear as written if multiple of the same sport or OK if different sports (eg, club soccer and high school basketball) would fit the wording.
- If an athlete participates in multiple sports, it is not specialization.
- Multiple teams?
- This is a really tricky component to get at, and I think this is mostly clear here, I’m just wondering if the example may make it appear that an athlete is only specializing if they are playing on 2 teams that are the same sport

simultaneously, when I think from our discussion that this is also intended to include playing their primary sport and a secondary sport at the same time.

Round 1, Element 4. The athlete may have quit other sports, or have only ever participated in one sport, to enable focused participation in a single sport.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	13	3	1	0
Relevance	12	3	1	1
Clarity	9	5	3	0

Panel Comments:

- Clarity: Participated “competitively” in 1 sport.
- Well stated.
- Not sure “have only ever participated in 1 sport” is necessary. I think it is the singular focused sport participation that is the issue.
- Some athletes only participate in 1 sport. So, for those athletes, they did not have a sport to quit. Thus, this definition may not be applicable.
- Suggest the “only play 1 sport” should be its own bullet. This is double-barreled as written.

Round 1, Element 5. The motivation for participation is performance or outcome oriented and is related to short-term (eg, making club or team, making an interscholastic team, participating on an all-star/elite team, regional/national championships, etc) or long-term (eg, college/professional/International/Olympic aspirations, financial benefit, etc) success.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	6	9	2	0
Relevance	8	4	4	1
Clarity	8	7	2	0

Panel Comments:

- I think the origin of the motivation may need to clarify if it is self-driven vs motivation by external factors (including coaches or parents or other as noted above)
- “Club team.”
- I think it might be helpful to provide what the opposite of a performance/outcome oriented motivation is in the first sentence. And then provide the short-term, long-term outcomes in the next sentence.
- Sometimes the motivation is not performance oriented, but they truly just like to play their sport and like being with their teammates.
- This is new, and I respect that a productive UW-Madison team is taking a first stab at this. Only question, I have, is, again, where this short- and long-term motivations are coming from. I feel that those goals were developed by coaches, parents, and clubs. I doubt that kids are motivated to win a gold medal at an age of 5 or 7 years old. Not sure how we should put those aspects, I just feel that we cannot ignore the fact that sport specialization is result of this early sports professionalization led by sport business.
- I think this is too broad. Covers everything. Perhaps break it down into (1) immediate goals and (2) long-term—college—goals?

- With an “eg” statement you do not need “etc.” Remove for clarity.

Round 1, Element 6. Sport participation may restrict opportunities or time available for other activities (eg, extracurricular activities, peer socialization, community engagement).

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	14	2	1	0
Relevance	14	2	1	0
Clarity	14	1	2	0

Panel Comments:

- I like this. In our original evaluation of the elements of definition, we tried to include, but it was not a big contributor of the variance of the definition, but should be revisited.
- Academic time as well?
- I might change “restrict” to “limit.” I have no idea why.
- I personally find things written in parentheses harder to follow. In parentheses also means some people skim right over. There are a lot of them in the proposed elements of this definition. Suggest rephrasing to “for other activities, such as extracurriculars, peer socialization, or community service.” Consider this for other bullets as well.
- Should remove the word “may.”

Round 1, Element 7. Individuals supporting the athlete encourage intentional/focused participation in sport (directly and indirectly) through logistical, emotional, or financial support and deliberate planning.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	7	6	4	0
Relevance	7	6	4	0
Clarity	3	10	4	0

Panel Comments:

- I’m not sure this is a necessary element. I think it is a given that in order to participate and train this support mechanism is already in place. I don’t see that it adds anything of significance.
- So when this is present, the athlete is at less risk for poor QOL and burnout; however, is it an element of sport specialization...I’m not sure.
- But this could occur with an athlete pursuing multiple sports. While this may be a driver, not sure that it is relevant to the definition.
- Again, getting a little caught up on intentional/focused. How would you contrast those words? Everyone that is playing a sport intended to play that sport for one reason or another (unless they are really just stumbling through life). I think focused is a clearer term and more closely related to sport specialization.
- May be hard to define for everyone since the support may not be obvious.
- This is definitely what I was trying to express. My bias is the “individuals” are adults. Finding who is the biggest influencer would be a great study to understand the mechanism of the early sport specialization.

