

Perceptions of Collegiate Student-Athletes About Their Youth Sport Specialization or Diversification Process

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Abstract

The present study addressed the critical question of whether or not sport specialization is necessary for future collegiate participation. Male and female collegiate student-athletes were studied using a mixed method approach ($N = 469$). Athletes were studied using the Youth Sport Participation Questionnaire. The data obtained from the quantitative items and open-ended survey items were analyzed, triangulated, and summarized. On average, athletes did not specialize in sport until high school ($M = 15.47 \pm 3.49$ years). Comparisons were made between participants using factorial ANOVAs based on gender, sport type and NCAA Division. Two significant first order interactions were noted between: (1) gender and sport type and (2) NCAA Division and sport type ($p < .05$). Specifically, males and females from individual sports specialized earlier than their counterparts from team sports. The individual sport participants from both Divisions I and III specialized sooner than team sport participants from both divisions. Three main effects also existed for gender, NCAA Division and sport type ($p < .05$). The perceptions and experiences of student-athletes based were evidence that specializing in sport may not be necessary, despite the increased sense of competition in youth sports. Practical implications will be provided for coaches and youth sport professionals.

Key Words

Intensive participation, youth sports, collegiate athletes, specialize



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Youth sport participation is more popular now than ever before. Upwards of 48 million children are estimated to participate in sport in the United States (Ewing & Seefeldt, 2002; Hedstrom & Gould, 2004). In addition, more than 7.5 million student-athletes compete in sports at the high school level (NFHS, 2009). The world of youth sport has changed in recent years. For example, competition levels have increased, competitive seasons are longer, financial costs to participants are greater, and participants are more skilled than in the past (Hedstrom & Gould, 2004). According to experts youth sport has become more professionalized in nature in comparison to the days of children's sand lot games (Hedstrom & Gould, 2004). Children are specializing in a single sport at an earlier age, playing on multiple teams in the same sport, and pursuing the elusive college scholarship (Baker, 2003; Baker, Côté, Abernathy, 2003; Hedstrom & Gould, 2004). Watts (2002) attributed the change in youth sports to the growth of club sports, as well as, the economic environment in the United States. The expansion of youth sport has generated a great deal of attention and enthusiasm. In addition to public popularity, youth sport has also received increased attention from scholars.

Although there are numerous documented physical, psychological and social benefits of youth sport, the effects of youth sports have not been all positive (Brustad, 1993; Watts, 2002; Hedstrom & Gould, 2004; Wiersma, 2000). Critics contend that there are many costs to intensive participation (Baker, 2003; Wiersma, 2000). For example, the increasing emphasis on winning more than skill development, socialization, enjoyment, or the pursuit of excellence are primary concerns (Brustad, 1993; Gould & Petlichkoff, 1988; Hedstrom & Gould, 2004; Watts, 2002; Wiersma, 2000). Many children are opting to participate intensely in just one sport with the hope of achieving advanced status, rather than participating in multiple sports (Gould, Dieffenbach, & Moffett, 2002; Hill, 1988; Staffo, 1977; Watts, 2002; Wiersma, 2000).

By definition, sport specialization occurs when "athletes limit their athletic participation to one sport which is practiced, trained for, and competed in throughout the year" (Hill & Hansen, 1988, p. 76). Youth athletes who choose to specialize may miss out on the benefits of participating in multiple sports, such as experiencing different coaches and learning transferable skills (Abernathy, Baker & Côté, 2005). Additionally, athletes who specialize at early ages may subject themselves to further risk of athletic burnout and overuse injuries (Baker, 2003; Henschen, 2005; Vealey, et al. 1998). While there may be purported benefits to specialization, such as increased talent level or ability to compete for positions, there is not recent data to support those contentions (Brustad, 1993; Hedstrom & Gould, 2004; Hill, 1988; Hill, 1993; Watts, 2002).

While a number of scholars have voiced concerns over early sport specialization, few attempts have been made to systematically examine the issue. In an early series of studies, researchers examined sport specialization by surveying directors of athletics and coaches from high schools in the Midwest (Hill, 1988b; Hill & Hansen, 1987; Hill & Simons, 1989). Coaches indicated that specialization was detrimental to other school sports, yet increased the chance of the team winning championships, through skill development (Hill & Hansen, 1987). Directors of Athletics indicated that several factors contributed to sport specialization, such as pressure from



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coaches, high parental expectations, desire of athletes to participate in a state championship, and pressure from collegiate recruiters (Hill, 1988). In general, the directors of athletics surveyed did not promote specialization within their programs, noting that specialization was inconsistent with the purposes of high school athletics. Directors of athletics were critical of coaches who did not promote multiple sport participation (Hill, 1988; Hill & Simons, 1989).

In addition to the research conducted with coaches and directors of athletics, several studies have been conducted with elite athletes (Hill, 1993). Professional baseball players reported that in most cases they did not specialize in baseball, because they also played other sports. Players did, however, participate in baseball throughout most of the year. In a study of elite swimmers, Barynina and Vaitsekhovskii (1992) found that early specialization was associated with spending less time on a national team, as well as earlier attrition from elite sport. Carlson (1988) found that early specialization and “professional-like” training in tennis did not favor the development of elite players. Stevenson (1990) examined the factors which influenced decisions of international athletes to specialize in their primary sport. The decisions of the athletes were dependent on their potential for success and the type of people associated with the sport. In a related study, albeit at the collegiate level, Susanji and Stewart (2002) studied male basketball players at several 4-year colleges in Montana and found that 80% of the college players played at least one other sport at the high school level.

In summary, the specialization research involving athletes and their long term achievement is limited in scope. Early sport specialization was apparent in samples of elite swimmers and tennis players, yet was not shown to be conducive to long term success (Barynina & Vaitsekhovskii, 1992; Carlson, 1988). In a sample of collegiate basketball players, multiple sport participation in high school preceded exclusive basketball participation at the college level (Susanji & Stewart, 2002). With a sample of professional baseball players, year round participation in baseball was accompanied by seasonal participation in other high school sports and/or conditioning for many participants (Hill, 1993). Slight distinctions exist between individual and team sports previously sampled. For example, individual sport athletes (tennis and swimming) have specialized at earlier ages than athletes from team sports (baseball and basketball) (Barynina & Vaitsekhovskii, 1992; Carlson, 1988; Hill, 1993; Susanji & Stewart, 2002). However, in relation to the present study, specialization patterns relative to gender or collegiate level have not been explored by previous researchers. Specialization patterns refer to the process by which athletes transition from sport diversification to sport specialization. Specific benchmarks in specialization patterns include, but are not limited to, the ages and frequency at which athletes commit to year round participation in a primary sport and/or the age at which athletes specialize in a primary sport. Although studies on specialization have been conducted, further research is necessary for a fuller understanding of the topic.

Overall, the specialization research that exists is mostly descriptive in nature and out dated in many cases (Barynina & Vaitsekhovskii, 1992; Carlson, 1988; Hill, 1988b; Hill & Hansen, 1987; Hill & Simons, 1989; Stevenson, 1990). Although descriptive research is necessary and helpful to better understand specialization,



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unanswered questions remain. Researchers have not examined causal relationships and effects, nor have they made longitudinal observations.

For example, the original line of research on specialization by Hill et al. (Hill, 1988b; Hill & Hansen, 1987; Hill & Simons, 1989) used survey methodology and provided descriptive data from coaches and athletic directors. In another study by Hill (1993), survey data was obtained from professional baseball players. Questionnaire items addressed participation history, position specialization, off season practices, advice from coaches, and influence of parents. Although the data was retrospective, the study was not a longitudinal. In addition, the survey did not directly address causal relationships which may have led to particular sport participation patterns or outcomes. Furthermore, the study was not replicated with other athletes, in alternate sports or from other geographical regions. However, the descriptive data obtained in Hill et al's line of research helped to establish a literature base for sport specialization.

