

UNIVERSITY OF WISCONSIN-LA CROSSE

Graduate Studies

EVALUATION OF THE EXERCISE PHYSIOLOGY KNOWLEDGE OF YOUTH  
COACHES

A Manuscript Style Thesis Submitted in Partial Fulfillment of the Requirements for the  
Degree of Master of Science, Clinical Exercise Physiology

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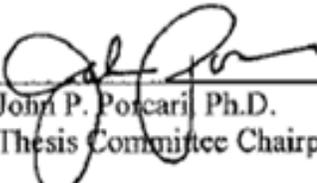
May, 2013

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By Courtney S. Carlson

We recommend acceptance of this thesis in partial fulfillment of the candidate's requirements for the degree Master of Science, Clinical Exercise Physiology

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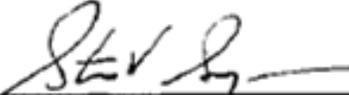
  
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## ABSTRACT

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This study was designed to evaluate the exercise physiology knowledge of youth coaches. A questionnaire of 40 multiple choice and T/F questions was developed to evaluate their knowledge. With the help of the American Council of Exercise, the questionnaire was promoted online for one month. Seventy youth coaches completed the questionnaire. Average score on the questionnaire was  $28.7 \pm 3.783$  (Range = 19-37) which is a 72% score. There was no significant difference in the total score based on the age of coach, their education level, major field of study, age level coached, whether the coach was paid or not, and the highest level of sports participation by the coach. The only significant difference found was that if college was completed and they were a health science major, they did significantly better on the exam than any other major. The questionnaire was broken down into subscales of information including, general physiology/practice design, strength and conditioning, concussions, hydration, nutrition and injury prevention. There were no significant differences between the subscales and demographics. In conclusion, there seems to be an overall lack of knowledge at the youth coaching level. The results of this questionnaire can be used to help create further studies and possible courses for youth coaches in the future.

## ACKNOWLEDGEMENTS

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## **INTRODUCTION**

The idea of “coaching” dates back to the beginning of mankind with the older, more experienced people teaching the younger ones the skills of survival (Performance Coaching International, 2006). Throughout the years, the concept of coaching has developed and evolved into many different areas: professional business coaching, finance coaching, life coaching, etc. (PCI, 2006). The most common variety of coaching that has developed in the modern era has been the coaching of sports. Coaching is a part of all levels of sport, beginning with the youth level and continuing all the way up to the professional level.

The level which has the most participants, and therefore has the need for the most coaches, is youth sports. As of 2008, the number of children participating in youth sports has risen to over 40 million in the U.S. alone (National Council of Youth Sports, 2008). This means that the need for youth coaches has quadrupled in the last 20 years, with over 2 million adults serving as youth coaches (National Council of Youth Sports, 2006; Koester, 2000). This large number of adults not only has the opportunity to teach the younger generations the skills of their particular sport, but the basics of exercise physiology as well. While some of these individuals may be able to coach effectively, many of these adults may not have the knowledge to be able to provide their players with the proper techniques and procedures about important aspects of exercise physiology. Some of the important topics that coaches should have knowledge in include proper

warm-up and cool-down techniques, hydration, nutrition, strength training techniques, practice design, communication, injury management and prevention, and concussion management.

There has been very limited research that has examined exactly how much youth coaches know and understand about each of these specific topics. The most concentrated research has involved concussions and injury prevention, and more recently nutrition. One survey of 250 youth soccer coaches found that 75% felt aware of concussions and 80% stated that their institutions had established a set of guidelines regarding player concussions (Baizen and Gates, 2012). On the other hand, the survey also found that only half of the coaches were familiar with the proper procedures on how to manage concussions. This study demonstrated a good step towards the recognition of a dangerous problem in youth sports, but revealed a need for more education required on how to best deal with and manage concussions.

Other related studies have found that demographics play a role in the knowledge and management of concussions. Level of education, age of the coach, and level of competition were all found to influence the decision-making process of coaches. The coaches with more education, older coaches, and coaches whose teams were not playing in a championship-type game were less likely to return a player prematurely, were more likely to recognize signs and symptoms of a concussion, and were able to manage concussions more effectively (McLeod, 2007, Bramley et al., 2012).

Another topic that has been researched is the level of education of youth coaches regarding CPR, first-aid, and acute injury management. One study of 752 coaches found that 40% of them had received no form of safety training (Mickalide and Hansen, 2012).

This same study found that of all safety training techniques, first-aid and CPR were the most commonly taught, but only 13% and 20% of all youth coaches, respectively, were actually certified in each (Mickalide and Hansen, 2012). Similar numbers were found in another study conducted by Weirsma and Sherman (2005). From these studies, we can generalize that of the over 2 million adults who are involved in youth sports, less than one third of them have the knowledge to successfully perform first aid and CPR should a problem arise. These numbers suggest that youth sports should require more education for youth coaches regarding these topics.

Another area of interest involves proper nutritional practices for athletes. Most of the research on this topic has been conducted at the collegiate level, where two studies found that more information and education needs to be required of coaches so that they are better able to relay nutrition information and provide advice to their athletes (Zinn, Schofield and Wall, 2006, Corley, Demarest-Litchford and Bazzarre, 1990). Another study at the collegiate level found that although 71.4% of 192 athletic trainers and 83.1% of 71 strength and conditioning specialists had adequate knowledge regarding nutrition information, only 35.9% of 131 coaches and 9% of 92 athletes (Torres-McGhee, Pritchett, Zippel, Minton, Cellamare and Sibilia, 2012) were deemed to have adequate knowledge. This shows that even at the collegiate level, only a small percentage of coaches and athletes know enough about sports nutrition and suggests more education needs to be required at all coaching levels.

There are other aspects of exercise physiology that are very important to the education of youth in sport and exercise. For example, proper warm-up and cool-down techniques, hydration, strength training, practice organization, and communication skills

are a few of the more important ones. There has been little, if any, research on each of these topics individually and even less on all of these skills combined. For youth coaches, it is important that they are well versed in all of these topics in order for them to instill healthy habits in youth, as well as to avoid dangerous and harmful situations. The purpose of this study will be to evaluate the basic knowledge of youth coaches around the United States on various areas of exercise physiology, as well as coaching procedures and techniques for youth sports.

## **METHODS**

A questionnaire, written in the form of a multiple choice and true/false examination, was developed and used to evaluate the coach's knowledge on seven important topics related to exercise physiology, including general physiology and practice design, hydration, nutrition, basic first aid and acute injury management, concussion care, and proper strength training knowledge. The questionnaire consisted of 40 multiple choice and true/false questions, shown in Appendix A.

The questionnaire included a demographic section that obtained the individual's background and history in coaching, as well as their age and educational background. This questionnaire was developed by the principle investigators in conjunction with the American Council of Exercise (ACE). After the examination was developed, ACE posted it on their website. Along with the ACE Public Relations firm, the principal investigator used personal contacts to further promote and spread the word about the study. Anyone who coached youth sports, defined as children and teenagers between 8-18 years of age, was eligible to take the test.

### **Statistical Analysis**

Standard descriptive statistics were used to characterize the subject population. Comparison between the total score and the demographic variables were made using one-way ANOVA. When there was a significant F-ratio, Tukey's Post-hoc tests were used to determine pairwise differences. Pearson Product-Moment correlations were used to

determine if the total score correlated with any of the demographic data. Alpha was set at 0.05 to achieve statistical significance for all analyses.

## RESULTS

Descriptive data for each of the demographic sections is presented in Figures 1-6. The figures provide the percentage of respondents for each demographic question including age, education level, major field of study, age level coached, whether the coach was paid or not, and the highest level of sports participation by the coach.

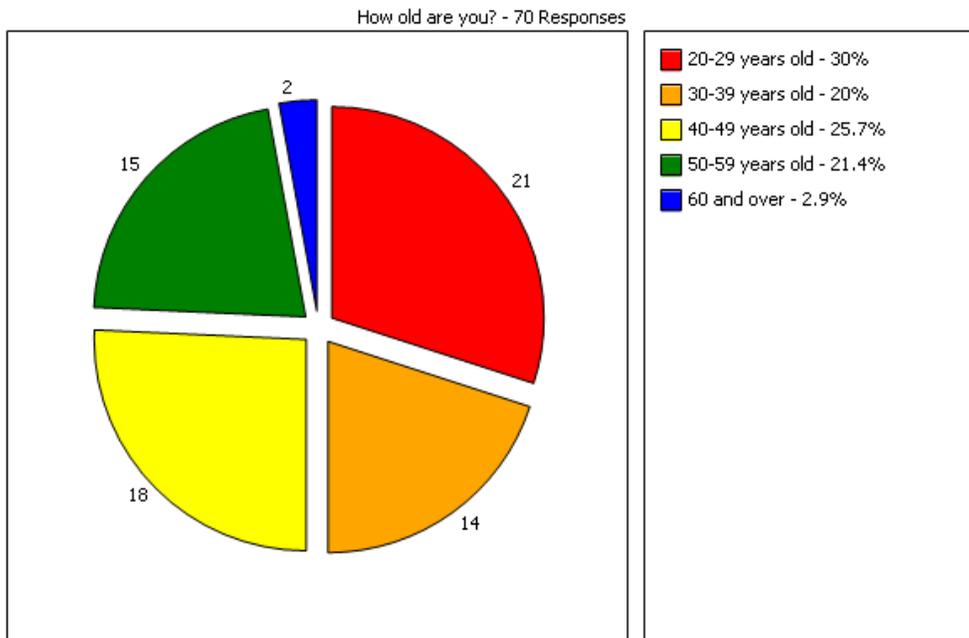


Figure 1. How old are you?

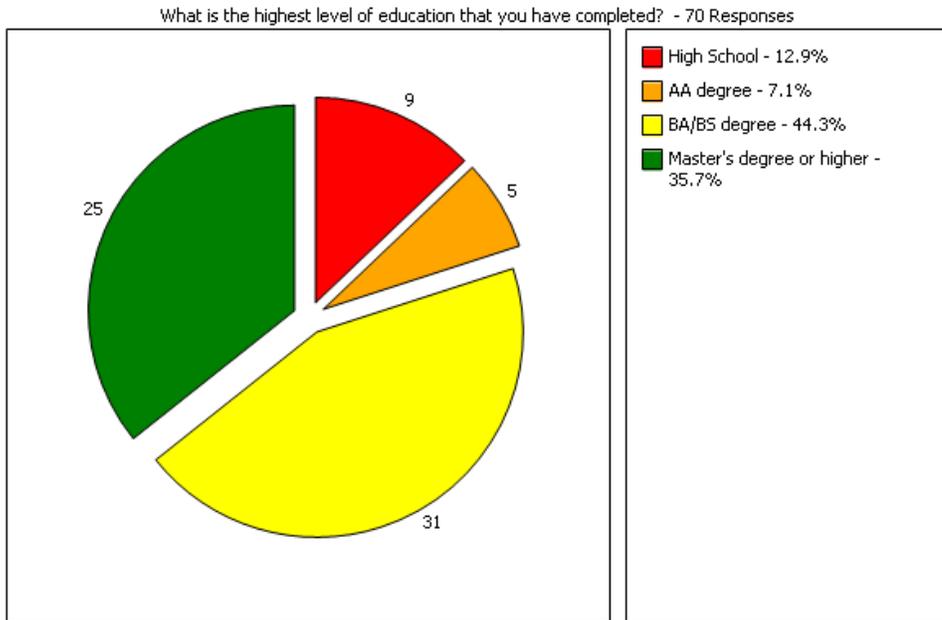


Figure 2. What is the highest level of education that you have completed?

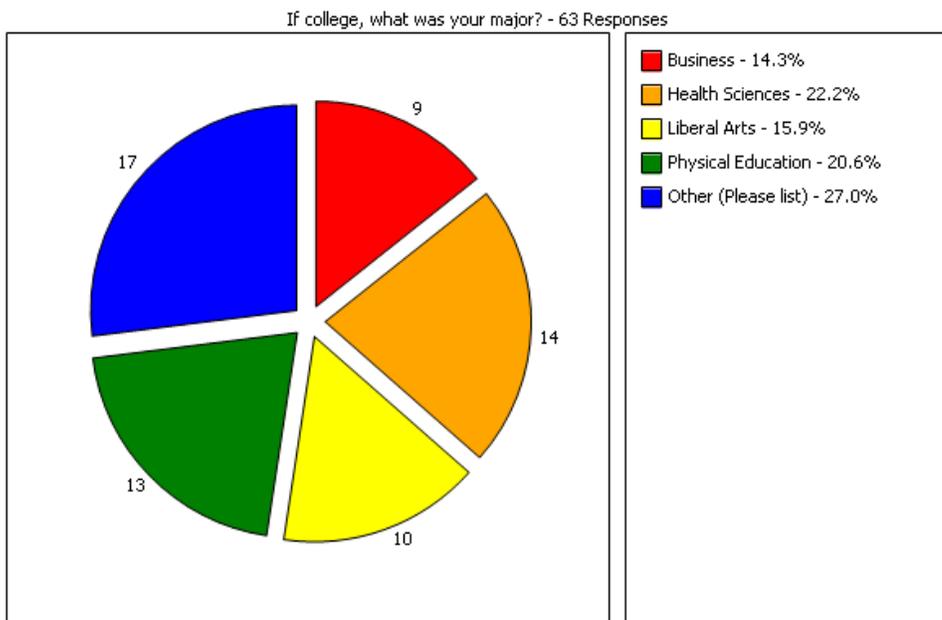


Figure 3. If college, what was your major?