- Intentional and focused. Do not think directly or indirectly is needed. There is no definition of what those terms mean and may just confuse respondents. Unclear what deliberate planning means.
- “In sport” should be replaced by “in 1 sport.”
- Is emotional support important to definition?
- The word “intentional” here is not clear. Do you mean “Individuals supporting the athlete intentionally encourage focused participation”? This makes more sense.
- This confusion holds true for the prior use of intention/focused.
- I think this is again a really interesting component to add to the discussion and is tricky to phrase; my thought here is that this could imply that the athlete has been pressured into specialized participation, rather than self-selecting this pattern. I do however think that the term “support” is a bit more neutral in this regard and would work overall to describe this idea.

ROUND 2

Full Definition:

Sport specialization is intentional and focused participation in a sport for more than 8 months of the year that restricts opportunities for similar engagement in other sports and activities. A specialized athlete may be identified through some or all of the following elements:

- Participation in a sport for greater than 8 months of the year that includes regular organized practices, competitions, and/or other structured training.
- The athlete may have quit other sports, or have only ever participated in 1 sport, to enable focused participation in a single sport.
- Focused and intentional participation in a single sport is motivated internally or externally by short-term or long-term success. Perceived success could include making a club or interscholastic team, winning regional/national championships, financial benefit, and aspiring to reach college/professional/international/Olympic levels. Potential sources of external motivations might include parents, coaches, peers, and league administrators.
- Focused participation in a single sport restricts opportunities or time available for other activities, such as participation in other sports, academics, extra-curricular activities, peer socialization, and community engagement.
- An athlete who participates in multiple organized sports may still meet the criteria to be specialized in a single sport.

Round 2, Element 1. Sport specialization is intentional and focused participation in a sport for more than 8 months of the year that restricts opportunities for similar engagement in other sports and activities. A specialized athlete may be identified through some or all of the following elements:

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	12	2	0	1
Relevance	12	2	0	1
Clarity	8	4	2	1

Note: only 15/17 respondents answered this element.

Panel Comments:

- I think that this root definition is the most thorough I’ve seen for specialization, while also not being overwhelming in terms of the multiple elements addressed.
- The 8-month boundary will not translate well across diverse levels of sports, different sports, and across countries. It is NOT NEEDED in this part of the definition. Perhaps use this: “Sport specialization is ongoing, focused participation in an organized sport that restricts opportunities for engagement in other sports and activities.”
- Does it have to be “restrict participation in other sports”? You could potentially still participate in other sports while being intentional and focused in another sport. While I think specialization might restrict participation in general, it is not always the case.
- Participation on multiple teams at once? That seems to be removed from this version. I agree that it is mostly only relevant to team sports so might not fit within a broad definition, but kids wouldn’t be able to play year-round in most instances unless they were participating on club (or “elite,” “travel,” AAU, “select,” etc) teams. I think the rise of those teams and the industry that caters to those teams are a huge aspect of specialization, but maybe it doesn’t fit within what you are trying to do here with the definition.
- Much cleaner!
- It is not clear what is meant by focused. I would take out “similar.” It is not clear what that means, and it does not add to the definition.
- I don’t think that it has to be intentional or focused; that’s us putting our lens and bias on it in terms of what is driving it. The kid who trains year-round (9–12 months) AND intensively (5–6 days per week or some minimum number of weekly hours) is specialized, regardless of whether they are doing it because they just love the sport and have no driving future aspirations or whether they are being directed to do so by parent or coach or society. There are various reasons for specializing. I don’t think the reason should be part of the definition. In my opinion, specialization is defined by 2 things: exclusivity and intensity. Exclusivity: plays only 1 sport OR plays 1 main sport with a very limited amount of time being spent on any other sports). Intensity: plays that sport year-round (which we need to agree on and define in terms of number of months/year, but also should include minimum number of hours per week, since a kid who plays 1 sport 1–2/weeks for 12 months is probably not training intensively enough to be called specialized). Also, would delete the word “similar.”
- The simpler the definition, the easier to study. I like this version, but perhaps, if we could keep the “restricts opportunities, delete “similar engagement,” and include “in other sports and activities”

Round 2, Element 2. Participation in a sport for greater than 8 months of the year that includes regular organized practices, competitions, and/or other structured training.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	12	4	0	0
Relevance	12	4	0	0
Clarity	10	5	1	0