Another example was a study conducted by Susanji and Stewart (2002). Male collegiate basketball players in the Midwest were studied. Although the descriptive data obtained was informative, the researchers did not inquire about reasons athletes had for specialization or diversification, or other factors influencing their athletic experiences. Susanji and Stewart (2002) noted the limited scope of their study and lack of generalizability to a wider population. Aside from Susanji and Stewart (2002), researchers have not studied the specialization practices of collegiate-athletes. Specialization research to date has only included minimal comparisons in regard to gender, sport or competition level. The survey research noted did not include female athletes, a variety of sports or comparison by competition level (Hill, 1988b; Hill & Hansen, 1987; Hill & Simons, 1989; Hill, 1993; Susanji & Stewart, 2002).

Several researchers studied elite, international athletes using personal interviews to obtain data about specialization. Carlson (1988) interviewed elite Swedish tennis players, their parents and coaches about the athletic experiences of the players. Barynina and Vaitsekhovskii (1992) studied elite Russian swimmers in regard to the impact of their high level participation socially, psychologically, and medically. Stevenson (1990) conducted interviews with first year professional athletes in field hockey, men's rugby, and water polo from England and Canada. The interviews focused on the factors that influenced the decision of the athletes to specialize in sport. Similarly to the survey data previously mentioned, the descriptive data collected through interviews enhanced the knowledge base for sport specialization. However, researchers did not address the issue of sport specialization in its entirety. For example, comparisons were not made between the males and females, sport types or the competition level of participants. Additionally, none of these international athletes were studied over time or in an experimental fashion (Barynina & Vaitsekhovskii, 1992; Carlson, 1988; Stevenson, 1990).

The limitations of this breadth of studies support the contention that further research is necessary on youth sport specialization. The present study explores the issue of specialization using a cross sectional approach, providing a much needed update to the specialization literature. While the present study does not address all of



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the previous limitations noted, it does provide valuable descriptive and comparative data which can be utilized by coaches and coaching educators.

The purpose of the study was to investigate the youth sport participation experiences of collegiate student-athletes to determine if specialization was necessary in order to compete at the collegiate level. Data was obtained on the age and frequency at which student-athletes specialized in their primary sport, as well as, the student-athletes perceptions of sport specialization. To better understand the specialization patterns for various groups of student-athletes in the sample, comparisons were made in regard to gender, competition level and sport type. Specifically, for gender, males were compared with females; for competition level, National Collegiate Athletic Association (NCAA) Division I student-athletes were compared with NCAA Division III student-athletes; and for sport type, individual sport athletes were compared with team sport athletes.

Method

The study was based on a survey approach (Locke, Silverman, & Spirduso, 2004). The researcher met individually with each of the 32 teams which participated in the study. Student-athletes completed the paper and pencil Youth Sport Participation Questionnaire which included both quantitative and qualitative items (Hill, 1988; Hill & Hansen, 1987; Hill & Simons, 1989).

Participants

Participants ($N = 469$) were varsity level, intercollegiate student-athletes. The sample included 267 (56.9%) males and 202 (43.1%) females. The mean age was 19.74 (± 1.19) years and ranged from 17-23 years. Participants were from four private colleges and universities in New England; two NCAA Division I schools and two NCAA Division III schools (Division I, $n = 221$, 47.1%, and Division III, $n = 248$, 52.9%). Both Division I schools in the study did not provide the maximum financial support allowed by the NCAA regulations for Division I scholarships. It should be noted that other Division I institutions provide more athletic scholarship money and that Division III institutions are unable to provide any athletic scholarships. The four institutions had reputable athletic programs and competitive admissions standards. No significant differences were found between schools, therefore data from both Division I schools and both Division III schools were combined for analysis.

Eight teams from the four schools were studied (four sports, both male and female teams). The four male and female sports utilized were lacrosse ($n = 186$, 39.7%), soccer ($n = 120$, 25.6%), swimming ($n = 87$, 18.6%) and tennis ($n = 76$, 16.2%). The number of participants per sport was commensurate with typical team sizes and representation in intercollegiate athletics. Lacrosse and soccer were combined as team sports and swimming and tennis were combined as individual sports for data analysis purposes. A minimum of 20 student-athletes per cell was necessary ($N = 120$) to make valid comparisons, as well as, to establish an appropriate effect size. The sample included enough student-athletes to exceed the minimum standards (Pedhazur & Schmelkin, 1991).



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Questionnaire Development

The Youth Sport Participation Questionnaire (Hill, 1988; Hill & Hansen, 1987; Hill & Simons, 1989) was designed to measure the youth sport participation trends of collegiate athletes in regard to specialization or diversification practices. Specifically, demographic information, youth sport opinions, the factors contributing to youth sport choices, and the decision-making process was measured. The questionnaire included both quantitative and qualitative items. Quantitative questions were both closed-ended and with Likert scale responses¹. A corresponding Likert scale of *strongly agree, agree, neither agree or disagree, disagree, and strongly disagree* was included for each item. Open-ended questions were used to gather additional data. The open-ended question of primary relevance to the present paper is “*What are the beliefs of NCAA student-athletes on the necessity of sport specialization for future collegiate athletic participation?*”

The current version of the survey underwent a thorough pilot testing and content validation process. A panel of five experts was used to establish content validity on the Youth Sport Participation Questionnaire. The panel of experts included professors, collegiate athletic administrators, and youth sport experts. Once content validity was determined, the questionnaire was evaluated for ease of completion. Freshman level college students enrolled in physical education courses were asked to complete the questionnaire and give feedback on the format. Minimal editorial and layout changes were made based on the feedback provided during the pilot testing process.

Procedures

IRB approval was obtained prior to the investigation. Permission was granted by collegiate directors of athletics, coaches, and student-athletes. The student-athletes studied provided informed consent prior to completing the survey. The researcher personally administered the paper and pencil questionnaire to the participants following the same protocol with each team at each institution. The protocol included the same explanation of the study and directions for completing the survey.

Data Analyses

After data collection was completed, the data were analyzed utilizing a mixed method approach. A concurrent data collection process was implemented and equal priority was given to the qualitative and quantitative data. The data from the quantitative and qualitative items were integrated at the data interpretation stage. A concurrent triangulation strategy was used, which attempted to confirm, cross validate, or corroborate findings

¹ The Likert scale items were designed by the researcher based on the previous work of Hill (1988), Hill & Hansen, (1987), Hill and Simons (1989). Hill gave permission to adopt the original survey items for use in the present study (G. Hill, personal communication, April 15, 2002). Several survey studies were conducted utilizing similar quantitative questions with a Likert scale format. Hill established the validity of the original survey items for use with directors of athletics and coaches. The question stems and response options for the present study were minimally modified for use with collegiate student-athletes based on published tables of data.



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within a single study (Creswell, 2003). The statistical analyses were conducted using SPSS (Statistical Package for the Social Sciences; 2004). The study was quasi-experimental in design. Group membership was ex postfacto, based on gender, NCAA Division, and sport type. Statistical procedures included descriptive statistics, Analyses of Variance (ANOVA), and chi square analyses.

The quantitative demographic and youth sport participation information in the form of closed-ended and Likert responses was summarized using descriptive statistics. Levene's test of equality of error variance was first conducted (age began sports, $p < .000$; age began primary sport $p < .000$; and age specialized, $p < .000$). Due to the lack of homogeneity of variance and unequal number of participants per cell, a Type I ANOVA was conducted. When running an ANOVA with SPSS, the program automatically defaults to a Type III ANOVA. To account for the unequal number of participants in each group, a Type III ANOVA required the researcher to randomly select equal numbers of cases from each sport. The decision was made not to randomly select cases and employ an alternate method. The proportion of participants from each sport was proportional to the numbers of participants on the given sports teams in a realistic setting. Randomly selecting cases would also have resulted in the loss of valuable data. Instead of randomly selecting cases, a Type I ANOVA was utilized to account for unequal numbers of participants (Stevens, 2002).

The demographic items listed were compared across three demographic factors: gender, NCAA Division, and sport type utilizing a 2 x 2 x 2 factorial ANOVA. Gender was defined as male or female. NCAA Division was either NCAA Division I or III. Sport type was individual or team sport (i.e., soccer was a team sport and tennis was an individual sport). Other dependent variables were items from the Youth Sport Participation Questionnaire. Since several ANOVAs were conducted, a Bonferroni adjustment was made to account for Type I error. A 2 x 2 x 2 (gender x sport type x NCAA Division) chi square analysis was conducted to compare differences in frequency of responses among the groups for items on the questionnaire. When significant interactions were found in the factorial ANOVA, a simple effects test was then computed.