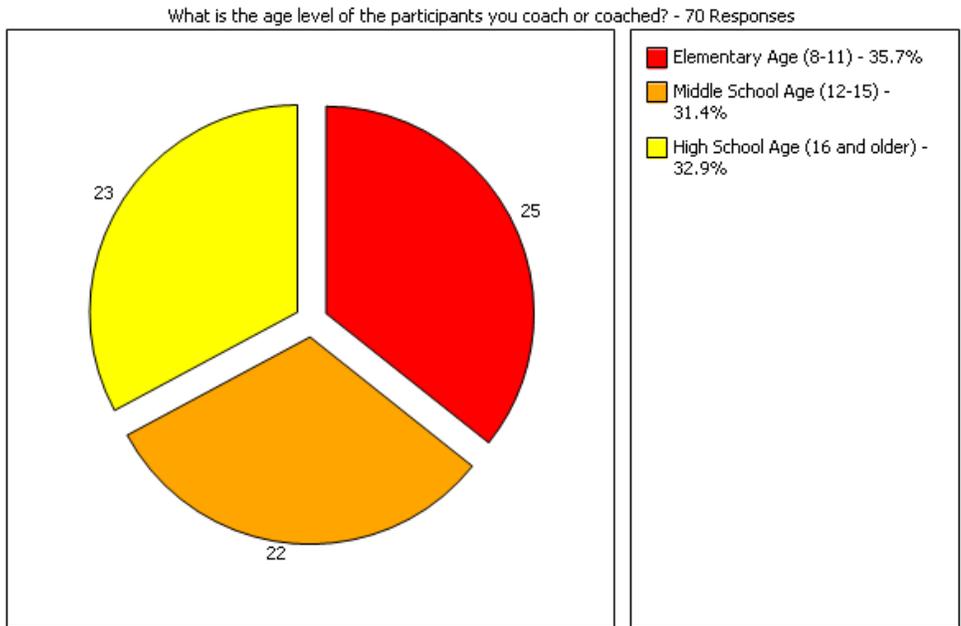


Figure 4. What is the age level of the participants you coach or coached?

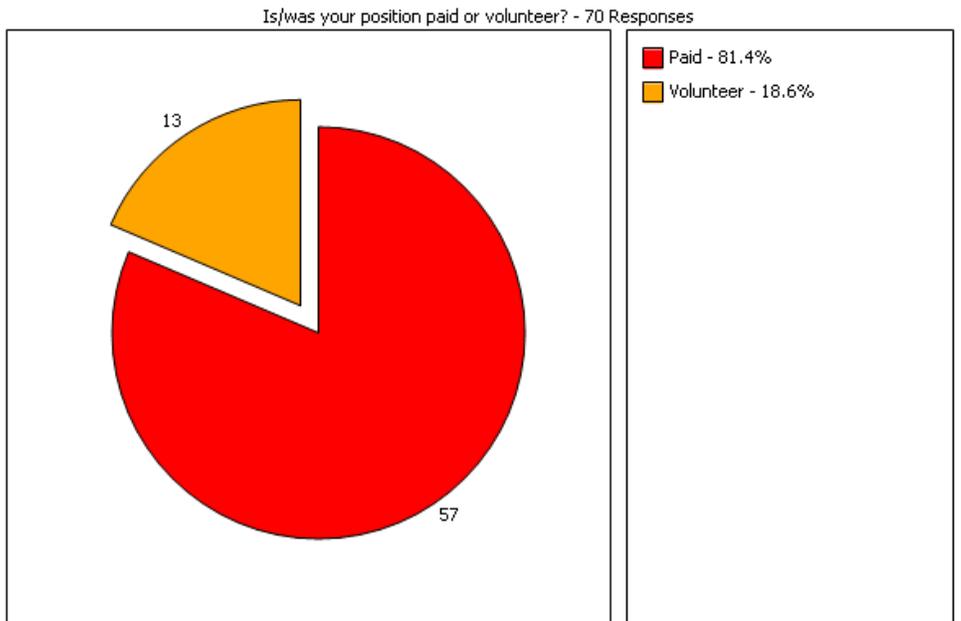


Figure 5. Is/was your position paid or volunteer?

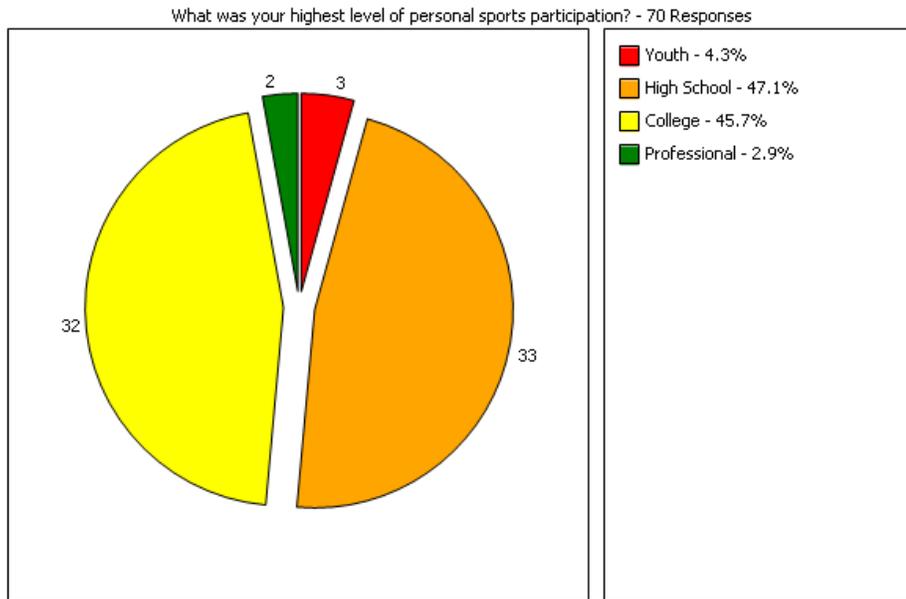


Figure 6. What was your highest level of personal sports participation?

The average score for all of the responders was  $28.7 \pm 3.783$  (Range = 19-37) which is a 72% percent score on the questionnaire. Individual responses for each question have been included in the appendix. Scores on the questionnaire were subdivided by the demographic data and are provided in Tables 1-6.

Table 1. Average scores compared by age group

Age	Score ( $\bar{x} \pm SD$ )	Range
20-29	$30.1 \pm 3.9$	23-37
30-39	$27.3 \pm 4.6$	19-35
40-49	$28.1 \pm 3.3$	23-26
50-59	$28.9 \pm 3.3$	23-37
60+	$27.5 \pm 3.5$	19-37

Table 2. Average scores compared by education level

<b>Highest level of education completed</b>	<b>Score (x ± SD)</b>	<b>Range</b>
High School	28.1 ± 3.7	23-33
Associates degree	26.0 ± 2.3	23-28
Bachelor's degree	29.2 ± 3.7	19-37
Master's degree	28.9 ± 4.0	23-37

Table 3. Average scores compared by college major

<b>Major in college</b>	<b>Score (x ± SD)</b>	<b>Range</b>
Business	26.0 ± 3.2	19-29
Health Sciences	32.3 ± 3.4*	26-37
Liberal Arts	27.3 ± 3.1	23-33
Physical Education	28.6 ± 3.2	24-35
Other	28.0 ± 3.3	23-34

\*Significantly different than all other majors (p<0.05)

Table 4. Average scores compared by age level coached

<b>Age level coached</b>	<b>Score (x ± SD)</b>	<b>Range</b>
Elementary	28.4 ± 3.9	19-35
Middle School	28.8 ± 4.1	23-37
High School	29.0 ± 3.5	23-36

Table 5. Average scores compared by if coached had received payment or not

<b>Paid or volunteer</b>	<b>Score (<math>\bar{x} \pm SD</math>)</b>	<b>Range</b>
Paid	28.8 $\pm$ 3.5	23-37
Volunteer	28.3 $\pm$ 4.9	19-37

Table 6. Average scores compared by highest level of personal sports participation

<b>Highest level of personal sports participation</b>	<b>Score (<math>\bar{x} \pm SD</math>)</b>	<b>Range</b>
Youth	27.0 $\pm$ 1.4	26-28
High School	28.6 $\pm$ 3.6	23-37
College	28.8 $\pm$ 4.0	19-37
Pro	32.0 $\pm$ 5.7	28-36

There was no significant difference in the total score when the data was subdivided by age, education level, age level coached, whether the coach was paid or not, and the highest level of sports participation by the coach. The only significant difference was that health science majors did significantly better than any other college major for the responders who had completed college as their highest level of education.

There was no significant correlation between the total score with any of the demographic categories. The correlations were: age ( $r = -0.135$ ), education level ( $r = 0.120$ ), major field of study ( $r = -0.118$ ), age level coached ( $r = 0.074$ ), whether the coach was paid or not ( $r = 0.050$ ), and the highest level of sports participation by the coach ( $r = 0.108$ ).

The questionnaire was further subdivided into six subscales. The six subscales and number of questions relating to each subscale were: injury prevention (13), practice

design/general physiology (7), hydration (7), nutrition (5), strength and conditioning (5), and concussions (3). There were no significant differences between any of the subscale scores for any of the demographic variables.

Table 7. Average scores per subscale compared to age

Age	Injury Prevention	Practice Design/ General Phys	Hydration	Nutrition	Strength and Conditioning	Concussion
20-29	11.1 ± 1.2	5.6 ± 1.0	4.1 ± 1.2	3.5 ± 1.3	3.3 ± 1.1	2.6 ± 0.5
30-39	10.5 ± 1.5	4.6 ± 1.6	3.8 ± 0.8	3.2 ± 1.7	2.7 ± 0.8	2.5 ± 0.5
40-49	10.6 ± 1.0	5.5 ± 1.0	3.3 ± 1.3	3.1 ± 0.8	3.0 ± 0.9	2.6 ± 0.5
50-59	10.9 ± 1.6	5.3 ± 1.1	3.4 ± 1.1	3.1 ± 1.0	3.8 ± 0.7	2.4 ± 0.6
60+	11.0 ± 2.8	6.0 ± 1.4	3.0 ± 1.4	3.0 ± 0.0	2.5 ± 0.7	2.0 ± 0.0

Table 8. Average scores per subscale compared to education level

Highest level of education completed	Injury Prevention	Practice Design/ General Phys	Hydration	Nutrition	Strength and Conditioning	Concussion
HS	10.3 ± 1.4	5.3 ± 1.0	3.8 ± 1.1	3.1 ± 0.9	3.1 ± 1.1	2.4 ± 0.5
AA	10.2 ± 0.8	5.0 ± 1.2	3.0 ± 1.0	2.4 ± 0.9	3.0 ± 0.7	2.4 ± 0.6
BS/BA	10.9 ± 1.2	5.1 ± 1.3	3.8 ± 1.2	3.4 ± 1.3	3.3 ± 0.9	2.7 ± 0.5
MS/MA	10.9 ± 1.5	5.7 ± 1.1	3.6 ± 1.3	3.2 ± 1.1	3.2 ± 1.0	2.3 ± 0.6

Table 9. Average scores per subscale compared to major in college

Major in college	Injury Prevention	Practice Design/ General Phys	Hydration	Nutrition	Strength and Conditioning	Concussion
Business	9.9 ± 1.1	4.8 ± 1.2	3.5 ± 0.9	2.6 ± 1.2	2.6 ± 0.7	2.6 ± 0.5
Health Sciences	11.5 ± 1.1	5.9 ± 0.9	4.1 ± 1.5	3.9 ± 1.0	4.0 ± 1.1	2.8 ± 0.4
Liberal Arts	10.1 ± 1.3	5.3 ± 1.2	3.7 ± 1.1	2.8 ± 1.5	3.0 ± 0.9	2.4 ± 0.5
Physical Education	11.2 ± 1.2	5.3 ± 1.4	3.5 ± 1.2	3.1 ± 1.2	3.3 ± 0.6	2.2 ± 0.6
Other	10.7 ± 1.3	5.2 ± 1.2	3.5 ± 1.2	3.3 ± 0.9	2.9 ± 0.8	2.5 ± 0.5