Panel Comments:

- Clear and as concise as possible.
- Concerned about whether the boundary of “8 months of the year” is culturally and sport specific.
- I am just not convinced that over 8 months is a high threshold. While I think rest and recovery are important, especially at a young age, many U11-U10 play at least 1 sport close to that amount.
- Might need a clarifier here (ie, “which includes regular organized practices for that same sport”).
- Very clear, and year-round volume is a huge component. Agree with other comments that while 8 months might not have originally been an evidence-based way to define year-round, it sure seems to have held up in many studies as a risk factor for injury.
- Why is 8 months used as the cutoff? What about unstructured training (ie in the backyard pitching or batting with father)?
- I like how this is worded.
- Agree but need to add minimum number of weekly training hours that would indicate intensive training (in addition to months per year). since playing 1–2 days/week for 9 months/year would not be intense enough to be considered specialized in my opinion.
- Does a month of participation need to have a definition? Such as more than 3–4 times/week every week per 4 in regular organized practices, competitions, and/or other structured training to constitute a month?
- I like this one...I’m assuming conditioning/injury prevention is included in this (does it need to be specifically included?). I like simpler, but I do get asked that a lot, and we have traditionally asked that separately

Round 2, Element 3. The athlete may have quit other sports, or have only ever participated in one sport, to enable focused participation in a single sport.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	14	1	1	0
Relevance	14	2	0	0
Clarity	10	5	1	0

Panel Comments:

- Proposed revision: “The athlete may have LIMITED OR ENDED THEIR PARTICIPATION IN other sports OR OTHER ACTIVITIES, or have only ever participated in 1 sport, to enable focused participation in a single sport.”
- I don’t think it is necessary to participate in only 1 sport or quit others to focus on 1 aspect of a sport while participating in another.
- I think this might be more clear as 2 sentences, instead of 1 sentence with a separate clause in the middle.
- The athlete may have quit ALL other sports (I think the ALL is important). I know there is the component of “multi-sport year-round,” but I’m not sure if this definition accomplishes this.

Round 2, Element 4. Focused and intentional participation in a single sport is motivated internally or externally by short-term or long-term success. Perceived success could include making a club or interscholastic team, winning regional/national championships, financial

benefit, and aspiring to reach college/professional/International/Olympic levels. Potential sources of external motivations might include parents, coaches, peers, and league administrators.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	10	1	3	2
Relevance	9	2	3	2
Clarity	5	4	5	2

Panel Comments:

- Though there are quite a few components in this element of the definition, I’m not sure I have any recommendation to improve it; though an individual viewing this definition may attend to different elements of the definition than another does, I think it’s important to allow for some personal variation here.
- A lot of the motivation can be athlete-internal, so I would delete this sentence “Potential sources of external motivations might include parents, coaches, peers, and league administrators.”
- I don’t think motivation is necessary. While it may be a factor of why they specialize, it doesn’t necessarily described the definition.
- My only quibble on this is that everything is an individual goal except “winning regional/national championships.” Does that belong here? Or should we stay with all individual goals?
- I don’t feel like this paragraph is necessary for the definition. I am not sure what it adds.
- “Perceived success” at the start of the second sentence: should this be “Internal motivating factors” instead? That way it reads better leading into the next sentence, which is a definition of external factors. That way you introduce internal and external motivations in the first sentence, define internal motivations in the second, and define external motivations in the third sentence. The term “perceived success” just came out of nowhere to me because there’s no mention of “perceived” in the first sentence. Or if this is a definition of various types of success, I think you are missing a definition of internal motivation to go along with your definition of external motivation.
- Only term not defined is internal motivations. Not sure if it should be for consistency with defining other terms.
- While these all may be true, I do not think they need to be a part of the actual definition. It is also a very “clunky” statement to follow.
- This is clear, complete and relevant.
- In my opinion, the reason a child specializes should not be part of the definition.
- Not sure I understand why motivation is included.
- I like the intent of this, but it perhaps needs to be simplified significantly. I worry, if this is a research definition, how young athletes can answer these questions (and understand them) if used in a research setting (or perhaps other settings).