The qualitative portion of the questionnaire was the open-ended questionnaire items. The open-ended questions included a qualifier response (i.e., yes or no) and a hand written explanation. The frequency figures for the qualifier were calculated using descriptive statistics, then an analysis of the explanation response was performed. A data analysis matrix was created to organize and condense the data into a manageable format (Patton, 2002). The data were reviewed and analyzed in the matrix for themes. Findings were formulated for each qualitative item. A domain analyses was then conducted with the content in the matrix for the specialization item (Spradley, 1980). The domain analysis illustrated the data from the open-ended responses by category (see Figure 1). Constant comparisons were made between each qualitative item and one or more corresponding quantitative items in the demographic and Likert sections of the questionnaire. For instance, demographic age data described what a student-athlete did in terms of sport specialization (i.e., specialized in tennis at age 14). The responses to Likert scale items described the factors which contributed to their specialization beliefs and decisions. Then the open-ended items allowed for student-athletes to describe their beliefs and practices in narrative form. Inferences were drawn from the triangulation of these quantitative and qualitative responses regarding the same topic area.



The results of the study should be considered within the context of the following limitations. The study was geographically limited to the New England area where the researcher had access. As a result, the sample was a convenience sample. Therefore, data collected from a non-probability sample cannot be generalized to a population (Creswell, 2003). The study was also limited by the demographics of the participants, including race and socio-economic status. In particular, the students in the sample attended private colleges or universities and may not reflect a cross section of the population. Additionally, the information provided by the participants was limited by the range and depth of the Youth Sport Participation Questionnaire.

There are other limitations inherent with survey research. For example, standardized questions can limit response options and skew results (Babbie, 1990). Another threat to validity is the tendency for participants to respond in a socially desirable way. Additionally, surveys can result in superficial coverage of complex topics. In general, surveys are apt to miss the context of social life (Babbie, 1990). Surveys can also be somewhat artificial in that they cannot measure social action. Specifically, Babbie (1990) noted that it is difficult to gain a full sense of the social processes of subjects in their natural settings through surveys. Overall, survey research tends to be weaker on validity and stronger on reliability (Babbie, 1990).

Conversely, there are benefits to survey research (Babbie, 1990). Survey research is appropriate to obtain descriptive data from large populations and may be used for explanatory purposes, as well. In particular, self administered questionnaires can allow participants anonymity, privacy, and reduce researcher bias. Another strength of survey research is the standardization of data. In summary, despite the limitations, a survey approach was an appropriate choice for the research design of the present study.

Results

Results from the Youth Sport Participation Questionnaire are presented. Data from the quantitative and qualitative questionnaire items were triangulated and summarized.

Quantitative Data

Sport Participation Ages. The mean sport participation ages based on NCAA Division, gender and sport type are presented in Table 1. On average, the student-athletes studied began their athletic participation by age six and began participation in their primary sport by age nine. The average student-athlete decided to participate in their primary sport on a year round basis ($M = 12.06$ years, $sd = 3.48$) during middle school. Based on mean age specialized in sport ($M = 15.47$ years, $sd = 3.48$), the student-athletes did not specialize in sports until high school.

Based on the frequency figures in Table 2, approximately a fifth of student-athletes specialized in middle school, a third specialized by the start of high school, half specialized by the end of high school, and then most



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were specialized by the start of college. There were no significant differences in the mean age or frequency of specialization across gender or NCAA Division groups.

The student-athletes completed a Likert scale section of the Youth Sport Participation Questionnaire. The section included questions about participants' beliefs on the effects of specialization and factors contributing to specialization or diversification. The chi - square test was significant for all of the Likert scale items ($p < .000$). Data were compiled, analyzed, and summarized for each of the subsections and presented in Tables 3 and 4. The *agree* and *strongly agree* responses and the *disagree* and the *strongly disagree* responses were collapsed for summary and discussion purposes.

Factorial ANOVAs were conducted to compare group responses based on NCAA Division, gender and sport type. No significant second order interactions existed for the dependent variables. There were two significant first order interactions between: (1) gender and sport type and (2) NCAA Division and sport type ($p < .05$). Significant main effects existed for age began playing sports by gender ($p < .003$); age began playing sports by NCAA Division ($p < .008$); and age began playing primary sport by sport type ($p < .000$).

A simple effects test was conducted to further examine the interactions. Specifically, athletes in individual sports specialized earlier than team sport participants. Also for gender and sport type, female individual sport participants began year round participation in a primary sport earlier than females from team sports. Regarding NCAA Division and sport type, individual sport participants in both NCAA Divisions I and III specialized earlier than team sport participants. Individual sport participants from Division III began playing a primary sport year round earlier than their team sport counterparts.

In addition to the interactions previously described, three main effects also existed for gender, NCAA Division and sport type ($p < .05$). First for gender, males began playing sports earlier than females ($p < .003$). Second, for NCAA Division, Division I athletes began playing sports earlier than Division III athletes ($p < .008$). Third, for sport type, individual sport participants began playing their primary sport earlier than team sport participants ($p < .000$).

Qualitative Data

The following response themes reported were based on the open-ended questionnaire items completed by the 469 participants. The open-ended responses were transcribed, coded, analyzed and summarized in themes.

Student-athletes were asked if they thought sport specialization was necessary for future collegiate athletic participation. The majority of student-athletes ($n = 303, 64.6\%$) believed specialization was not necessary for future collegiate athletic participation. Upon closer examination of the qualifier response, by group classification (gender, Division, sport type), further distinctions can be made. The largest difference in opinion was between the percentage of individual athletes ($n = 82, 50.3\%$) who believed specialization was not necessary compared to the percentage of team sport athletes ($n = 221, 72.2\%$). There were no notable



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differences between males and females or Divisions I and III. The response pattern between groups on the necessity of specialization item corresponded with previous response patterns with the sport participation ages in the quantitative results. Thus, not only did individual sport athletes specialize earlier and more frequently, but individual athletes also believed specialization was necessary more so than their team sport counterparts.

The responses of the student-athletes were either in favor of specialization, against specialization or made a combined comment on the pros and cons of specialization. Several sets of themes emerged from the data, reflecting each of the possible views on the issue.

Several consistent themes emerged from the responses of student-athletes who were in favor of sport specialization. The first theme was improved skills. The student-athletes expressed a general belief that sport specialization led to increased skill, improvement, and performance enhancement. Similarly, the notion of specialization contributing to improved skills was highly supported in the Likert scale item (94.5% agreed). For example, a male Division I swimmer commented, “athletes are given the fundamentals they need to excel at a young age and through high school. Without focusing on a sport, the foundation won't be strong enough to compete at high levels.” A female Division III swimmer identified the basic belief about improved skills through specialization, “specializing in a sport allows an individual to fine tune his/her abilities and continual improvement occurs.” A Division III female tennis player in favor of specialization commented:

I believe that if you really want to play collegiate sport then it is very important to specialize in that sport. When you specialize in one sport, you are focused on what you need to work on. You know the game well and know what you should be doing when. Usually people who specialize in one sport play in tournaments or on a special all-star team. This gives athletes the chance to compete with very good other athletes.

In addition to the first theme of improved skills through specialization, the data from proponents of specialization contained two other themes. The second theme was competition. Specifically, increased competition in intercollegiate athletics has led to an increased demand to specialize in a sport. The competition theme reinforced the quantitative findings related to the competitive nature of intercollegiate athletics. According to the Likert responses, the majority of student-athletes surveyed agreed that specialization contributed to the competitive nature of making a college varsity team and the possibility of receiving an athletic scholarship. Also, stiff competition for collegiate varsity positions was the highest rated factor contributing to specialization. The third theme was time and encompassed the responses involving time commitment, increased concentration, and greater focus due to time spent on a particular sport.