Table 10. Average scores per subscale compared to level coached

Age level coached	Injury Prevention	Practice Design/ General Phys	Hydration	Nutrition	Strength and Conditioning	Concussion
Elementary	10.8 ± 1.3	5.2 ± 1.1	3.9 ± 1.3	2.9 ± 1.2	3.0 ± 1.0	2.5 ± 0.5
Middle	10.7 ± 1.1	5.4 ± 1.3	3.7 ± 1.2	3.3 ± 1.3	3.3 ± 1.0	2.4 ± 0.6
HS	10.9 ± 1.6	5.4 ± 1.2	3.5 ± 1.2	3.5 ± 1.0	3.3 ± 0.9	2.6 ± 0.5

Table 11. Average scores per subscale compared to if coached received payment or not

Paid or volunteer	Injury Prevention	Practice Design/ General Phys	Hydration	Nutrition	Strength and Conditioning	Concussion
Paid	10.8 ± 1.3	5.4 ± 1.2	3.6 ± 1.2	3.3 ± 1.1	3.3 ± 1.0	2.5 ± 0.5
Volunteer	10.5 ± 1.5	5.3 ± 1.3	4.1 ± 1.2	2.9 ± 1.3	3.0 ± 1.0	2.6 ± 0.5

Table 12. Average scores per subscale compared to highest level of personal sports participation

Highest level of personal sports participation	Injury Prevention	Practice Design/ General Phys	Hydration	Nutrition	Strength and Conditioning	Concussion
Youth	11.0 ± 1.4	4.5 ± 0.7	2.5 ± 0.7	3.5 ± 0.7	2.5 ± 0.7	3.0 ± 0.0
HS	10.6 ± 1.3	5.4 ± 1.3	3.9 ± 1.2	3.2 ± 1.3	3.2 ± 0.8	2.5 ± 0.5
College	10.9 ± 1.3	5.3 ± 1.1	3.6 ± 1.2	3.3 ± 1.1	3.2 ± 1.1	2.5 ± 0.6
Pro	12.0 ± 1.4	5.0 ± 1.4	3.5 ± 2.1	4.0 ± 0.0	4.5 ± 0.7	3.0 ± 0.0

The results indicated that there was an overall lack of knowledge in each of the categories and it did not matter what demographic category the respondent was in as to how well they did in each of the sub-categories. Since there was no relationship between the scores in each sub category and with the demographic information, we looked at the individual questions in which a majority of the responders answered incorrectly. These questions are as follows with the breakdown of the percentage of individual responses.

Correct answers are bolded.

Question 5: Fluid intake should be dictated by taste preference, since volume of intake, rather than fluid content is the most critical issue in child athletes.

- A. **True: 15.7%**
- B. False: 84.3%

Question 8: Rapid swelling of the brain following a second head injury that occurs before the symptoms of a previous head injury have resolved is referred to as \_\_\_\_\_.

- A. Second Cerebral Injury: 17.1%
- B. Second Impact Syndrome: 52.9%**
- C. Second Relative Abrasion: 0%
- D. Post Concussive Syndrome: 30%

Question 10: If children are ready to participate in organized sports, they are also ready for some type of strength training.

- A. **True: 28.6%**
- B. False: 71.4%

Question 11: Which two micronutrients are MOST likely to be deficient in youth athletes?

- A. Calcium and vitamin D: 31.4%
- B. Iron and vitamin C: 18.6%
- C. Vitamin D and vitamin C: 10%
- D. **Calcium and iron: 40%**

Question 26: What is a good way to monitor an athlete's hydration levels during exercise?

- A. Asking the athlete how thirsty he or she is after practice: 5.7%
- B. Observing the athlete's rate of sweating: 45.7%
- C. **Weighing an athlete before and after practice: 32.9%**
- D. Monitoring reaction time and coordination: 15.7%

Question 27: During which of the following is it MOST appropriate to consume electrolyte-supplemented beverages such as sports drinks?

- A. When activity lasts longer than 30 minutes: 47.1%
- B. During high-intensity strength-training workouts: 15.7%
- C. Whenever participants are visibly sweating: 15.7%
- D. **When the schedule calls for repeated same-day sessions: 21.4%**

Question 36: The performance of strength training by children and adolescents should be \_\_\_\_\_.

- A. Discouraged due to the potential for damage to their growth plates: 32.9%
- B. Avoided due to the increased risk of musculoskeletal injury: 11.4%
- C. Allowed only if the youth are mature enough to exercise on their own: 21.4%
- D. **Encouraged to reduce the risk of sports-related injuries: 34.3%**

Question 38: Nausea, initially pale and then flushed skin and light headedness are some acute signs and symptoms of what?

- A. Heat cramps: 2.9%
- B. **Dehydration: 47.1%**
- C. Hypothermia: 0%
- D. Heat stroke: 50%

Question 39: What percentage of a child's caloric intake should be carbohydrates?

- A. **55-70%: 48.6%**
- B. 25-35%: 44.3%
- C. 12-15%: 4.3%
- D. 70-85%: 2.9%

## **DISCUSSION**

Even though research assessing the exercise physiology knowledge of coaches has been limited, our study found comparable results. In a majority of the previous research, it was found that there is a general lack of knowledge amongst coaches. In previous research, the studies that were conducted usually only covered one topic. These studies focused usually had a questionnaire, survey or other form of assessment on a specific topic like concussions, injury prevention or nutrition. In this study, we assessed the general knowledge in six different topic areas in one comprehensive questionnaire. In general, it was found that there was a general lack of knowledge in all areas, and not in one topic versus another. This compares to previous research in that a lack of information in specific areas were found.

The average score on the exam was 28.7 out of 40. Thus, respondents answered approximately 11 questions incorrectly. There was no significant difference between total score and age, level of education, age level coached, whether the coach was paid or not, and the highest level of sports participation by the coach. The only significant difference was that respondents with a health science major scored higher compared to the respondents with any other major. On average, health science majors answered five more questions correctly.

We also broke down the responses for each individual question. From this information, we found nine questions in which a majority (approximately 50% or greater)

of the respondents answered incorrectly. Four of the nine questions fell into the hydration category. This shows that there is a huge need for more hydration information when educating youth coaches, especially since dehydration can lead to a variety of serious heat-related problems. This hydration information needs to include when and what type of fluid should be consumed, as well as how to assess hydration status. The other five questions fell into the nutrition (2), strength and conditioning (2), and concussion (1) categories. This not only pinpoints certain categories that may need more education but it also helps to uncover important concepts that need to be covered in an education program. For example, question 8 asks for a definition of second impact syndrome. Only 50% of the people got this question correct. It is disturbing that only half of the responders knew what this syndrome was called. If the proper precautions are not taken, returning an athlete to competition too soon can have catastrophic consequences. Additionally, there seems to be a general lack of information about when strength and conditioning can be instituted for young athletes. This type of information needs to be in an education program.

Attached in the appendix are two sections of the demographic data that we did not use when we compared results. These included the specific sports that the respondents coached and the type of certifications that the respondents held. It is important to note that 74% (52 out of 70) of coaches were first aid certified as well as 73% (51 out of 70) of coaches were also CPR certified. Similarly, 54% (38 out of 70) had AED training. This shows that there is a fairly high percentage of coaches that are both first aid and CPR certified if an emergency situation were to arise. In previous research, it was found by Mickalide and Hansen (2012) that only 13% of youth coaches were certified in first aid

and only 20% were certified in CPR. Our study shows that a much higher percentage of coaches were certified in each. Over the course of the last year it seems that numbers and awareness of being CPR and first aid certified has increased.

There were several possible limitations to the study. First, when looking at the questions that were answered incorrectly, it is possible that some of the problems could be due to poorly worded questions, which could have caused confusion on the part of the exam taker. However, most of these questions relate to basic knowledge that all coaches should know. These questions could also have been balanced better in each of the subscales of information to allow for the same amount of questions in each category. Second, the study itself was only online for one month and more responses could have been generated if the questionnaire was left online longer and more public relations awareness was done to further promote the study.

At the end of the questionnaire, the respondents were able to access a PDF file with all of the questions and the correct answers, which allowed them to evaluate which questions that they answered incorrectly. This holds practical implications for youth coaches as they are able to use this information to better their knowledge of basic exercise physiology. These coaches are able to see what questions they got wrong and evaluate which areas they need to know more about. By doing studies like this that allow the responder to see their own results, it will help to better the basic exercise physiology knowledge of the coaching population as a whole.

The benefit of conducting and evaluating a study such as this one is the ability to use this knowledge, especially of the individual questions, to help develop and create courses for youth coaches that cover these topics. This will help youth coaches become

more knowledgeable on how to coach youth sports and understand the basic topics of exercise physiology, so that a safer and more enjoyable environment can be created for young athletes.

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APPENDIX A  
QUESTIONNAIRE



QUESTIONNAIRE

- 1. Which of the following athletes is at the LOWEST risk of developing a heat-related illness?**
  - A. An overweight high school football player who recently recovered from a diarrheal illness engaging in two-a-day practices in 80 degree Fahrenheit heat
  - B. A physically fit, well-rested 12-year-old soccer player participating in a tournament in 95 degree Fahrenheit heat
  - C. A physically fit, mildly dehydrated 15-year-old cross-country runner completing a five-mile run in 90 degree Fahrenheit heat
  - D. A previously inactive 8-year-old boy with a mildly elevated temperature playing tag with his friends in 95 degree Fahrenheit weather
  
- 2. A player is experiencing shortness of breath, coughing, wheezing, and tightness in his chest. What condition is he MOST likely experiencing?**
  - A. An asthma attack
  - B. A heart attack
  - C. A concussion
  - D. A fractured rib
  
- 3. The preferred way to stay safe and prevent hypothermia when exercising outdoors is to \_.**
  - A. Dress as warmly as possible
  - B. Drink warm fluids prior to exercising
  - C. Eat warm foods before exercise so the core body temperature increases
  - D. Dress in layers and adjust them according to body temperature
  
- 4. Current recommendations state that children and adolescents should perform 60 minutes of \_\_\_\_\_ on a daily basis.**
  - A. High-intensity cardiorespiratory exercise
  - B. Body-weight exercises and calisthenics
  - C. Moderate to vigorous physical activity
  - D. Strength training with light to moderate loads
  
- 5. Fluid intake should be dictated by taste preference, since volume of intake, rather than fluid content, is the most critical issue in child athletes.**
  - A. True
  - B. False

**6. Before exercise, it is recommended that athletes consume \_\_\_\_.**

- A. 8-12 ounces of fluid, 10-15 minutes before exercise
- B. 5-10 ounces of fluid, 15-20 minutes before exercise
- C. 16-20 ounces of fluid, 10-15 minutes before exercise
- D. Players do not need any fluids before exercise

**7. What does the acronym RICE stand for in injury prevention and care?**

- A. Rest, ice, console, elevation
- B. Rest, inform, console, evaluation
- C. Rest, ice, compression, elevation
- D. Rest, inform, compression, evaluation

**8. Rapid swelling of the brain following a second head injury that occurs before the symptoms of a previous head injury have resolved is referred to as \_\_\_\_\_.**

- A. Second Cerebral Injury
- B. Second Impact Syndrome
- C. Second Relative Abrasion
- D. Post Concussive Syndrome

**9. A youth sports coach who sees a decrease in performance and sudden lack of enthusiasm about participation in one of his or her athletes is MOST likely seeing the results of \_.**

- A. Overtraining
- B. Overuse injury
- C. Under-training
- D. Puberty

**10. If children are ready to participate in organized sports, they are also ready for some type of strength training.**

- A. True
- B. False

**11. Which two micronutrients are MOST likely to be deficient in youth athletes?**

- A. Calcium and vitamin D
- B. Iron and vitamin C
- C. Vitamin D and vitamin C
- D. Calcium and iron

**12. Which of the following statements comparing youth exercisers to adult exercisers is MOST accurate?**

- A. Children tend to recover more quickly from high-intensity bouts of physical exertion.
- B. Children have higher levels of anaerobic power than adults.
- C. Children eliminate lactic acid more slowly after exercise than adults.
- D. Children typically perform better on high-energy activities lasting 30–120 seconds.