Round 2, Element 5. Focused participation in a single sport restricts opportunities or time available for other activities, such as participation in other sports, academics, extracurricular activities, peer socialization, and community engagement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	12	4	0	0
Relevance	13	3	0	0
Clarity	12	4	0	0

Panel Comments:

- I very much like this reworked element of the definition and feel that the inclusion of non-sport elements mentioned in the latter part is important and novel to the framing of specialization.
- I LOVE that you included “extracurricular activities, peer socialization, and community engagement.”
- Clear as written.
- This is clear and true but not necessarily part of the definition. It is more a component of the definition or background info. Maybe a sub-definition?
- Suggest: “Focused participation in a single sport can restrict.”
- Again, can this be written [in a way] that also makes sense for the subjects (ie, “time with friends” instead of “peer socialization”)?

Round 2, Element 6. An athlete who participates in multiple organized sports may still meet the criteria to be specialized in a single sport.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	11	4	1	0
Relevance	11	4	1	0
Clarity	5	6	5	0

Panel Comments:

- I like this a lot!
- The word “single” is confusing here. Try “an athlete who participates in multiple organized sports may still meet the criteria to be specialized in a sport.”
- I think this is very important, but it seems to conflict with some of the other statements.
- Agree with statement but it does read a little awkwardly. Maybe better reworded as “an athlete may still meet criteria to be specialized in a single sport even while participating in multiple organized sports.”
- Should clarify how can this be so.
- Confusing.
- This needs to be further clarified. This is a factual statement, but unlike the other “definitions” [it] does not define what it means to be multisport-specialized. Perhaps “multi-sport specialized athletes” train/compete in 1 main sport >8 months/year while also training/competing in other sports throughout the year (or competing in multiple sports at the same time).

ROUND 3

Full Definition:

Sport specialization is intentional and focused participation in a sport for more than 8 months of the year that restricts opportunities for similar 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 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 have only ever participated in 1 sport, to enable focused participation in a single sport.
- Focused participation in a single sport restricts opportunities or time available for other activities, such as participation in other sports, academics, extracurricular activities, time with friends, and community engagement.
- Focused participation in a single sport restricts opportunities or time available for other activities, such as participation in other sports, academics, extracurricular activities, peer socialization, and community engagement.

Round 3, Element 1. Sport specialization is intentional and focused participation in a sport for more than 8 months of the year that restricts opportunities for similar engagement in other sports and activities. Single and multisport athletes may be considered specialized if they meet some or all of the following elements:

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	14	2	0	0
Relevance	13	3	0	0
Clarity	6	7	3	0

Note: only 16/17 respondents answered this element.

Panel Comments:

- I believe that this statement was generated as a result of many drafts by respected experts. I just feel that it is a bit too long. The second sentence is confusing to me.
- I’m happy with the 8-month definition. It is arbitrary, but I think there has to be some line drawn.
- I’m still a little hung up on “intentional.” Why is this word included as well as “focused”? What is the difference between these? I think it’s overly complicating the definition. Focused makes sense to me (they are focusing on a sport), but not sure the importance of “intentional” (they are playing their sport with the intent of—how do we know this in every case?). Everyone plays a sport “intentionally”; ie. nobody is playing on accident because they happened to show up to all practices and games. I don’t think this word is valuable in the definition because we have no idea what their “intent” is—fun, scholarship, get in shape, spend time with friends, etc, and there’s nothing in the definition that says how the intent of specialized athletes is different from the intent of all other athletes
- I suggest consider deleting the words “intentional and” in order to improve clarity. Their meaning is not clear to me, nor is it obvious whose intentions should be considered (child only? Parent and child?).
- That is the definition of “focused”? It may restrict or LIMIT but doesn’t completely prevent participation in other sports. Where did the 8-month cutoff come from?
- From reading some of the other panelist comments throughout the rounds, I’m interested in whether there is evidence suggesting 8 months as the cutoff. I had not

really thought about it previously as to where that number came from.

- Does this definition allow for “degree of specialization,” which still seems to be relevant?