For example, a male Division I lacrosse player stated, “The competition grows even stronger overtime - more expectations and demand to specialize.” Similarly, a female Division III tennis player noted, “More and more kids are starting intense training at a younger age. Unless you specialize, you are going to be too far behind.” According to a male Division I soccer player, “The fact that many players are now specializing in their sports and in order to keep your level up to par, it is necessary to dedicate yourself accordingly.” A female Division I



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lacrosse player wrote, “Everyone comes from a team where they were the best on their team, so for future participation you have to really work hard.” Essentially, the idea was that increased time devoted to a single sport would inevitably enhance the chances for improvement and eventual success in a particular sport.

Beyond the student-athletes who were in favor of specialization, there were also neutral responses that highlighted a combination of advantages and disadvantages. The neutral rationales were classified into three themes as well. The three neutral themes were (1) the impact of athleticism, (2) the need for year round participation, and (3) specialization as effective, but not necessary or desirable. Further description and examples are provided for each neutral theme.

The first neutral theme was athleticism. There was a consistent belief that the need or demand to specialize was contingent on athleticism. Terms such as *natural*, *gifted* or *talented* athlete were used to describe the type of individual who could afford to participate in multiple sports and still be successful, more so than their less naturally gifted counterparts. A male Division III lacrosse player noted “I think specializing in a sport will help cultivate skills, but I think that playing other sports helps to develop athleticism and field vision.” Another comment that noted skills in terms of athleticism was offered by a female Division I tennis player who wrote “People can be very athletic and in shape and be able to pick up the skills quickly to play a sport. They can play more than one sport and be good at both.” And lastly, a male Division III soccer player responded to the necessity of specialization, “No, I believe it may help a great deal, but there are some people who are just natural athletes and do not need to completely specialize to do well. I believe it helps a great deal, but isn't completely necessary.” This quotation and others illustrated the consensus from the student-athletes studied that athleticism, in part, determined the need for specialization.

A second neutral theme was the need for year round participation in a primary sport, more so than the need for specialization. Year round participation in a primary sport still allows participation in other secondary sports, according to the responses from student-athletes. A typical response within the year round theme was from a female Division III tennis player:

I actively pursued/played tennis in addition to swimming and diving throughout high school. I did need to play tennis all year-round (I often did two sports in one night) in order to stay competitive, but as long as you can balance the sports and practice each it is not necessary to specialize.

A comment with a similar theme was from a male Division I soccer player:

I played three sports until I was a senior in high school. I think that playing in college depends on your youth coaches over the years, natural talent, and hard work to further develop yourself. I do believe that you need to play that sport for most of the year, but it doesn't have to be exclusive.



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By opting to participate in a sport year round student-athletes in the study were able to derive some of the perceived benefits of specialization without eliminating the opportunity to experience other sports throughout the year.

The third neutral theme was that specialization is effective, but not necessary. Numerous student-athletes identified the performance benefits of specialization, yet reiterated why specialization was not necessarily needed or desirable. For instance, a male Division III lacrosse player wrote, "I think the opposite. It is much healthier for an athlete to play multiple sports. You don't want someone to get burnt out. But, it does help to specialize in a specific sport if it doesn't become harmful." Similarly, a female Division I soccer player stated:

I believe that specialization in a sport does not guarantee future collegiate participation but does make it easier to be disciplined towards that particular sport. I feel that you should only continue participating in multiple sports if you see yourself being involved in them in the future.

Examples of the twofold responses in the specialization as effective, but not necessary theme were comments about the sport and division comments. Student-athletes noted that the necessity of specialization was dependent on the sport type and competition division level. For example, a female Division I swimmer wrote:

I do not believe it is necessary for certain sports. However, those sports that are more selective and maximize the number of participants at a certain number may require that one specializes in order to attain a high enough skill level to play.

Similarly, a male Division I soccer player commented:

I don't believe that specialization in sport for college participation is necessary. I feel that specializing in a sport depends on how good you want to be. If an athlete wants to participate at an elite school, specializing may be necessary, but not at lower division schools.

As demonstrated in the quotations, student-athletes noted that the necessity of specialization was dependent on the sport type and competition division level.

The third and final perspective on the necessity of specialization item was from student-athletes who were clearly opposed to sport specialization. Given that 64.5% of the student-athletes surveyed responded that specialization in sport was not necessary, the majority of these responses contained at least one theme that was critical of specialization. Often times evidence of several themes existed. The criticisms of specialization were also classified into three themes: (1) multiple sport athletes, (2) transferable skills, and (3) avoidance of athletic burnout. The first theme, multiple sport athletes, was evident throughout the responses. Student-athletes mentioned various physical, psychological, and social benefits of multiple sport participation in their responses.



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For example, a male Division I lacrosse player wrote:

I strongly disagree with anyone that claims that specialization guarantees a collegiate career. In actuality, I believe a diverse sporting youth actually benefits a kid more with motor skills and coordination. Learning from one sport and applying it to another.

Similarly, a female Division I lacrosse player stated:

I've always been encouraged to play a variety of sports. I never specialized until I reached college and I just happened to get the most attention in lacrosse, so I stuck with it. However, my training in cross country has made me a better runner up and down the field and find myself using my defensive skills from basketball on the lacrosse field. Not specializing in sport has made me a much more successful lacrosse player, with different strengths.

Division I lacrosse players were not the only proponents of multiple sport athletes. Responses from Division III student-athletes from other sports echoed the same theme.

A female Division III soccer player noted:

I do not believe specializing in sport is necessary for future college participation. It may depend on which level of collegiate participation. But personally, I believe I learned the most about teammates, coaches, dedication, commitment, time management and life skills through playing three sports in high school.

A male Division III swimmer articulated some perceived benefits of multiple sport participation. He said, "Other sports can provide valuable cross-training and serve to avoid burnout." Other qualitative responses suggested participation in a wide range of sports to determine one's talents and preferences for sports. For example, a male Division III swimmer noted:

My reason (for being against specialization) is because all through my youth and high school I played three sports. I played tennis, but it wasn't my specialty sport. Over the years I became disinterested with my other sports and by my senior year I enjoyed tennis more. Now I am playing tennis in college.

In addition to the prominent multiple sport athlete theme, two other predominant themes were shared by those critical of specialization. The second theme was transferable skills. Many proponents of diversification in sport participation suggested that sports share transferable skills and therefore specialization is not necessary for skill development. Numerous skills were listed in responses that were both physical and psychological in nature. Reference was made to the value and prevalence of transferable skills in many of the quotes from multiple sport athletes. Frequently, the two themes, multiple sports and transferable skills, overlapped, but sufficient responses



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were offered that mentioned one theme without the other to address each theme as discrete. According to a female Division I lacrosse player:

I don't think athletes should specialize until they go to college. I learned so much from basketball and soccer that truly helped me to succeed as a lacrosse player. I often see my "game sense" as a result of other sports - especially basketball. My defense is purely from learning basketball slides and even the move I use on attack looks strangely like a crossover move. Besides, specializing leads to mental, physical, and emotional burnout.

Another example of a general transferable skills response was from a male Division I lacrosse player, "Specializing only enhances certain skills in an athlete whether mental or physical. By diversifying in sports one can develop more attributes for life." In an example from a male Division III soccer player, several themes are emphasized: "I play two sports, basketball and soccer. I think playing two sports has kept me from burning out or getting sick of either one. Also, you become a more well-rounded player. Many skills overlap." As eluded to in the quotations, the third and final theme contrary to specialization was the athletic burnout theme.

Athletic burnout was mentioned by numerous respondents in their explanations. Athletic burnout was also identified as an effect of sport specialization by 70.6% of the student-athletes surveyed. Student-athletes expressed the need to avoid burnout in general, more so than their own personal experiences with athletic burnout. The student-athletes against sport specialization were particularly cognizant of the risk of athletic burnout. A generalized example from a male Division III lacrosse player was, "I feel that the marginal benefit of highly tuned skills is outweighed by the possibility of burnout and the loss of the other athletic experiences." Another more general comment was from a female Division I soccer player who stated, "I believe that the trend to specialize will prove to be detrimental to college athletics. The best athletes that I know never specialized. Specialization leads to burnout and a decline in mental toughness and passion for sport."

Based on previous research, a link has been made between early sport specialization and potential risk for burnout (Coakley, 1992; Gould, 1993; Gould et al, 1996; Vealey, et al, 1998). Characteristics of burnout, such as excessive training volumes, high demands or performance expectations, and consistent intense competition were evident in examples given by the respondents.