**13. One of the athletes on your team has begun to struggle in practice. He looks pale and complains of dizziness, fatigue, and a throbbing headache. As he describes his symptoms, he begins to vomit. When you try to talk to him, he is somewhat disoriented. He does not fall or hit his head. As his coach, what should you do?**

- A. Have the child lie down on the ground where he is, identify a person to call 9-1-1 while you offer the child ice cold water, give the child a fever-reducer such as Tylenol or ibuprofen, and await EMS arrival
- B. Move the child to shade, identify a person to call 9-1-1 while you remove protective equipment and clothing, give the child a fever-reducer such as Tylenol or ibuprofen, force the child to drink ice cold water, and await EMS arrival
- C. Remove the child from practice and move him to the shade, instruct an assistant coach to attend to the athlete and call the child's mother while you call 9-1-1, continue practice while you await arrival of the child's parents and EMS
- D. Move the child to shade, identify a person to call 9-1-1 while you remove protective equipment and clothing, spray cold water on the child, and await EMS arrival

**14. When should an athlete return to play after a concussion?**

- A. When the athlete says he or she feels ready to return to play
- B. After receiving written consent from the athlete's parents
- C. After receiving written clearance from a licensed healthcare provider
- D. When the coach feels he or she is able to return

**15. What is the primary purpose of a cool-down?**

- A. To reduce heart rate and prevent blood pooling in the extremities
- B. To raise the body's core temperature
- C. To prepare the body for the next bout of exercise
- D. To decrease the amount of post-workout muscle soreness

**16. A player must experience loss of consciousness in order to be diagnosed with a concussion.**

- A. True
- B. False

**17. If the temperature and heat-stress index are expected to be mildly elevated, how should a coach respond?**

- A. Remind parents to make sure the kids wear sunscreen
- B. Postpone or cancel practice
- C. Include one scheduled five-minute break per one hour of activity
- D. Lower the intensity and/or duration of activity

**18. The primary goal of acute injury management for strains and sprains is \_\_.**

- A. To limit swelling and control the pain
- B. To improve the range of motion of the injured area
- C. To ensure that the injured athlete remains relatively calm
- D. To determine the general severity of the injury

**19. A 15-year-old female club soccer player was pushed to the ground by an opposing player. You witness her hit her head. She stands up on her own but looks “foggy.” She complains of a mild headache and answers your questions appropriately but slowly. What is the BEST next step?**

- A. Monitor the athlete for several hours to assess clinical condition
- B. Prompt referral to the ER or a physician for evaluation
- C. Return to play since she did not have loss of consciousness
- D. Send her home with a teammate to rest and recover

**20. What is a function of protein in the diet?**

- A. Protein helps regulate metabolism
- B. Protein helps the body recover and repair itself after exercise
- C. Protein is used as a source of energy for short burst activities
- D. Protein helps with nerve conduction

**21. The purpose of an AED is to \_\_.**

- A. Help with delivering compressions during CPR
- B. Analyze heart rhythm and deliver a shock if necessary
- C. Help to clear a possible airway obstruction
- D. Prevent the loss of consciousness

**22. An example of a proper pre-competition meal would be \_\_\_\_.**

- A. A piece of fruit
- B. Pasta with chicken
- C. A hamburger with fries
- D. A candy bar

**23. You are the coach of a middle school basketball team. Two of your players showed up late to practice and you would like to discipline them so that they learn the importance of punctuality. What would be the LEAST appropriate disciplinary method?**

- A. Require the players to apologize to their teammates for being late
- B. Require that the players stay after practice for several minutes to help clean up the gym
- C. Have a discussion with the players after practice about the importance of timeliness for the team
- D. Have the players run several extra laps at the onset of practice

**24. A well-designed warm-up period will accomplish which of the following?**

- A. Prevent early-onset muscle soreness and fatigue
- B. Enhance the flexibility of all participants
- C. Prepare the body for the upcoming exercise events
- D. Allow an athlete to reach a steady-state heart rate that can be maintained

**25. Drastic loss in weight, mood swings and a preoccupation with food, calories and weight are warning signs of what illness?**

- A. Bulimia
- B. Compulsive overeating
- C. Anorexia
- D. Night eating syndrome

**26. What is a good way to monitor an athlete's hydration levels during exercise?**

- A. Asking the athlete how thirsty he or she is after practice
- B. Observing the athlete's rate of sweating
- C. Weighing the athlete before and after practice
- D. Monitoring reaction time and coordination

**27. During which of the following is it MOST appropriate to consume electrolyte-supplemented beverages such as sports drinks?**

- A. When activity lasts longer than 30 minutes
- B. During high-intensity strength-training workouts
- C. Whenever participants are visibly sweating
- D. When the schedule calls for repeated same-day sessions

**28. What is the MOST likely cause of an overuse injury in a young athlete?**

- A. High body mass index
- B. Training errors
- C. Previous injury
- D. Improper footwear

**29. Acute musculoskeletal injuries should be treated with heat packs for up to the first 72 hours before ice is applied.**

- A. True
- B. False

**30. When an athlete suffers a suspected spinal injury, you should first \_\_\_\_\_.**

- A. Provide stabilization to the suspected injured area
- B. Determine if the athlete can move his or her extremities
- C. Check for vital signs
- D. Ask the athlete to touch his or her toes

**31. For exercise bouts lasting LESS THAN 60 minutes, it is recommended that a player should replace his or her fluids with \_\_\_\_\_.**

- A. Chocolate milk
- B. Sports drinks
- C. Energy drinks
- D. Water

**32. During the preseason, it may be prudent for youth sports coaches to spend a little less time practicing \_\_\_\_\_ and a little more time performing \_\_\_\_.**

- A. Sport-specific skills; conditioning exercises
- B. Aerobic exercise; sport-specific skills
- C. Conditioning exercises; balance training
- D. Plyometric exercise; aerobic exercise

**33. The most important consideration when strength training with youth is \_\_\_\_.**

- A. Lifting the most weight possible
- B. Increasing muscle mass
- C. Teaching proper technique and safety
- D. Increasing muscular endurance

**34. Static stretching is MOST appropriate during which segment of a youth sports practice?**

- A. Warm-up
- B. Resistance training phase
- C. Aerobic conditioning phase
- D. Cool-down

**35. Players should only take water breaks when they are thirsty.**

- A. True
- B. False

**36. The performance of strength training by children and adolescents should be \_\_\_\_.**

- A. Discouraged due to the potential for damage to their growth plates
- B. Avoided due to the increased risk of musculoskeletal injury
- C. Allowed only if the youth are mature enough to exercise on their own
- D. Encouraged to reduce the risk of sports-related injuries

**37. During the acute phase of injury management, ice should be applied every hour for up to \_\_\_\_ until the tendency for swelling has passed.**

- A. 5 minutes
- B. 20 minutes
- C. 45 minutes
- D. 60 minutes

**38. Nausea, initially pale and then flushed skin and light headedness are some acute signs and symptoms of what?**

- A. Heat Cramps
- B. Dehydration
- C. Hypothermia
- D. Heat Stroke

**39. What percentage of a child's caloric intake should be carbohydrates?**

- A. 55-70%
- B. 25-35%
- C. 12-15%
- D. 70-85%

**40. Which of the following would be the LEAST effective way to help minimize heat-related injuries during an outdoor football practice?**

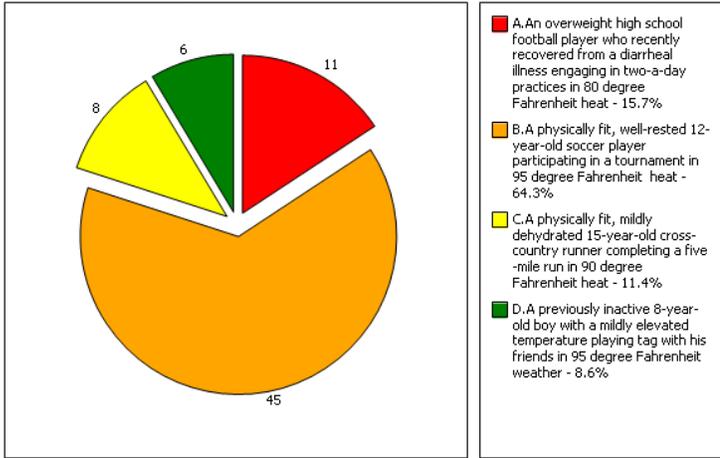
- A. Practice with no pads or helmets
- B. Conduct a walk-through of plays instead of running them at full speed
- C. Take frequent water breaks
- D. Hold practice between 1:00 – 4:00 p.m.

APPENDIX B

INDIVIDUAL RESPONSES TO EACH QUESTION

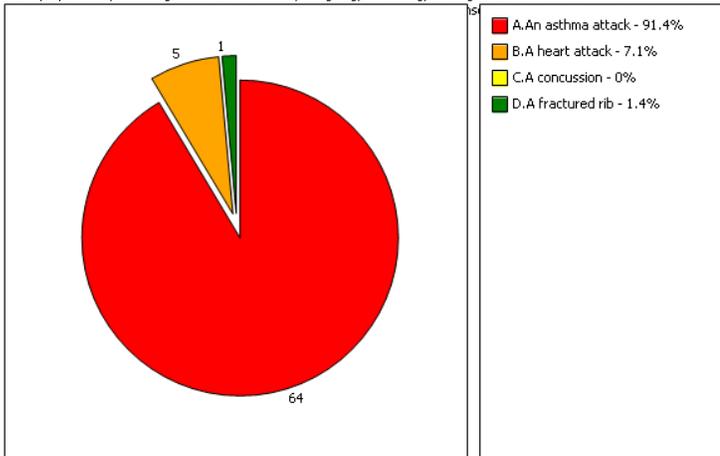
### Question 1

1. Which of the following athletes is at the LOWEST risk of developing a heat-related illness? - 70 Responses



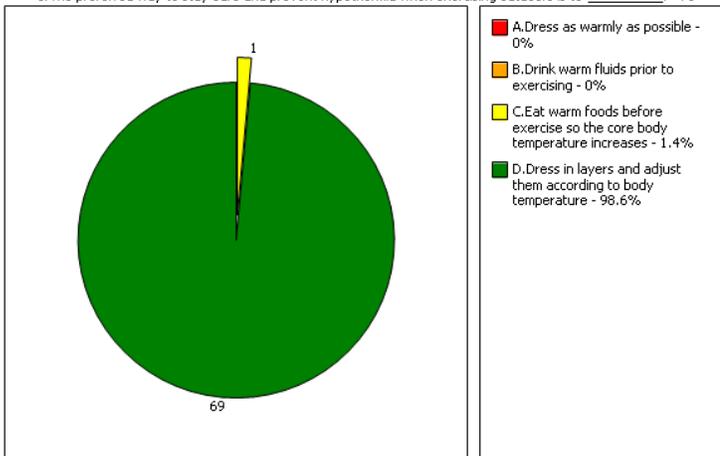
### Question 2

2. A player is experiencing shortness of breath, coughing, wheezing, and tightness in his chest. What condition is he experiencing?



