Is the Future Success of Young Adult Female Volleyball Players Correlated with Early Sport Specialization in Their Youth?

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Introduction

According to the Canadian Youth Sports Report, 60% of Canadian youth aged 3-17 participate in organized sport regularly (Solutions Research Group, 2014). Additionally, in the United States of America (USA), it is recorded that 6 in 10 American youth, aged 6-17, participate in sport (Hyde et al., 2020). With the competitive nature of sport, there is often pressure to perform and experience athletic success. The specific sport will determine when adolescents are recommended to specialize in a single sport. For example, sports with a peak performance before maturation, such as gymnastics, have a high rate of early sport specialization, and athletes are expected to specialize at a young age (Root et al., 2019). The early specialization will occur after the athlete has already been participating in the sport for numerous years, if they wish to pursue elite competition level. However, it is unclear if sports that have a peak performance after maturation should specialize early.

With most youth participating in organized sport, the effects of early specialization are very relevant and current. Many families will need to decide if and when they want their children to play one sport all year round exclusively. Perhaps the perceived idea of the potential benefit of experiencing long-term success blinds the realistic possibility that early specialization does not guarantee anything. Alternatively, parents may not consider that sport diversification might not limit long-term success for the athletes' sport. The implication of long-term athletic success with early specialization is essential to research as it may be the reason youth miss out on opportunities to be involved in and experience more than one sport. There is limited knowledge

of early specialization, especially for sports with peak performance after maturation, on future success.

Volleyball is a sport that is introduced to youth typically when they are 9-11 years old. At this time, other youth may already be specializing in other sports, such as gymnastics, figure skating, or diving. Even with the later introduction of volleyball, a sport of peak performance after maturation, participants often experience pressure to specialize during the early stages of introduction. In this study, each variable will have two operational definitions. When collecting discrete data, the independent variable will be success identified as the league level reached, and the dependent variable will be the age at which specialization occurs. When collecting continuous data, the independent variable will be the degree of specialization in the participants' youth, and the dependent variable will be success, defined as the role they play on their respective team. Specifically, this study's research question is 'how is young adult female volleyball players' future success correlated with early sport specialization in their youth?'

Literature Review

Early Sport Specialization

Early specialization is commonly defined as competing exclusively in sport, year-round, before the age of 12 (Callender, 2010; Waldron, DeFreese, Pietrosimone, Register-Mihalik, & Barczak, 2020). There is a debate in youth sports on whether adolescents should specialize in a single sport at an early age, before the age of 12, or diversify across multiple sports, called sports sampling or sport diversification, then choose a single sport after (Gould, 2010; Callender, 2010).

There is growing pressure for athletes to specialize at a young age as specialization is believed to bring future athletic success (Waldron, DeFreese, Mihalik, Pietrosimone, & Barczack, 2020). The pressure to specialize may come from parents, as Walker et al. (2021) found, but it may also come from coaches or the athletes themselves (Gould, 2021). The pressure to specialize in a single sport is growing as researchers found that current high school athletes are specializing two years earlier than current collegiate athletes did in their adolescent years (Buckley et al., 2017). Athletes said, in a study by Smith et al, (2020) that they specialized in both sport and the position they played, to have the highest chance of playing at the collegiate level. The athletes were adamant that to succeed, they needed to specialize in their sport and their position (Smith et al., 2020). This research reflects the belief in early specialization, but fails to recognize if early specialization was the deciding factor in future athletic success.

There is available research on the negative long-term effects of early specialization, general to sport as a whole. Research has shown that athletes who specialize in a single sport before the age of 12 have a greater risk of injury (Walters, Read, Estes, 2018; Feeley, Agel, & Laprade, 2016). Sport specializers are also at a greater risk of experiencing mental and physical fatigue, leading to increased rates of dropping out (Waldron et al., 2020; Walters et al., 2018). Additional research has also correlated burnout theory with early specialization (Myer et al. 2015; Waldron et al., 2020). Horn (2015) found that athletes who specialize are at a greater risk for negative psychosocial effects and dropping out, especially those who have extrinsic forms of motivation, such as gaining an athletic scholarship. As these studies were conducted with general athletes of any sport, the findings have little external validity when considering early specialization for a specific sport.

Why do athletes continually engage in early specialization despite the negative long-term effects? Yustres et al. (2019) has supported that early specialization is recommended, for swimmers, to achieve success in the highest levels of competition. Early specialization may occur due to the nature of the sport, just as Yustres et al., (2019) found, as swimming and gymnastics have a peak performance before maturation (Root et al., 2019). Livingston, Schmidt, & Lehman, (2016), researched competitive soccer players and found that although early specialization, in any sport, increases the risk for psychological effects, the family may be more of a risk for burnout than early specialization itself. It is recommended to consider the sport, gender, athletic environment, and age of the athlete to decide the benefits and drawbacks of early specialization for their unique situation (Callendar, 2010).