Discussion

Results based on specialization comparisons, specialization practices, and the necessity of specialization are addressed in the following subsections. The student-athlete responses provide a great deal of descriptive and comparative data that addresses actual specialization practices, as well as, perspectives on the critical issue of specialization. While the present study makes a contribution to the limited literature on specialization, continued study remains necessary for a full understanding of the long term outcomes of youth sport specialization.



Specialization Comparisons

Several demographic variables were compared including gender, NCAA Division and sport type. No significant differences in specialization ages of student-athletes by gender or NCAA Division were noted. Males, however did begin playing sports earlier than females; and Division I athletes began playing sports earlier than Division III athletes. Previous research linked quantity of practice with level of proficiency which is reinforced by the Division I males and females who had an earlier start in sport than their Division III counterparts (Baker, 2003).

Sport type elicited significant differences in specialization ages between team and individual sport student-athletes. The pattern of distinctions between team and individual sports was prevalent throughout the data. Similarly, previous researchers found that international level swimmers and tennis players specialized prior to high school, although comparisons to team sport participants were not made (Barynina & Vaitsekhovskii, 1992; Carlson, 1988).

In response to the findings, coaches of individual collegiate sports such as swimming and tennis may need to consider the specialization ages and the role specialization may play in the development of their potential recruits. In contrast, there is not strong evidence to suggest that coaches of men's or women's team sports at Divisions I or III recruit specialized athletes more so than diverse athletes. This finding is also helpful for coaches at the youth, club or high school levels to know that there were not significant differences between genders or Divisions that support the need for early specialization. Results did support earlier exposure to sport for males and Division I student-athletes which may be useful for professionals who develop of entry level youth sport programs.

Specialization Practices

On average, the student-athletes studied began playing sports in elementary school, participated year round during middle school and specialized in sport sometime during high school. The majority of student-athletes did not report that specialization was necessary for future collegiate participation. The participants were cognizant of the advantages and disadvantages of specialization that have been reported in previous research (Heldstrom & Gould, 2004; Hill, 1988; Hill, 1990; Hill & Hansen, 1988; Watts, 2002; Wiersma, 2000). Participants were also aware of the growing sense of professionalism and competition in youth sport that has been identified by coaches, directors of athletics, parents, and elite athletes in earlier research (Carlson, 1988; Hensch, 2004a; Hill, 1988; Hill, 1990; Hill & Hansen, 1988b; Watts, 1999).

The specialization pattern illustrated by the age data and specialization frequency figures suggested a process whereby student-athletes were exposed to sport, began participation in a primary sport, progressed to year round participation in a primary sport, then ultimately specialized at some point during high school. Familiarity with the reported specialization pattern can assist coaches in their understanding of sport specialization and diversification. While the pattern is consistent for male and female student-athletes, from both NCAA Divisions



I and III, there was a noticeable difference in the pattern for individual sport participants compared to team sport participants. The individual sport participants specialized earlier and more frequently than the team sport participants. The pattern of the specialization process also supports the data on attrition from youth sport between the ages of 11-13 years. Participants in the present study made key participation decisions between ages 11-13, the same age at which many youth drop out of one or more sports altogether (Ewing & Seefeldt, 2002; Gould & Petlichkoff, 1988; Heldstron & Gould, 2004). Therefore it is especially important for coaches of athletes ages 11-13 to be informed about the participation trends relative to this age group.

Is Specialization Necessary?

The present study is the first known by the researcher to address the question of whether or not current collegiate student-athletes believe specialization is necessary for success at their level. The perspectives of the student-athletes offer coaches current, relevant data from which to guide practices. The previous research on specialization is sparse and has not included much comparable data. However, some of the themes revealed in the qualitative data are related to previous research which will be discussed. In particular, the perspectives of the student-athletes will enable coaches and others to better understand the circumstances under which specialization may be necessary or unnecessary for future success. For instance, coaching advice for individual sport athletes may differ from those in team sports based on the lessons learned from the present sample.

To reiterate, the student-athletes in the present study expressed views that were favorable, neutral and critical of youth sport specialization. Proponents believed that increased skills, time, and competition were reasons for specialization. Directors of athletics, coaches, and parents from previous research agreed that specialization leads to improved skills (Hensch, 2004a; Hill, 1988; Hill, 1990; Hill & Hansen, 1988b). Time was another favorable theme for specialization. Logically, an increased devotion of time should correlate with improvement. Other time related issues involved making a time commitment, increased concentration, and greater focus due to time spent on a particular sport. The sense that the student-athletes became heavily scheduled and regimented at early ages was evident throughout the qualitative responses. While proponents argued that the time aspect of specialization was necessary, the critics disagreed. Coaches and administrators who schedule youth sports, in particular, should consider age appropriate time commitments. A practical rule of thumb implemented by the National Soccer Coaches Association of America (NSCAA, 2010) is to have practices last as long as games – eliminating the idea of lengthy practices which may be inappropriate for many age groups.

In addition to increased skill and time, competition was also a theme raised by proponents of specialization. Proponents argued that specialization was necessary to stay competitive, in light of the current status of intercollegiate athletics. Depending on the sport, the rate of high school athletes who go onto compete at the college level differs. In the sports studied the percentages range from less than 5% to just over 10%, which is similar to the average across sports which is 5.9% (NCAA, 2009; National Federation of State High School Associations, NFHS, 2009). For the sports included in the study the amount of students who compete at the college level is a small percentage of those who compete in high school (lacrosse is 10.7%, soccer is 6.2%, swimming is 7.1% and tennis is 4.9%) (NCAA, 2009; NFHS, 2009). For comparison, a mainstream sport such



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as football is approximately 5.8%. These figures are estimates are based on available, published data. But clearly, participation at the collegiate level is competitive from a mathematical perspective. According to the proponents in the sample, student-athletes who do not specialize early in sport risk the possibility of a specialized athlete earning a scholarship, position, or other opportunity ahead of non-specialized athletes.

The neutral responses were categorized in the themes of necessity of year round participation, athleticism, and specialization as effective, but not necessary. A main theme from the neutral responses was the need for year round participation, more so than the need for specialization in a primary sport. In an earlier study, similar findings among professional baseball players were identified (Hill, 1993). The recommendation for year round participation was provided by the professional baseball players, as well as a number of the student-athletes from the present study. Likewise, in Watts (1999), soccer players and swimmers reported being under pressure from club coaches to compete in their respective sports on a year round basis. Watts (1999) contended that the results pointed to club sports as another possible factor contributing to specialization.

Based on the data, year-round participation in a single sport with simultaneous participation in other sports may be a viable solution for some athletes engaged in the specialization debate. Ultimately, the decision as to whether or not specialization is necessary is highly individualized. Coaches at various levels may be in a position to assist athletes with their decision making process. The data presented here will inform coaches and coaching educators about the perceptions of collegiate athletes, so that they may disseminate the findings to their constituents.

Despite the favorable and neutral themes that emerged from the data, the majority of student-athletes offered critical reactions to specialization. The critical responses included the themes of multiple sport athletes, transferable skills, and athletic burnout. The most prevalent argument against specialization was the various physical, social, and psychological benefits perceived to accompany multiple sport participation. Benefits included, but were not limited to, advanced motor skills, coordination, understanding of tactical concepts, teamwork, time management, and commitment.

Student-athletes also stressed the importance of exposure to multiple sports prior to determining a specialty sport. Other researchers have not specifically studied the benefits of multiple sport participation compared to the risks of specializing in a single sport over time. Earlier studies with directors of athletics and coaches emphasized exposure to several coaches, skill sets, competitive environments, and teammates to be among some of the benefits of multiple sport participation at the high school level (Hill, 1988; Hill & Hansen, 1987; Hill & Simons, 1989). Previously, other scholars have offered professional opinions on the issue, primarily in favor of the perceived benefits of multiple sport participation (Gillis, 1993; Martens, 1978; Orn, 1989; Smoll & Smith, 1988; Wiersma, 2000).