Round 3, Element 2. Participation in a sport for greater than 8 months of the year that includes regular organized practices, competitions, and/or other structured training.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	13	3	0	0
Relevance	13	2	1	0
Clarity	10	7	0	0

Panel Comments:

- This is clear to me.
- I don’t have a problem with the 8 months/year. We need a line in the sand.
- Like the simplicity, but would it be easier to just say year-round instead of 8 months? Otherwise we are setting an exact cutoff that might not be relevant for all sports.
- I worry that “greater than 8 months of the year” reflects a cultural artifact that may be specific to certain sports or cultures. It feels like an arbitrary boundary. Is 8 months safe? Is 9 months not safe? I worry that there are youth who are specialized but only participate for 8 months of the year. I freely confess that this is a vague niggles, and that I don’t have a specific sport in mind that is specialized but limited to 8 months of the year.
- I like this a lot, but still not convinced 8 months is the cutoff.
- Doesn’t get at the general concept of overall volume, but still rather sticking to the 8 months.
- Should the definition include some minimum for how often per week they are engaged in the sport, or other measure of intensity? What if someone plays their single sport more than 8 months per year but only trains once/week? Would we call that specialized? My daughter plays AYSO soccer fall and spring, which amounts to 8 months, but it is only 1 or 2 days per week for an hour. It’s very low key—no playoffs. I would not classify her as specialized. I suppose that this would be fleshed out with the next few criteria for the definition: “Does the level of participation restrict or limit time for other sports and activities?” In her case the answer would be “no,” so then she would not meet criteria for specialized.
- Participation in a “single” sport—otherwise looks good.

Round 3, Element 3. The athlete may have limited or ended their participation in other sports, or have only ever participated in 1 sport, to enable focused participation in a single sport.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	15	1	0	0
Relevance	15	1	0	0
Clarity	11	4	0	0

Panel Comments:

- Maybe adding the word “may” after “or” (or may have only ever participated) may flow better? Not essential, just a small idea to consider.

- This sentence is clear to me.
- Clear as written.
- What does “limited” mean? How much quantitatively?
- FOCUSED needs to be defined. Otherwise I like this very much.
- Excellent. Very clear.
- Again, does this allow for degree of specialization? Does this then include or exclude “multisport” specialized athlete?

Round 3, Element 4. Focused participation in a single sport restricts opportunities or time available for other activities, such as participation in other sports, academics, extra-curricular activities, time with friends, and community engagement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	15	1	0	0
Relevance	14	2	0	0
Clarity	12	3	1	0

Panel Comments:

- This is clear to me.
- I like this reworded version. Clarity is significantly improved.
- Clear as written.
- I suggest that “time with friends” should become “time with friends who are not specializing in the same sport.” I see lots of year-round swim teams where kids on the teams do social things together, but these activities are organized by coaches and don’t really reflect child-centered “time with friends.” As another example, playing games on the phone together while waiting on the pool deck to swim your event is not what we mean by “time with friends.” I can imagine parents who would argue that their kids get lots of “time with friends,” but these “friends” are also specialized athletes on the same team, and these “friendships” will not continue if one of the kids (or even both of them) quits the team.
- I would use LIMITS instead of restricts. Great part otherwise.
- Very much like this addition.
- Should we include “family” (ie, “time with family/friends”)?

ROUND 4

Full Definition:

Sport specialization is intentional and focused participation in a sport for a majority of the year that restricts opportunities for similar 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 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 have only ever participated in one sport, to enable focused participation in a single sport.

- Focused participation in a single sport restricts opportunities or time available for other activities, such as participation in other sports, academics, extracurricular activities, time with friends, and community engagement.

Round 4, Element 1. Sport specialization is intentional and focused participation in a sport for a majority of the year that restricts opportunities for similar engagement in other sports and activities. Single and multisport athletes may be considered specialized if they meet some or all of the following elements:

	Strongly Agree	Agree	Disagree	Strongly Disagree
Importance	4	3	1	0
Relevance	5	3	0	0
Clarity	1	6	1	0

Panel Comments:

- I could see this going either way (the original as well as this revised version) since this version may be perceived as greater than 6 months, but I think in combination with the operational aspects that this is a very strong definition overall.
- I am comfortable with the revision.
- Some may take “majority” as more than 6, which does differ from the 8 listed in the sub-bullet.
- I don’t mind the definition, but we are validating a definition for research purposes. “Majority” can mean 6 months, 8 months, 10 months and it makes it more vague with assessing “year-round play.” We may not all agree on 8 months, and it is a continuum I am sure, but something with a continuous numeric variable is helpful as we assess the relative importance of this in research is probably good. For the layperson, yes, that work

Abbreviations: AAU, Amateur Athletic Union; AYSO, American Youth Soccer Organization; QOL, quality of life; U10, under 10; U11, under 11.

^a Reproduced in their original format.