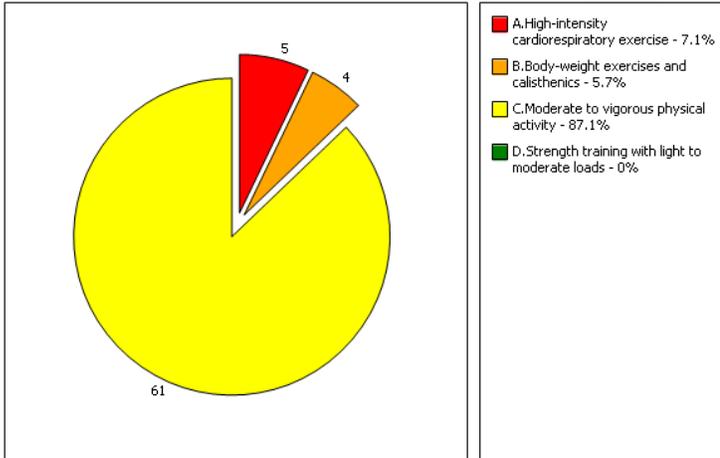
### Question 3

3. The preferred way to stay safe and prevent hypothermia when exercising outdoors is to \_\_\_\_\_.



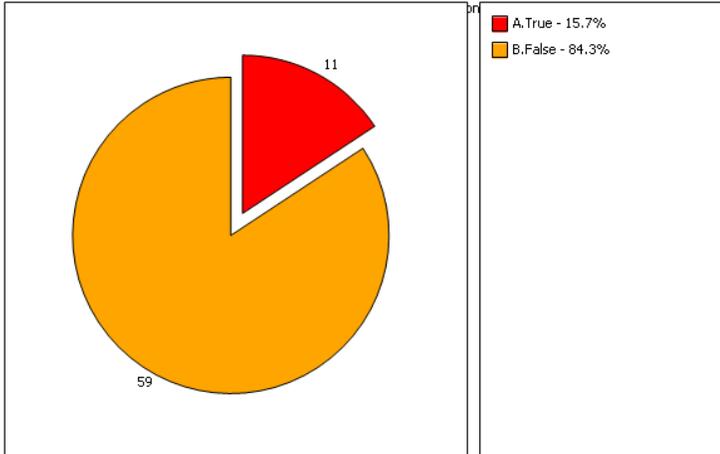
### Question 4

4. Current recommendations state that children and adolescents should perform 60 minutes of \_\_\_\_\_ on a daily



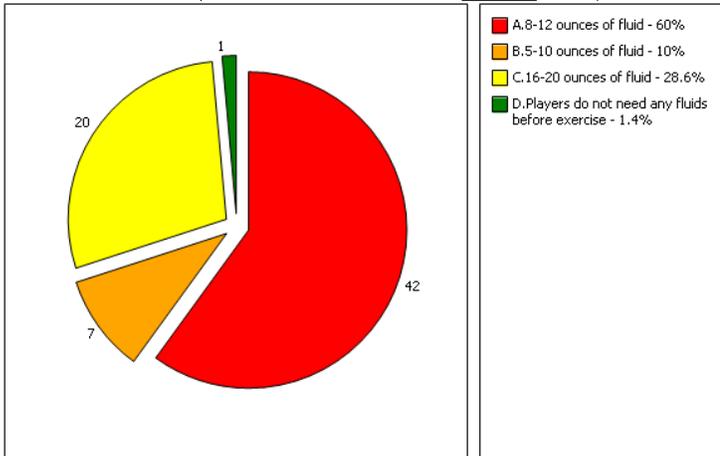
### Question 5

5. Fluid intake should be dictated by taste preference, since volume of intake, rather than fluid content, is the most



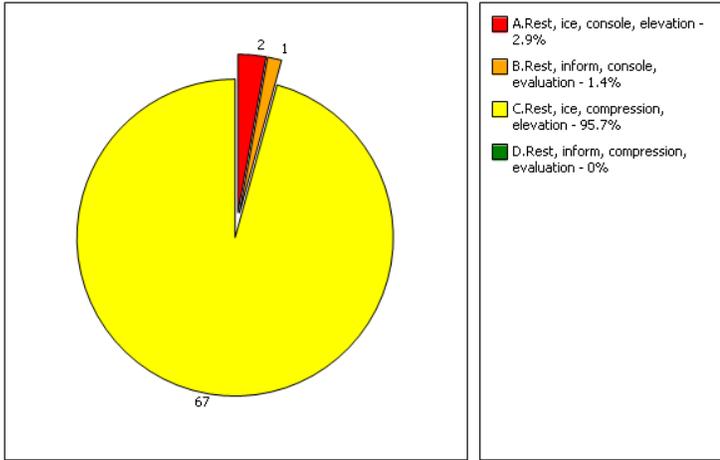
### Question 6

6. Before exercise, it is recommended that athletes consume \_\_\_\_\_ - 70 Responses



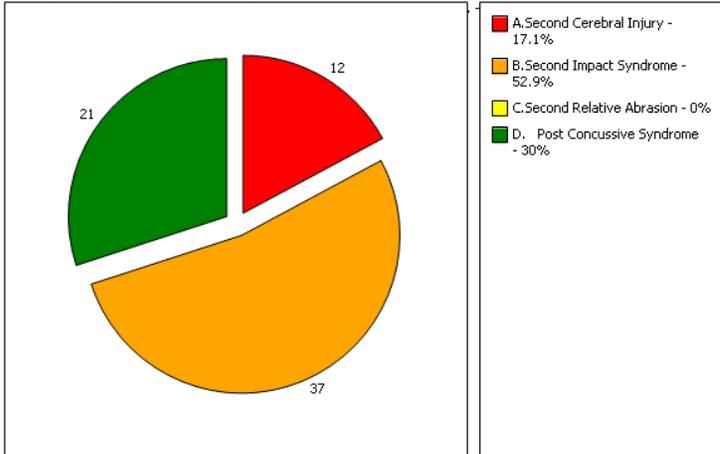
### Question 7

7. What does the acronym RICE stand for in injury prevention and care? - 70 Responses



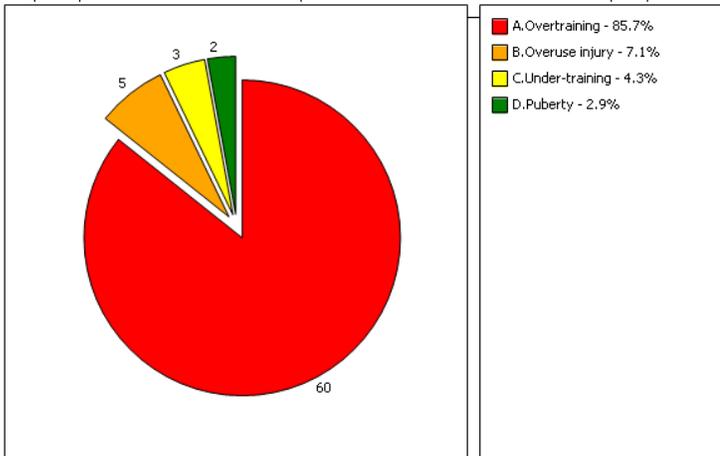
### Question 8

8. Rapid swelling of the brain following a second head injury that occurs before the symptoms of a previous head



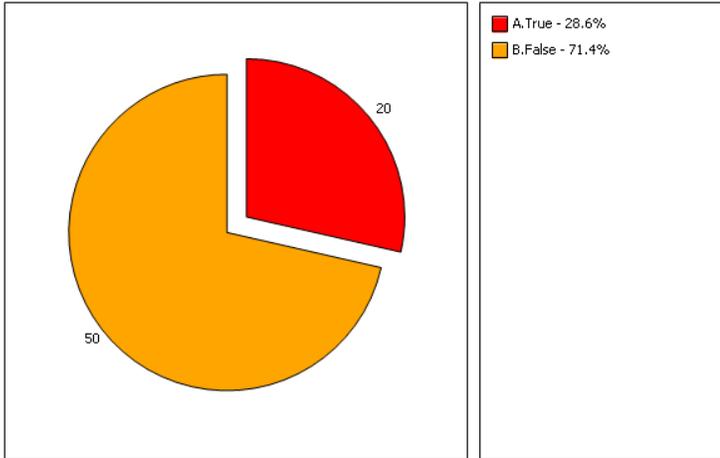
### Question 9

9. A youth sports coach who sees a decrease in performance and sudden lack of enthusiasm about participation in one



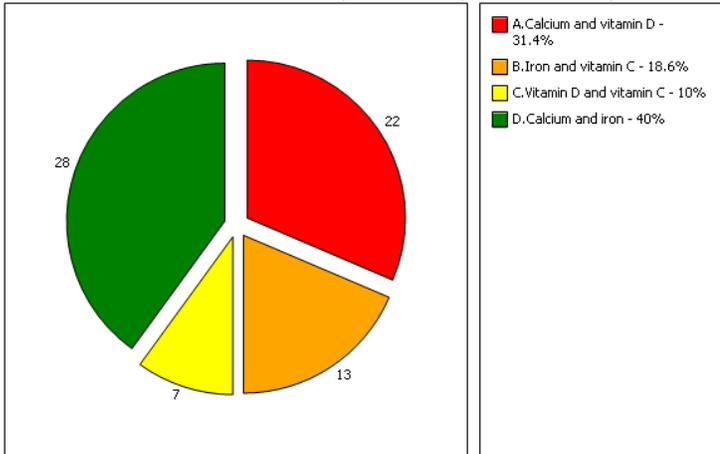
### Question 10

10.If children are ready to participate in organized sports, they are also ready for some type of strength training. - 70



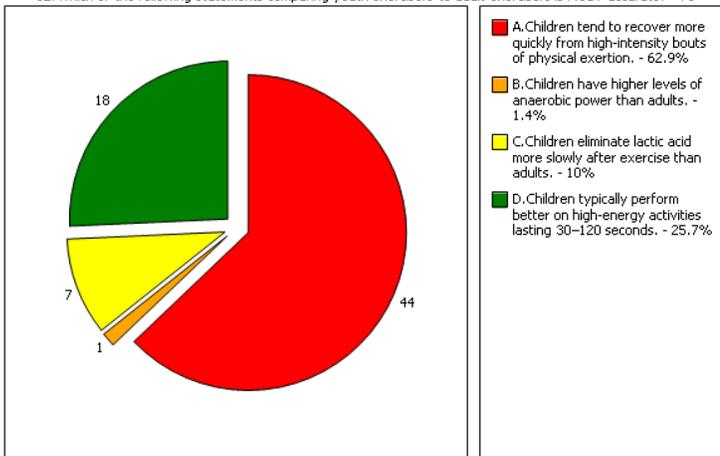
### Question 11

11.Which two micronutrients are MOST likely to be deficient in youth athletes? - 70 Responses



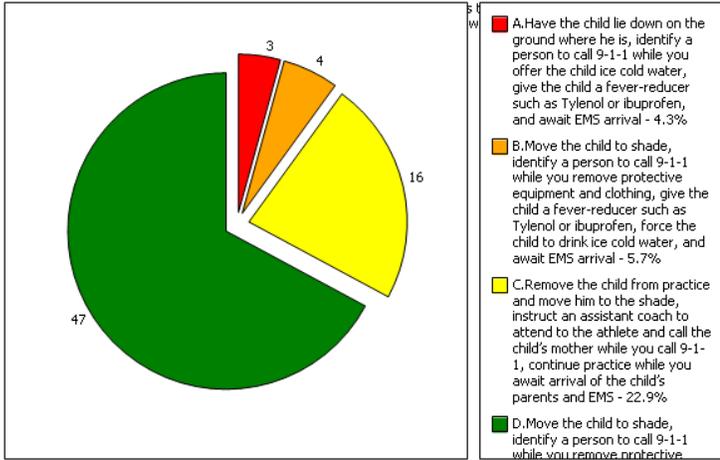
### Question 12

12.Which of the following statements comparing youth exercisers to adult exercisers is MOST accurate? - 70