A related argument against specialization was the pervasiveness of transferable skills from sport to sport. Student-athletes indicated that physical and psychological skills from one sport could easily transfer to other sports. Numerous anecdotal examples were provided throughout the data to reinforce the transferable skill



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theme. Other researchers have suggested that the transfer of skills from sport to sport is possible (Abernethy, Baker & Côté; 2005). Coaches can take advantage of findings related to transferable skills, by accentuating skills from one sport in another where applicable. For example, when teaching defensive posture in soccer, the footwork from basketball techniques can be employed (i.e., characteristics such as quick shuffling, bent knees, and ready position).

Practical Implications

When asked about the factors contributing to specialization, one third of the student-athletes in the present study reported *encouragement from college coaches* and *pressure from youth or high school coaches* as factors. If a portion of student-athletes hold the perspective that coaches play a role in the choice to specialize or diversify in sport, it makes sense for coaches at all levels to be informed on the issue of specialization. Coaches can apply the results of the present study in numerous ways. An applicable example is in regard to scholarships. In the study, over 70% of student-athletes noted *college scholarships* as an effect of specialization. Of the student-athletes studied, less than one third actually earned athletic scholarships (note: Division III does not give athletic scholarships). Furthermore, the available data from governing bodies also illustrates that few student-athletes earn athletic scholarships (NCAA, 2009; NFHS, 2009). Specifically, coaches can explain the realities of attaining athletic college scholarships to parents and young athletes. As previously noted, the reality is that few high school athletes ultimately compete in the NCAA and even less than 5% of high school athletes will earn a full or partial athletic college scholarship (NCAA, 2009; NFHS, 2009).

Coaches can apply other results from the present study, as well. Coaches may gain valuable perspective from understanding possible effects of specialization, as well as, contributing factors. Based on the findings presented, coaches can familiarize athletes with the perceived, pros and cons of specializing in sport, as well as, the perceptions of the necessity of specializing in sport. Additionally, coaches from various sports may be able to utilize the knowledge gained about the differences in perceived demands of individual sports compared with team sports. Also, the NCAA participation rates may be helpful to inform decisions, as well. Overall, coaches should know that specialization in sport may not be necessary in order to compete at the college level. However, perceptions of collegiate student-athletes suggest that perhaps year round participation in a primary sport may be advisable at some point leading up to the collegiate experience. After reviewing the data, coaches will be informed and perhaps able to offer guidance as needed.

In general, promoting diversification in sport may reduce the pressure on youth athletes to excel in a single sport (Hedstrom & Gould, 2004). Based on the retrospective perceptions of collegiate student-athletes, critics of specialization recommended multiple sports participation, the value of transferable skills and the importance of avoiding athletic burnout. Additionally, the neutral respondents encouraged year round participation in lieu of specialization.

Sport specialization was favored by a select group of student-athletes in the study. Based on the responses of student-athletes, scenarios in which it may be advisable to promote specialization occur when children want to:



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improve skills, dedicate their time and stay competitive. Coaches can assist youth athletes in determining personal reasons for or against specializing in sport.

Conclusion

An increasing sense of professionalism and competition in amateur sport ranging from intercollegiate athletics down to youth sports is evident. Current researchers suggest that sport specialization is on the rise (Ewing & Seefeldt, 2002; Hedstrom & Gould, 2004; Hensch, 2004a; Hensch, 2004b; Watts, 2002; Wiersma, 2000). Student-athletes agreed that increased competition levels contribute to the growing demand to specialize in sport. Yet, the essential question remains: Is early youth sport specialization necessary for athletic participation and success at the collegiate level? Overall, the majority of student-athletes studied did not specialize in sport until high school. Some individual sport athletes specialized earlier, while a number of team sport athletes prolonged specialization until college. Most student-athletes believed that youth sport specialization is not necessary for future collegiate success. Based on the responses from student-athletes, specialization may be helpful, but is not necessary for success. Decisions to specialize or diversify in sport still have abundant risks and benefits for young athletes. Many long-term consequences of specialization and intensive sport participation remain unknown. Future exploration is necessary to fully understand the critical process of youth sport specialization and/or diversification.

Table 1: Mean Youth Sport Participation Ages Based on Group Membership: NCAA Division, Gender, and Sport Type

Student-Athlete Group Membership	Began organized sports		Began primary sport		Played year round*	Specialized in primary sport**		
	<i>sd</i>	<i>sd</i>	<i>sd</i>	<i>sd</i>	<i>Sd</i>	<i>sd</i>	<i>sd</i>	<i>sd</i>
NCAA Division I	5.68	1.57	8.63	3.66	11.97	3.67	15.70	3.18
NCAA Division III	6.03	1.98	8.92	3.79	12.16	3.96	15.30	3.76
Males	5.64	1.66	8.81	3.77	12.15	3.70	15.58	3.37
Females	6.16	1.95	8.74	3.69	11.98	3.99	15.39	3.49
Individual Sports	6.01	1.70	7.84	3.24	11.05	3.79	14.05	3.79
Team Sports	5.79	1.86	9.29	3.88	12.63	3.73	16.33	3.00
Total	5.86	1.80	8.78	3.73	12.07	3.82	15.47	3.49



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Note. Values are in years of age. Terms (i.e., primary sport, year round and specialization) were defined in the text of the questionnaire.

* 22 Participants have not participated in their primary sport year round.

** 38 Participants have not specialized in their primary sport.

Table 2: Frequency Figures for Youth Sport Specialization Based on Group Membership: NCAA Division, Gender, and Sport Type

Student-Athlete Group	Age 12	Age 14	Age 17	Age 18	Have not specialized
NCAA Division I	18.3	28.1	54.9	92.5	1.7
NCAA Division III	23.2	35.3	53.3	88.5	6.4
Males	18.8	29.0	54.0	91.3	4.5
Females	23.2	35.1	54.0	89.1	3.6
Individual Sports	32.7	49.4	75.0	94.9	1.1
Team Sports	13.8	21.5	42.0	87.8	7.1
Total	20.7	31.7	54.1	90.4	8.1

Note. Values are in percentage of participants specialized in sport, unless otherwise noted. Terms (i.e., primary sport, year round and specialization) were defined in the text of the questionnaire.



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Table 3: Frequency Data for Effects of Specialization Based on Likert Scale Responses of Collegiate Student-Athletes

Item	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither</i>	<i>Agree</i>	<i>Strongly Agree</i>
Sport Specialization Contributes to:					
High skill levels	0.4	1.7	3.4	49.3	45.2
Making college team	1.3	5.3	14.7	44.8	33.9
Athletic college scholarship	2.3	6.4	20.3	42.9	28.1
Athletic burnout	1.7	9.8	17.9	40.1	30.5

Note. Values are in percent valid. Cumulative percentages for each item equal 100.



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Table 4: Frequency Data for Factors Contributing to Decisions of Collegiate Student-Athletes to Specialize or Diversify in Sport

Item	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither</i>	<i>Agree</i>	<i>Strongly Agree</i>
Contributing Factors					
Competition for collegiate varsity positions	9.4	19.7	27.3	34.8	8.6
Encouragement from college coaches	14.9	18.3	29.2	31.1	6.4
Parental expectations	19.8	20.3	22.6	32.4	4.9
Social trend toward specialization	13.4	23.3	27.8	30.6	4.7
Community emphasis on a particular sport	18.1	24.5	24.3	27.1	6.0
Pressure from youth or high school coaches	17.1	23.5	26.2	28.8	4.3
Desire for professional athletic careers	32.6	28.6	18.3	14.1	6.4
Media	32.3	28.4	26.3	11.5	1.5

Note. Values are in percent valid. Cumulative percentages for each item equal 100.



Table 5: 2x2x2 Analysis of Variance Comparing Age Began Playing Sports.

Source	<i>ss</i>	<i>df</i>	<i>ms</i>	<i>F</i>	<i>p</i>
Gender * Sport Type *NCAA	4.66	1	4.66	1.47	.23
Gender * Sport Type	4.03	1	4.03	1.27	.26
NCAA * Sport Type	4.27	1	4.27	1.34	.25
NCAA * Gender	0.54	1	0.54	0.17	.68
Gender	30.52	1	30.52	9.61	.00
NCAA Division	15.56	1	15.56	4.90	.03
Sport Type	1.73	1	1.73	0.55	.46
Error	1461.21	460	3.18		
Total	1522.52	467			



2x2x2 Analysis of Variance Comparing Age Began Playing Primary Sport.