### Question 13

13. One of the athletes on your team has begun to struggle in practice. He looks pale and complains of dizziness,



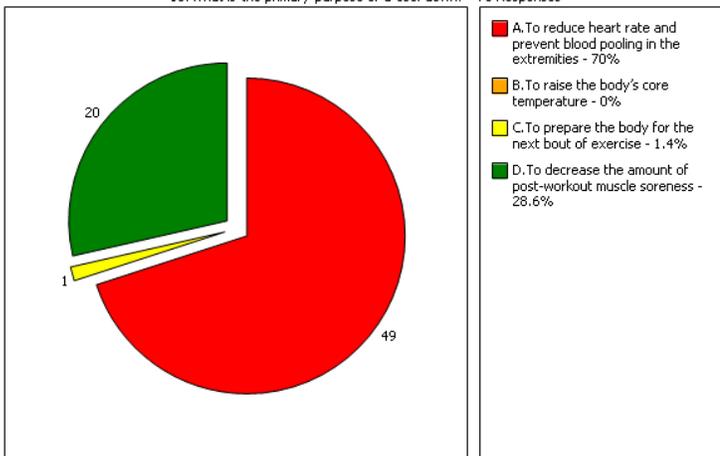
### Question 14

14. When should an athlete return to play after a concussion? - 70 Responses



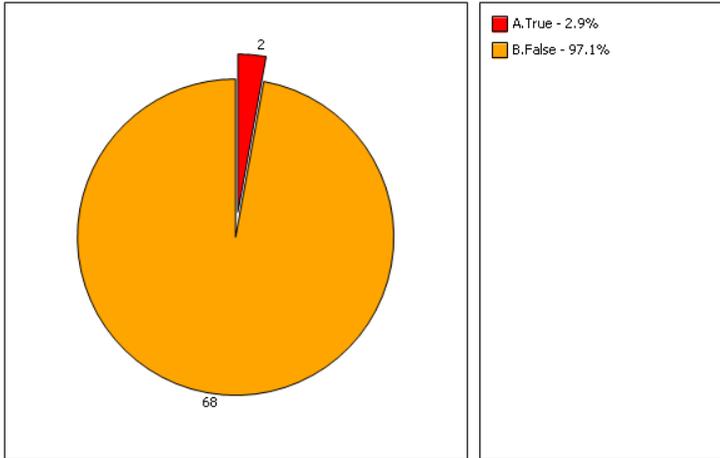
### Question 15

15. What is the primary purpose of a cool-down? - 70 Responses



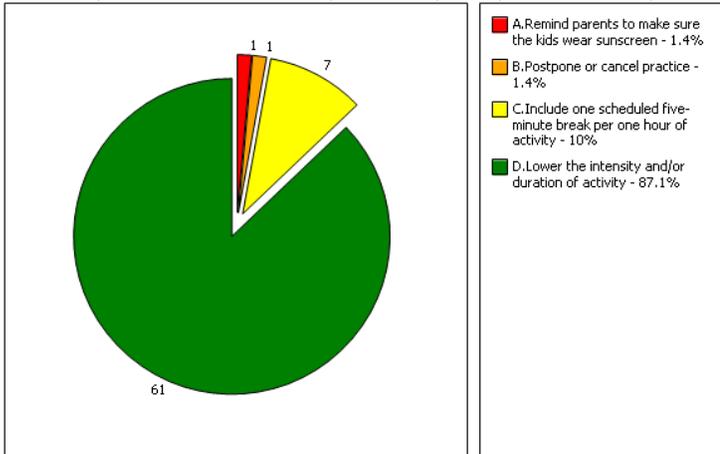
### Question 16

16. A player must experience loss of consciousness in order to be diagnosed with a concussion. - 70 Responses



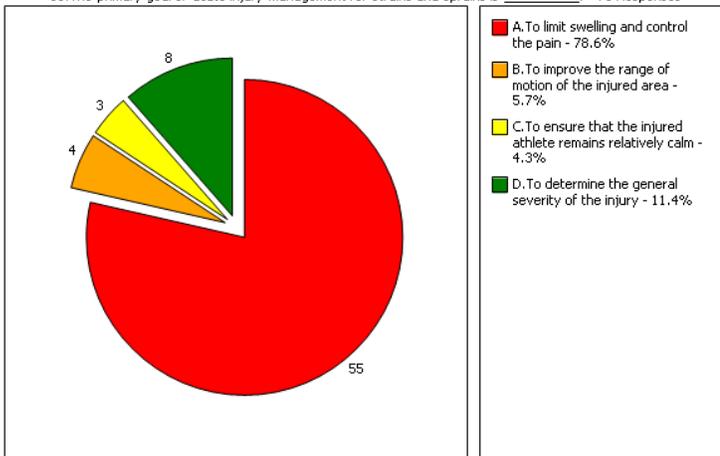
### Question 17

17. If the temperature and heat-stress index are expected to be mildly elevated, how should a coach respond? - 70



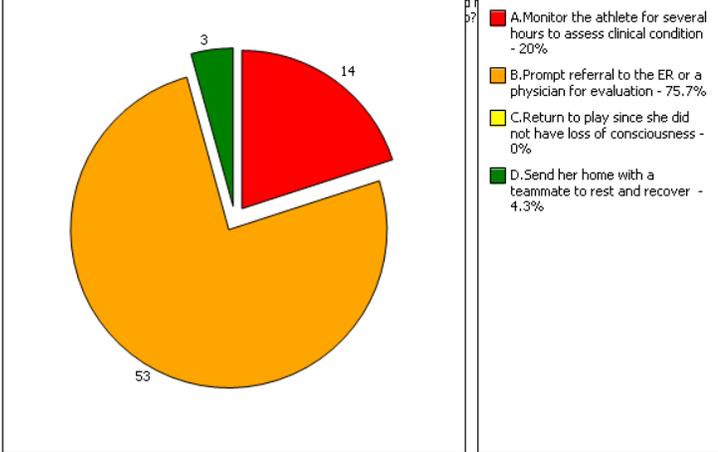
### Question 18

18. The primary goal of acute injury management for strains and sprains is \_\_\_\_\_ . - 70 Responses



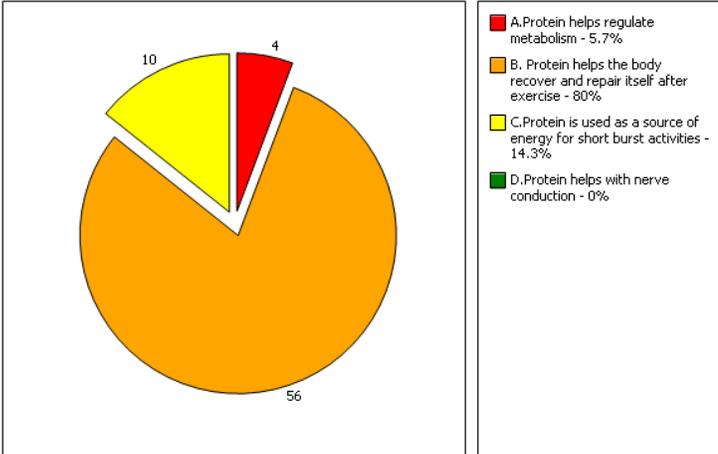
### Question 19

19. A 15-year-old female club soccer player was pushed to the ground by an opposing player. You witness her hit her



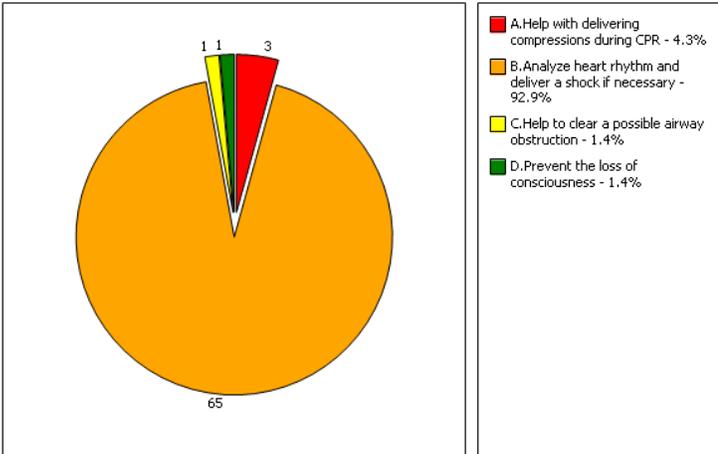
### Question 20

20. What is a function of protein in the diet? - 70 Responses



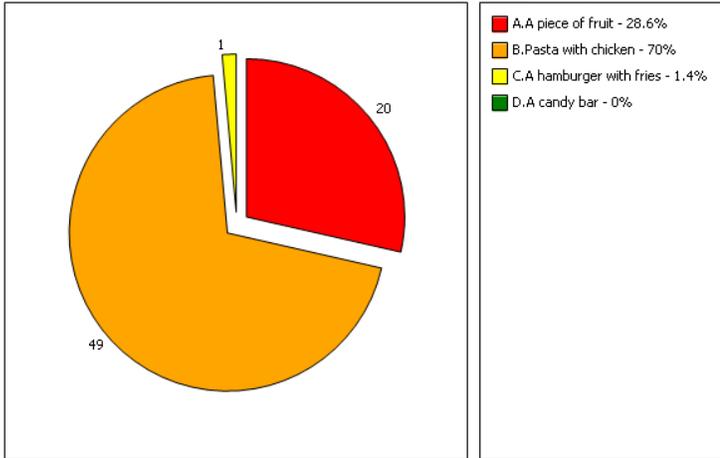
### Question 21

21. The purpose of an AED is to \_\_\_\_\_ . - 70 Responses



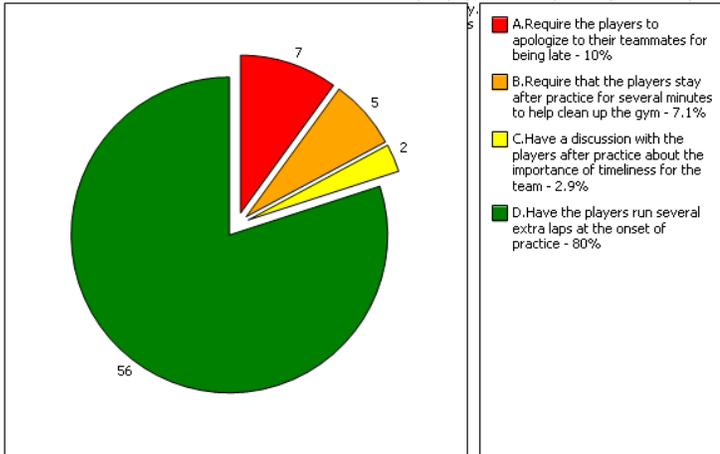
### Question 22

22. An example of a proper pre-competition meal would be \_\_\_\_\_ - 70 Responses



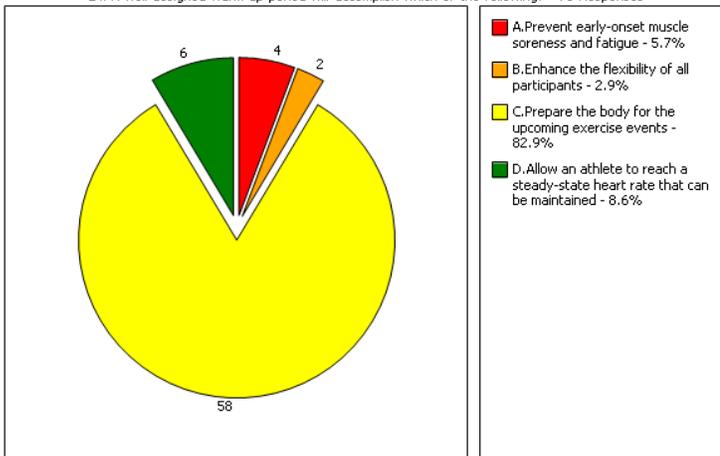
### Question 23

23. You are the coach of a middle school basketball team. Two of your players showed up late to practice and you \_\_\_\_\_ - 70 Responses



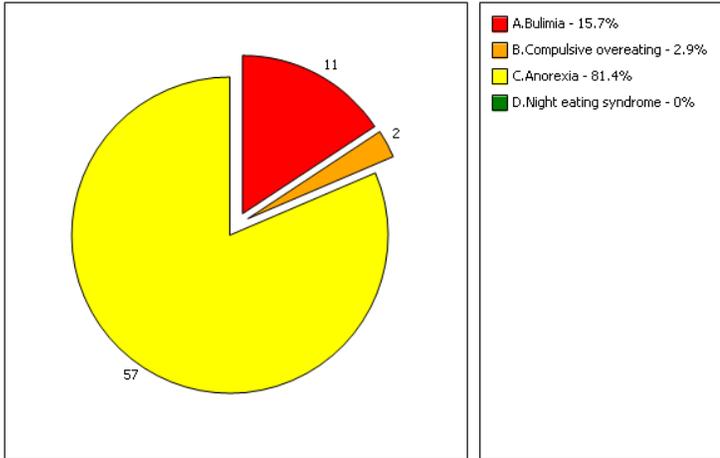
### Question 24

24. A well-designed warm-up period will accomplish which of the following? - 70 Responses



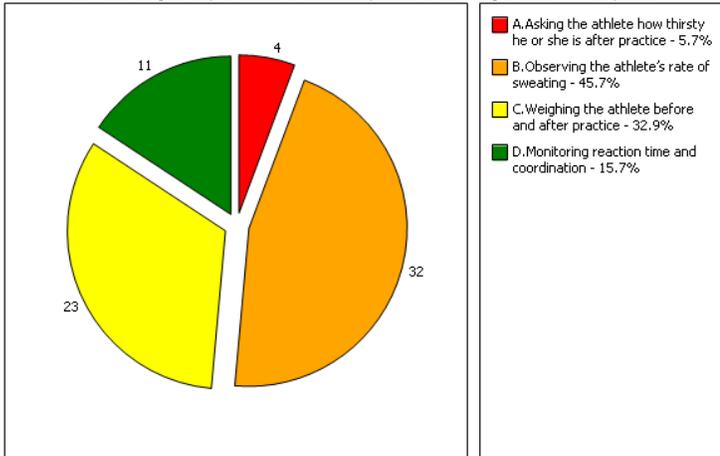
### Question 25

25. Drastic loss in weight, mood swings and a preoccupation with food, calories and weight are warning signs of what



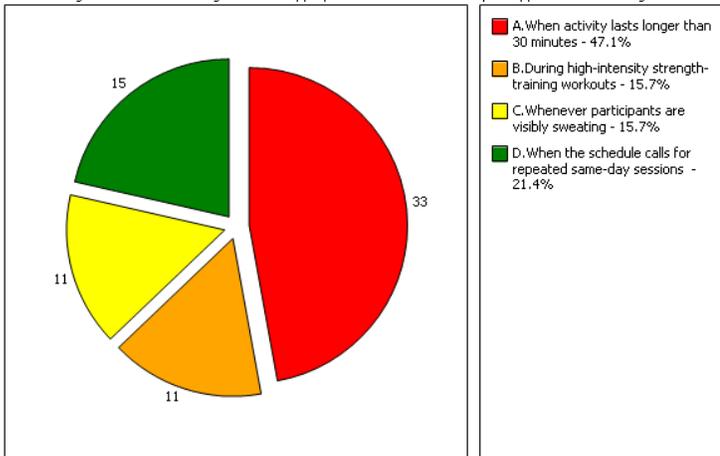
### Question 26

26. What is a good way to monitor an athlete's hydration levels during exercise? - 70 Responses



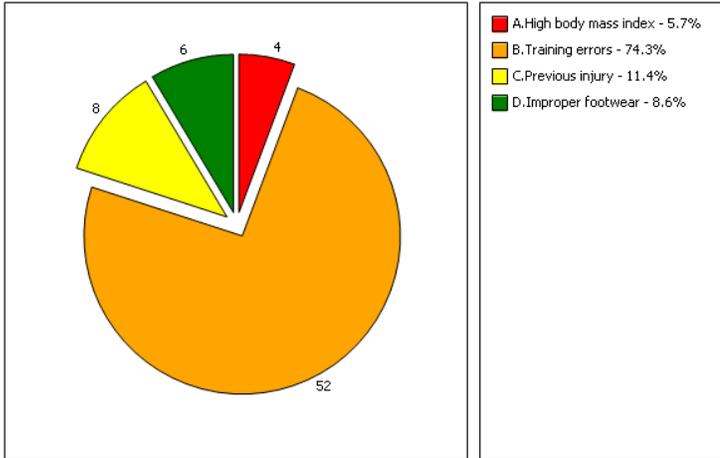
### Question 27

27. During which of the following is it MOST appropriate to consume electrolyte-supplemented beverages such as



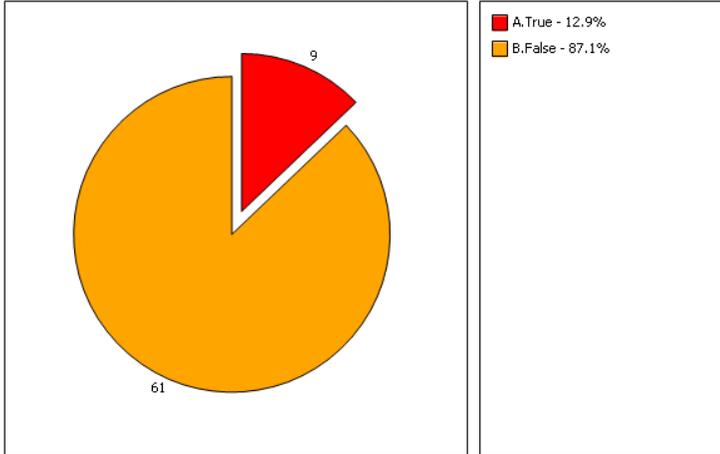
### Question 28

28.What is the MOST likely cause of an overuse injury in a young athlete? - 70 Responses



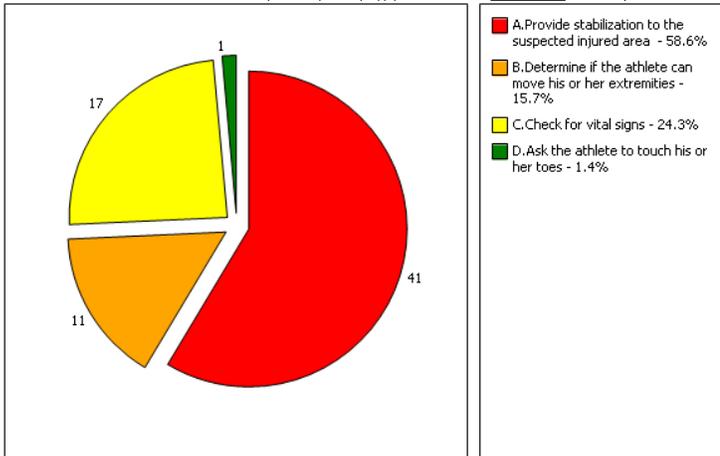
### Question 29

29.Acute musculoskeletal injuries should be treated with heat packs for up to the first 72 hours before ice is applied. -



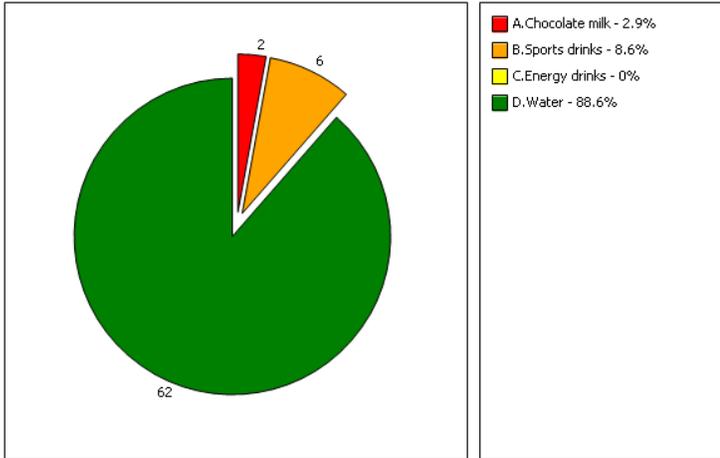
### Question 30

30.When an athlete suffers a suspected spinal injury, you should first \_\_\_\_\_ . - 70 Responses