Source	<i>ss</i>	<i>df</i>	<i>ms</i>	<i>F</i>	<i>p</i>
Gender * Sport Type *NCAA	17.10	1	17.10	1.27	.26
Gender * Sport Type	48.65	1	48.65	3.63	.06
NCAA * Sport Type	8.13	1	8.13	0.61	.44
NCAA * Gender	15.69	1	15.69	1.17	.28
Gender	0.467	1	0.467	0.04	.85
NCAA Division	10.27	1	10.27	0.77	.38
Sport Type	227.16	1	227.16	16.92	.00
Error	6147.65	458			
Total	6475.11	465			



2x2x2 Analysis of Variance Comparing Age Began Playing Primary Sport Year Round.

Source	<i>ss</i>	<i>df</i>	<i>ms</i>	<i>F</i>	<i>p</i>
Gender * Sport Type *NCAA	12.99	1	12.99	0.95	.33
Gender * Sport Type	128.57	1	128.57	9.41	.00
NCAA * Sport Type	101.47	1	101.47	7.43	.00
NCAA * Gender	15.83	1	15.83	1.16	.28
Gender	2.78	1	2.78	0.20	.65
NCAA Division	3.40	1	3.40	0.25	.62
Sport Type	256.54	1	256.54	18.78	.00
Error	5981.83	438	13.66		
Total	6503.41	445			



2x2x2 Analysis of Variance Comparing Age Specialized in Primary Sport.

Source	<i>ss</i>	<i>df</i>	<i>ms</i>	<i>F</i>	<i>p</i>
Gender * Sport Type *NCAA	.029	1	.029	0.00	.96
Gender * Sport Type	99.63	1	99.63	9.28	.00
NCAA * Sport Type	62.83	1	62.83	5.86	.02
NCAA * Gender	1.59	1	1.59	0.14	.70
Gender	4.09	1	4.09	0.38	.54
NCAA Division	17.04	1	17.04	1.59	.21
Sport Type	497.51	1	497.51	46.35	.00
Error	4518.53	421	10.73		
Total	5201.25	428			



Table 6: Simple Effects Test for Comparing Specialization Ages by Sport Type and Gender.

Means	Mean Diff.	S.E.	<i>t</i>	<i>p</i>
Individual Sport				
Year Round Age				
Males = 11.84	-0.44	0.51	1.71	.39
Females = 10.43	-2.76	0.54	-5.11	.00
Specialization Age				
Males = 14.73	-1.28	0.46	-2.78	.01
Females = 13.60	-3.32	0.49	-6.78	.00
Team Sport				
Year Round Age				
Males = 12.28	0.44	0.51	0.86	.39
Females = 13.19	2.76	0.54	1.41	.00
Specialization Age				
Males = 16.00	1.28	0.46	2.78	.01
Females = 16.92	3.32	0.49	6.78	.00

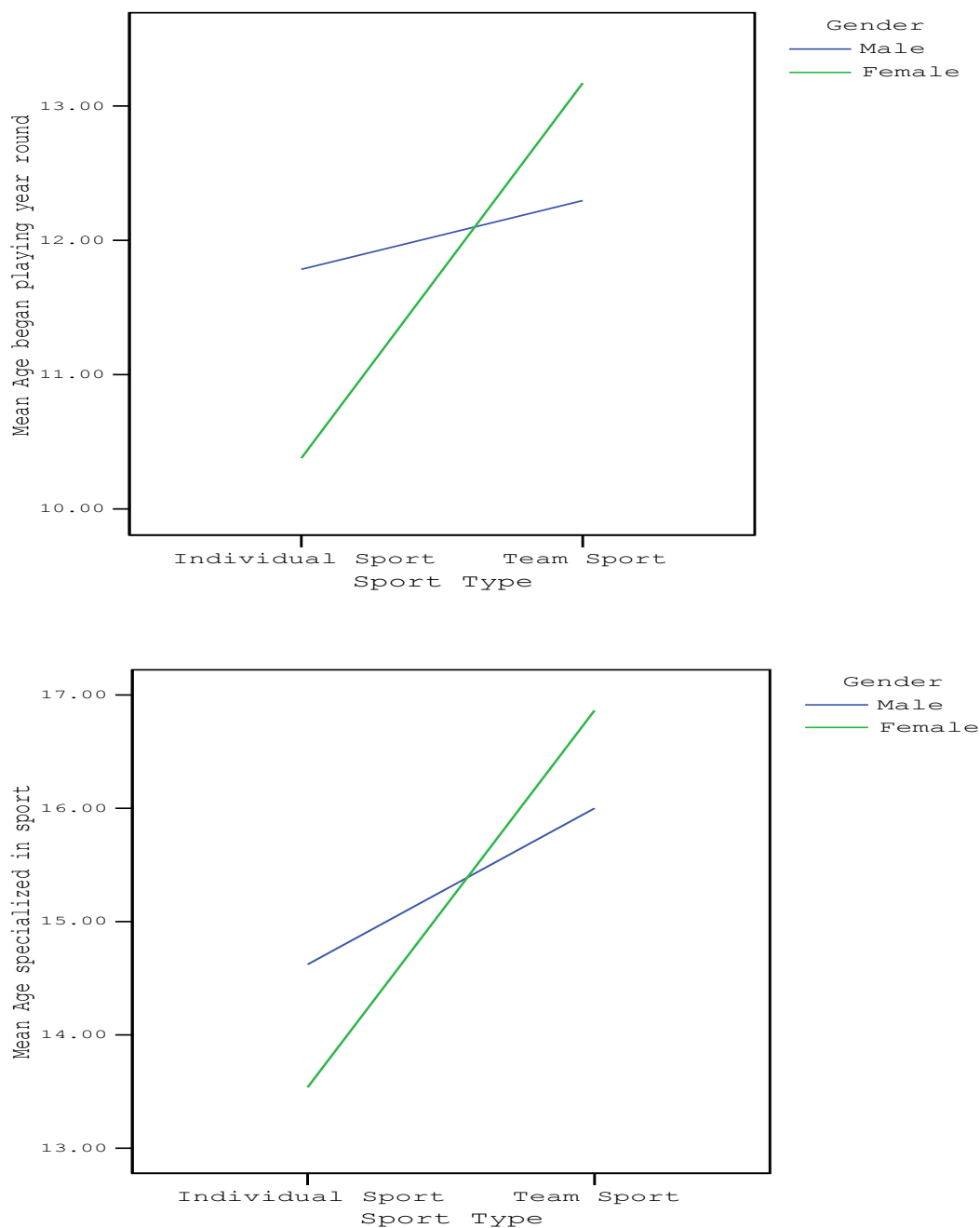


Simple Effects Test for Comparing Specialization Ages by Sport Type and NCAA Division.

Means	Mean Diff.	S.E.	<i>t</i>	<i>p</i>
Individual Sport				
Year Round Age				
NCAA Division I = 11.61	-0.59	.54	-1.09	.27
NCAA Division III = 10.59	-2.60	.51	-5.09	.00
Specialization Age				
NCAA Division I = 14.75	-1.46	.49	-2.98	.00
NCAA Division III = 13.57	-3.14	.46	-6.83	.00
Team Sport				
Year Round Age				
NCAA Division I = 12.27	0.59	.54	1.09	.27
NCAA Division III = 13.19	2.60	.51	5.10	.00
Specialization Age				
NCAA Division I = 16.21	1.46	.49	3.17	.00
NCAA Division III = 16.71	3.14	.46	6.83	.00



Figure 1. Summary Plots for Interactions.



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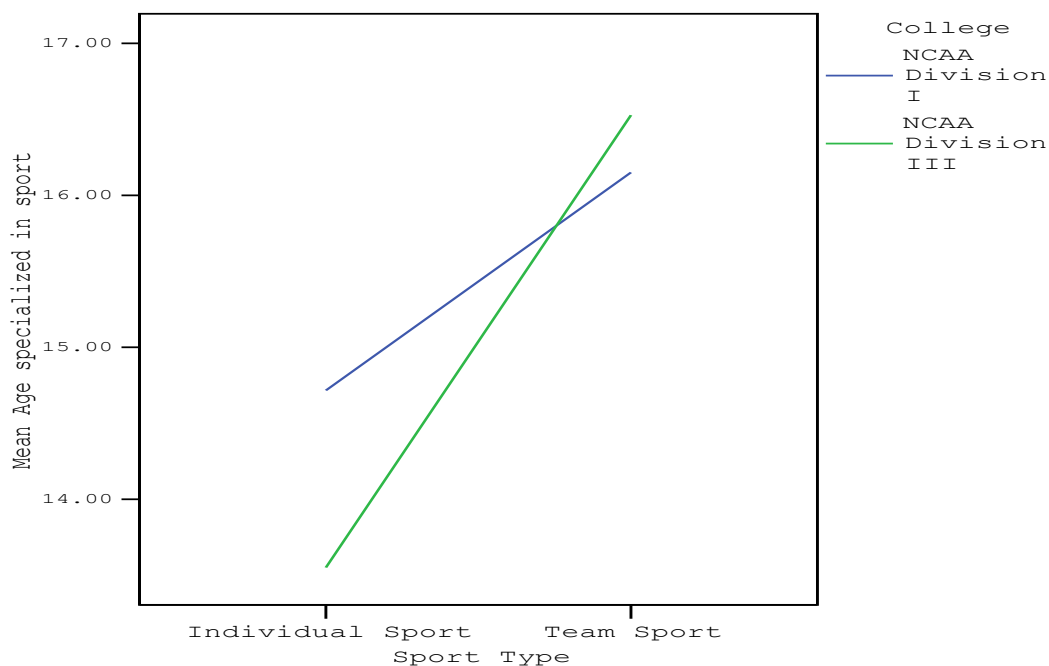
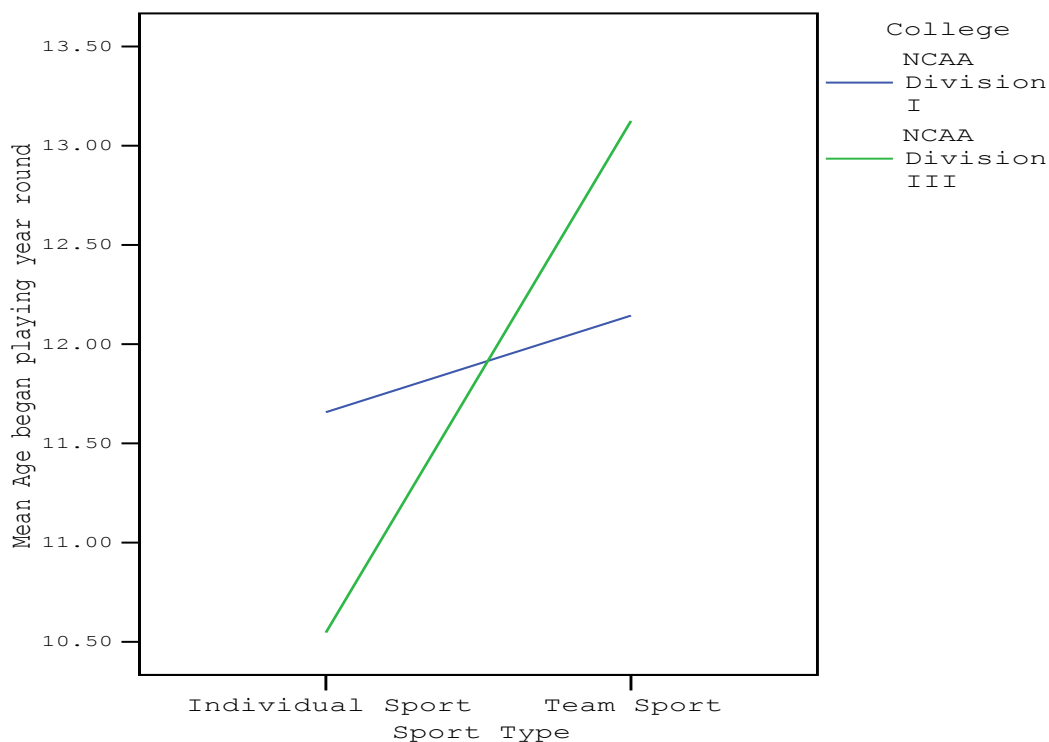
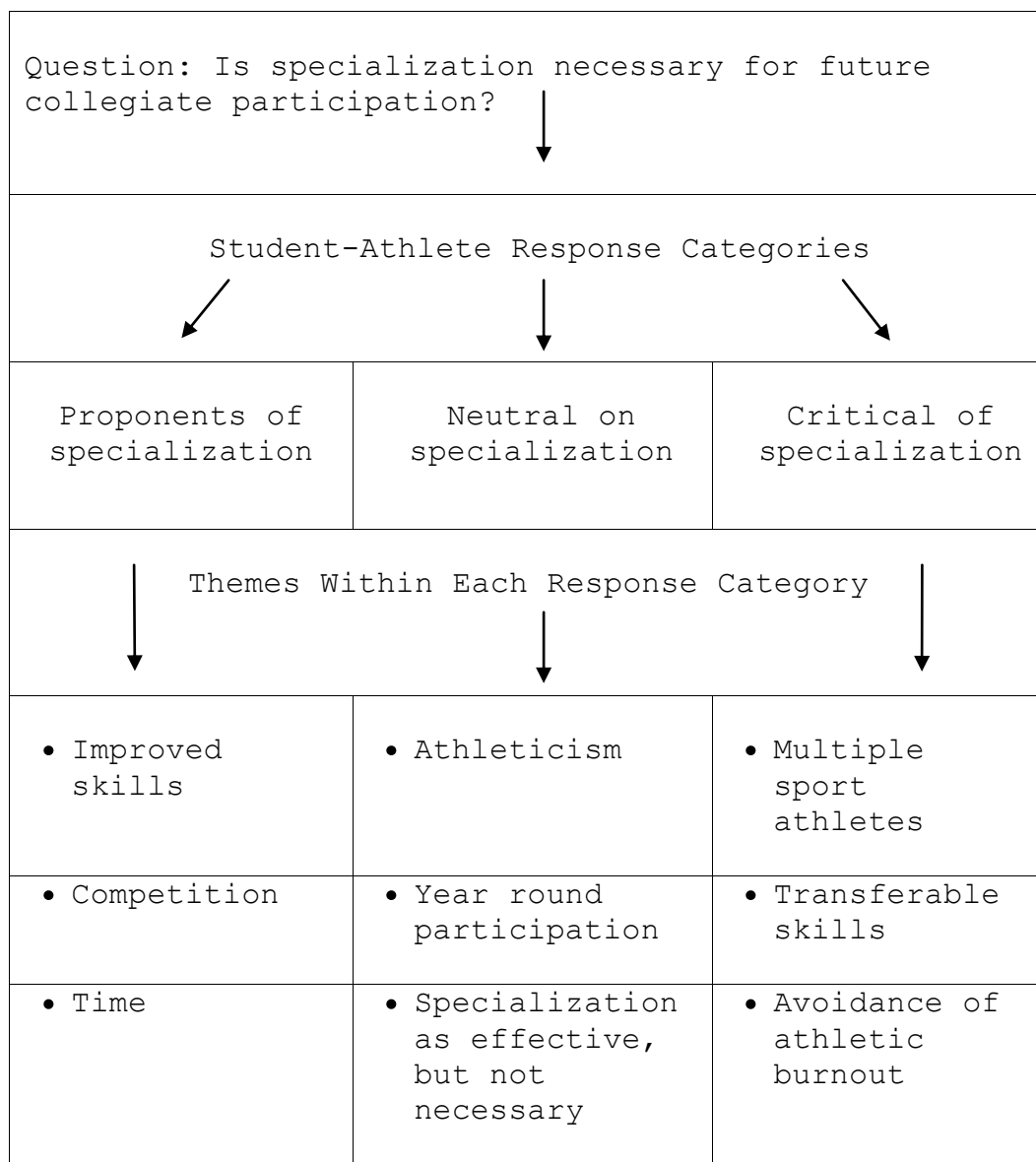


Figure 2. Domain analysis for specialization item responses.



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