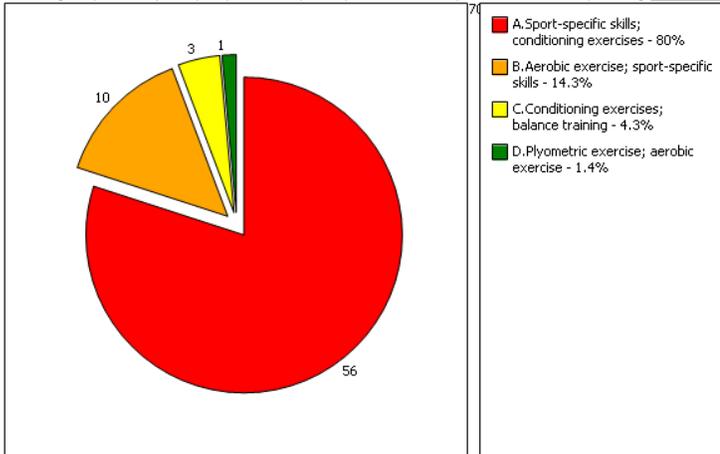
### Question 31

31. For exercise bouts lasting LESS THAN 60 minutes, it is recommended that a player should replace his or her fluids



### Question 32

32. During the preseason, it may be prudent for youth sports coaches to spend a little less time practicing \_\_\_\_\_



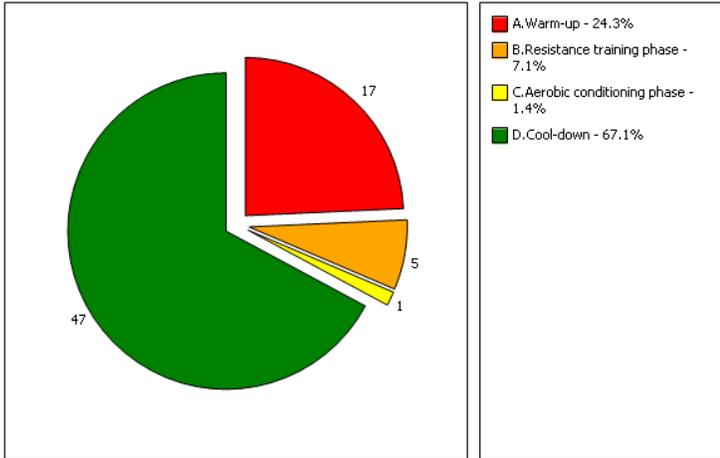
### Question 33

33. The most important consideration when strength training with youth is \_\_\_\_\_ - 70 Responses



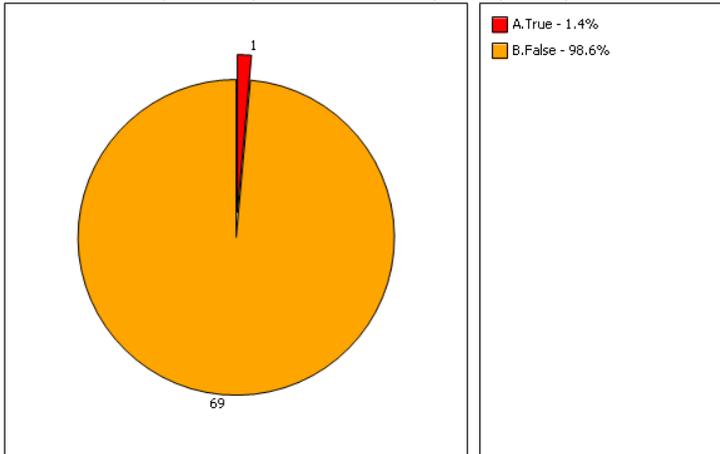
### Question 34

34. Static stretching is MOST appropriate during which segment of a youth sports practice? - 70 Responses



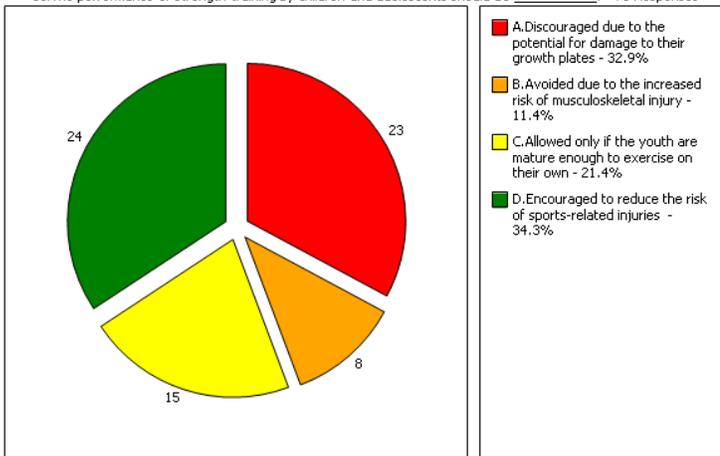
### Question 35

35. Players should only take water breaks when they are thirsty. - 70 Responses



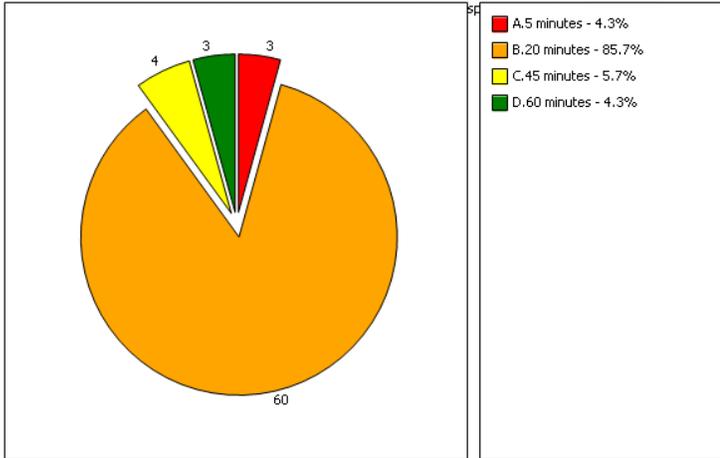
### Question 36

36. The performance of strength training by children and adolescents should be \_\_\_\_\_. - 70 Responses



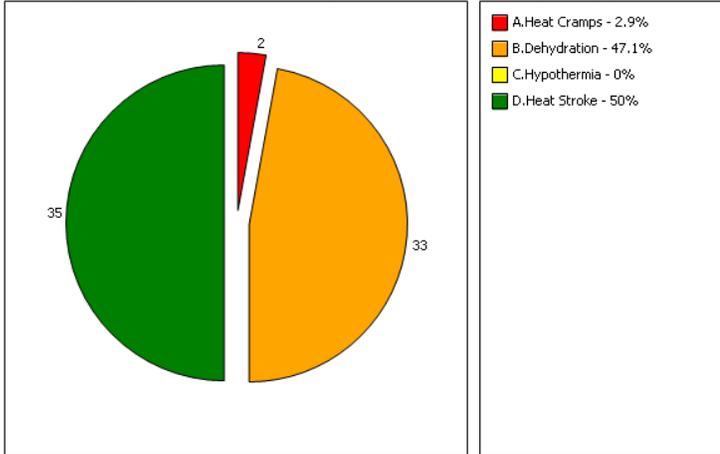
### Question 37

37. During the acute phase of injury management, ice should be applied every hour for up to \_\_\_\_\_ until the



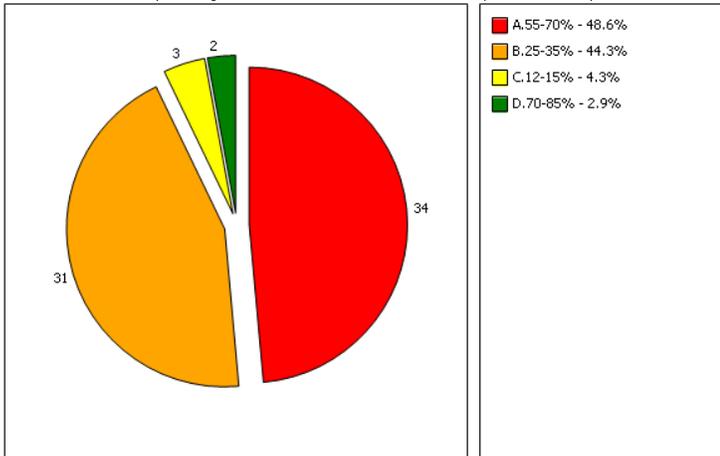
### Question 38

38. Nausea, initially pale and then flushed skin and light headedness are some acute signs and symptoms of what? -



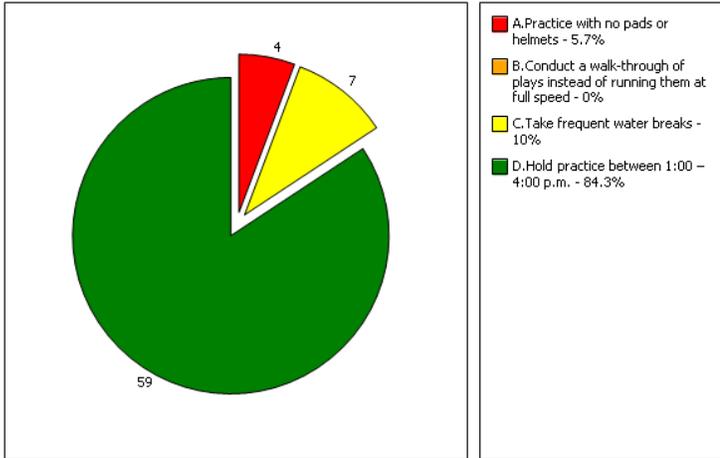
### Question 39

39. What percentage of a child's caloric intake should be carbohydrates? - 70 Responses



### Question 40

40. Which of the following would be the LEAST effective way to help minimize heat-related injuries during an outdoor



APPENDIX C

BREAKDOWN OF OTHER DEMOGRAPHIC DATA

## WHAT SPORT DO YOU COACH?

Basketball: 28.6% (20)  
Alpine Ski Racing: 24.2% (17)  
Baseball: 22.9% (16)  
Volleyball: 17.1% (12)  
Softball: 17.1% (12)  
Soccer: 17.1% (12)  
Football: 10.0% (7)  
Track and Field: 8.6% (6)  
Tennis: 7.1% (5)  
Wrestling: 4.3% (3)  
Swimming 4.3% (3)  
Ice Hockey: 2.9% (2)  
Field Hockey: 1.4% (1)  
La Crosse: 1.4% (1)  
Cross Country Running: 1.4% (1)  
Golf: 1.4% (1)  
Gymnastics: 1.4% (1)  
Dance: 1.4% (1)  
Cross Country Skiing: 1.4% (1)  
Rowing: 1.4% (1)  
Strength and Conditioning: 1.4% (1)

## **DO YOU HAVE ANY CERTIFICATIONS?**

First Aid: 74.3% (52)

CPR: 72.9% (51)

AED: 54.3% (38)

ACLS: 5.7% (4)

PSIA level II: 5.7% (4)

Concussion training: 2.9% (2)

USSA alpine official: 2.9% (2)

NFHS Certified Coach: 2.9% (2)

MSHSL Coaching Certificate 2.9% (2)

Coach 100: 1.4% (1)

EMT: 1.4% (1)

USA Football Level 1 Coach Certification: 1.4% (1)

CSCS: 1.4% (1)

USAW: 1.4% (1)

Special Recreation: 1.4% (1)

US Lacrosse Certified coach: 1.4% (1)

College coaching certification: 1.4% (1)

CAN: 1.4% (1)

Fitnessgram Certification: 1.4% (1)

CPI (restraint): 1.4% (1)

USA Gymnastics Master of Sport: 1.4% (1)

APPENDIX D  
REVIEW OF LITERATURE

## **REVIEW OF LITERATURE**

The purpose of this paper is to review the literature concerning the knowledge and development of youth coaches including the mental, psychological, physical and exercise physiological aspects of coaching.

### **Background of Coaching and the Development of Knowledge**

The idea of “coaching” connects back to the beginning of mankind with the older, more experienced people teaching the younger ones the skills of survival (Performance Coaching International, 2006). Throughout the years this idea has developed and evolved into many different kinds of coaching: professional business coaching, finance coaching, life coaching, etc. (PCI, 2006). The most common variety of coaching that has developed in the modern era has been the coaching of sports. Coaching is a part of all levels of sport, beginning with the youth level and continuing all the way up to the professional level.

Coaching begins with an individual gathering knowledge and information of the specific sport as well as learning how to teach the skills and create healthy habits in youth, which can be done in a variety of ways. Research has been conducted on the most effective way that coaches can develop this knowledge. It was found that out of 118 youth basketball coaches, formal education was found to be the factor that had the greatest importance to coaches when designing and carrying out practices. The knowledge acquired by being a player in the sport was found to be the next effective and most utilized development of coaching knowledge. And finally, the experience acquired as a coach was the least effective factor that contributed to the development of a coach’s knowledge. This study also found another important point, that although formal

education was found to be the most effective and important, it was stated that experiences as a player and coach are essential for the education of the future coach (Feu).

There is also research examining the level of experience a coach needs for them to be effective (Nash and Sproule). A study involving one novice coach and one expert coach found that the expert coach will adapt her practice to the changing situations in the sport and throughout the practice, whereas the novice coach will simply mimic a “good practice” and continue with the original plan rather than adapting to the situation that has evolved throughout the practice. It was also found that the expert coach had taken some coaching classes when beginning her career, but had not attended any in the last six years. She believes that they are not pertinent to her anymore, but are effective in the earlier stages of coaching. Along the same lines, the novice coach had just finished her first coaching class and found it to be very effective. She was excited at the opportunity to go to more and create her own coaching identity.

There are many factors that go into the development of coaches and it has been found that at the beginning stages of coaching, classes are very helpful to the development of their knowledge of the technical aspects of the sport. Similar findings were discovered in another literary review (Cushion, Armour and Jones, 2003). It was suggested that coaches should have practical experience in their sport and if they have not personally played the sport, there should be a class that simulates the sport and allows the coach to understand the different aspects of the sport. The position of the study suggests that field experiences should be included in the development of coaches, especially at the novice level.

In an article reviewing the literature on coaching effectiveness, they defined coaching effectiveness as “the consistent application of integrated professional, interpersonal, and intrapersonal knowledge to improve athlete’s competence, confidence, connection and character in specific coaching contexts” (Cote and Gilbert). The study concluded that there are many different aspects that contribute to being an effect coach. The coach needs to be able to communicate with others effectively and have awareness of their athletes needs. The coach should be able to teach the sport-specific skills involved in that sport. Additionally, the coach must be able to “create and maintain relationships with others as well as possess the ability to learn from one’s own practice”. It was also discussed that coaches should be concerned with not just teaching the sport-specific skills, but also contributing to the overall development of the athlete.

### **Mental Aspect of Coaching**

There are many different sides of coaching. There is a mental side, a social side, a psychological side, and a physical side to coaching. To be considered a well-rounded coach, one should have a good grasp on understanding all of these concepts and be able to conduct their team in a manner that involves all of these facets of coaching effectively. Over the last few decades, the research surrounding effective coaching has focused on the certain attributes more than others.

Some coaching research has focused on the psychological and mental sides of coaching. Coaching efficacy and confidence contribute to the effectiveness of a coach and athlete. This also contributes to an athlete’s self-esteem. One study gave eight coaches a workshop that was designed to increase a coach’s supportiveness and instructional effectiveness (Smoll, Smith, Barnett and Everett, 1993). The results of this

study found that the coaches who had attended the workshop were evaluated more positively by their players. The players stated they had more fun and the teams exhibited a higher level of attraction among players. Also, the players with low self-esteem at the beginning of the season left with a feeling of significantly higher general self-esteem at the end in comparison to the players that had the control group of coaches who did not attend the workshop. These players self-esteem did not improve throughout the season (Smoll et al. 1993). There was not a difference in win and loss record between the workshop attending coaches and the control group coaches, however (Smoll et al. 1993). It was also shown in a similar study that the coach's behaviors are an important predictor of continuation in youth sports. When given praise and supportive coaching, the athlete will be more likely to keep participating in the sport and their self-perception will be increased (Clatsworth and Conroy, 2009).

### **Exercise Physiology Knowledge**

In addition to the mental side of coaching, there is another important side that coaches must be knowledgeable in. Exercise physiology plays an important role in the development of youth athletes. This knowledge base includes information on how coaches should design practices and how they should create healthy habits in youth athletes.

Youth coaches have the opportunity to teach the younger generations the skills of their particular sport, as well as the basics of exercise physiology. While some may be able to coach effectively, a majority of these adults may not have the knowledge to be able to provide their players with the proper techniques and procedures about important

aspects of exercise physiology. Some of these important topics include proper warm-up and cool-down techniques, hydration, nutrition, and strength training guidelines. When creating healthy habits in our youth, it is important that the players understand the basics of each of these topics, which the coaches should be able to provide.

There has been very limited research that pinpoints exactly how much youth coaches know and understand about each of these specific topics. The most concentrated research has involved concussions, injury prevention, and more recently nutrition. Physical contact comes with many youth sports and has led to an increase in concussions, a type of traumatic brain injury that is caused by a blow to the head or body, a fall, or another injury that jars or shakes the brain inside the skull (Brain and Nervous System Health Center, 2012). Since these injuries involve the brain, there has been a lot of concern in the lack of knowledge and understanding regarding the recognition and treatment of a concussion, especially in youth. Previous research provides insight on some of the knowledge of coaches, the demographics surrounding decision making, as well as effective methods of learning about concussions.

Baizen and Gates (2012) demonstrated that out of 250 youth soccer coaches, 75% of them felt that they were “very” or “extremely” aware of concussions and 80% of them stated that their institutions had established a set of guidelines regarding player concussions. The survey also showed that there is still a gap of knowledge on how to actually test for a concussion and the best protocol for managing concussions. Only half of the coaches surveyed in the study were familiar with these procedures. This study shows a good step towards the recognition of dangerous problems in youth sports, but

reveals a need for more education required on how to best deal with and manage concussions.

Valovich McLeod (2007) found that coaches who had previous education on coaching were “more likely to recognize signs and symptoms of concussion” compared to coaches who had less education. These coaches with less education were more likely to make poor decisions and allow a player to return to play prematurely. A similar study involving youth hockey coaches yielded the same results. The more education and higher level of USA Hockey Coaching an adult had received, the less likely they were to prematurely return a player with a known concussion to competition (Bramley, Kroft, Polk, Newberry and Silvis, 2012). It was also found in this study that the age of the coach played a part in the decision making process. Younger coaches were more likely to play a player prematurely than older coaches (Bramley et al, 2012). Another deciding factor included the level of the competition. The hockey coaches surveyed were more likely to play a player with a previously known concussion if the competition was described as a championship or final high school game (Bramley et al, 2012). All of these factors play into the decision-making skills of the coaches in regards to their knowledge of concussion recognition and management.

The other topic that has had some research conducted on it is the level of education of youth coaches regarding CPR, first-aid, and acute injury management. The bulk of this research has yielded poor results. One study of 752 coaches found that 40% of them had received no form of safety training (Mickalide and Hansen, 2012). This same study found that of all safety training techniques, first-aid and CPR are the most commonly taught, but only 13% and 20% of all youth coaches were actually certified in

each (Mickalide and Hansen, 2012). Another study of 154 coaches found similar results, with 19% and 30% being certified in first aid and CPR, respectively (Weirisma and Sherman, 2005). This means we can infer that of the over 2 million adults who are involved in youth sports, less than one third of them have the knowledge to successfully perform first aid and CPR should a problem arise. These numbers are somewhat alarming and suggest that youth sports should require more education for youth coaches regarding these topics.

Most of the research that has been found on injury prevention and heat injury has been more of a collection of information about the subject rather than a specific study regarding how knowledgeable youth coaches are on these subjects. These reviews explain specific types of injuries and what can cause them. They explain how to minimize the risk of these injuries but do not provide insight as to how much of the information provided in the review that coaches or other people in youth sports understand (Ray, 2010, Marshall, 2010).

Proper nutrition has become a growing concern across America. With the obesity epidemic continuing to grow, it is even more important for youth coaches to have information and knowledge about the proper foods to feed into the body and to instill these good habits in our youth. Most of the recent nutrition studies have been conducted using collegiate coaches and athletes, therefore, little to no information is known about the knowledge at the youth level. Both studies found that more information and education needs to be required of coaches even at the collegiate level to be able to relay nutrition information and provide advice to athletes (Zinn, Schofield and Wall, 2006, Corley, Demarest, Litchford and Bazzarre, 1990).

There are other aspects of exercise physiology and youth sport that are also very important to the education of youth in sport and exercise. For example, proper warm-up and cool-down techniques, hydration, strength training, practice organization, and communication skills are a few of the more important ones. There has been very little, if any, research on each of these topics individually and even less on all of these skills combined. For youth coaches, it is important that they are well versed in all of these topics in order for them to instill healthy habits in youth as well as to avoid dangerous and harmful situations.

### **Summary**

In conclusion, there is a need for more evaluation of the overall exercise physiology knowledge of youth coaches. Youth coaches have a lot of influence in the lives of young children when it comes to instilling good healthy habits. It is important that they understand the basics of different aspects of exercise physiology and are able to take this knowledge and carry it over to their practices and help teach youth the proper techniques in a safe environment.

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