Considering female volleyball as a unique situation, there is little research available that investigates the effects of early specialization to this demographic. Biese et al. (2020) conducted a cross-sectional study to determine female volleyball players' association between sport specialization and previous injuries. More than 1,500 participants were used to determine that highly and moderately specialized athletes were more likely to have had sports-related injuries than athletes who identified as low specializers (Biese et al., 2020). The application of their statistically significant findings meant that female volleyball athletes who specialize early and to a high degree, are more likely to experience sports-related injuries (Biese et al., 2020). DiCesare et al., (2019), conducted a cohort study, investigating the differences in landing coordination between female multi-sport and, in either volleyball, basketball, and soccer, sport-specialized athletes. The purpose of their study was to collect data that would support or refute the notion that early specialists are at a greater risk of injury due to coordination differences (DiCesare et al., 2019). They found that early sport specialization was associated with increased variability in

hip- and knee-joint landing angles (DiCesare et al., 2019). Meaning that early specialization increases the likelihood of poor landing mechanics, leading to an increased risk of injury (DiCesare et al., 2019). While there is research on the long-term effects of early specializers within volleyball, much of it focuses on the increased risk of injury.

Early Sport Specialization and Success

Early specialization may be strongly associated with some sports, as Root et al., (2019) found for gymnastics, but there are many sports where athletes are not required to specialize, if they wish to potentially experience athletic success, as peak performance is after maturation. A study was conducted with 14-19-year-old participants who, in 2004, were nationally ranked in the top 10 athletes in Spain, across many sports domains, such as jumping, throwing, and running (Latorre-Roman, Pinillos, & Robles, 2018). The researchers checked in with the athletes ten years later, finding statistically significant dropout rates from high performance, which means that early success in a sport is not correlated with success in the future (Latorre-Roman et al., 2018). Latorre-Roman et al., (2018) concluded that specializing early in a single sport should be questioned when the peak performance is at the senior level. Other research has concurred that early specialization is not correlated with future success (Fernandez-Ortega, Rodriguez-Buitrago, & Sanchez-Rodriguez, 2021). Athletes may specialize in their primary sport to set themselves up for future success, but depending on the sport, if peak performance is post-maturation at the senior level, it may not be necessary (Callendar, 2010).

Sport sampling, or sports diversification, is when adolescent athletes diversify across multiple sports and then choose a single sport after (Gould, 2010; Callender, 2010). Depending on the athlete's situation, participating in multiple sports at an early age may result in greater

athletic achievement as an adult (Brenner, LaBotz, Sugimoto, & Stracciolini, 2019). Callendar (2010) and Gould (2010) concluded that early sport specialization might have detrimental effects, while sport sampling does not hinder future sport participation when peak performance is after maturation. Athletes who engage in sport sampling are also associated with a decreased risk of injury than athletes who are early sport specialized (Carder et al., 2020). Additionally, athletes who sport sample are associated with decreased levels of the three aspects of burnout, reduced sense of accomplishment, sport devaluation, and exhaustion, when compared with sport specialists (Giusti et al., 2020). Although it may not be commonly practiced, research shows that sport sampling should be considered when the sport's nature allows for it.

There is research that supports other factors contributing to the future success of athletes. DiFiori, Quitiquit, Gray, Kimlin, & Baker (2019) conducted a study that looked at collegiate student-athletes and their non-athlete student peers who had been involved in competitive youth sports. It was found that the varsity student-athletes did not specialize earlier than their student peers who were competitive athletes in adolescence (DiFiori et al., 2019). The results showed that early specialization played only a small role in the athletes' future success and that genetic endowment and family influences played a large role in whether the adolescent athletes ended up as varsity athletes or non-athlete college students (DiFiori et al., 2019). Although these results were not specific to any sports, the results still have external validity when looking at, generally, adolescents' future success in becoming a varsity athlete. Other factors, such as personality, have shown to be statistically significant when clarifying the relationships between character and athletic success (Steca, Beretta, Greco, D'Addario, & Monzani, 2018). Compared to a less successful athlete, being a more successful athlete is statistically significant with being more

agreeable, conscientious, and emotionally stable (Steca et al., 2018). As shown through research, many factors, other than early specialization, play a role in any athlete's future success.

Early specialization is believed to allow adolescents to excel in sport to attain university scholarships or reach a professional level when they are seniors, but it is not a guarantee for later success (Callendar, 2010; Gould 2010; Buckley et al., 2017). While early specialization may be evident and successful in research for sports with peak performance before maturation, such as gymnastics and figure skating, it will not hold for every athlete and may not apply to sports with peak performance after maturation (Root et al., 2017; Callendar, 2010; Gould 2010). As volleyball is a sport with peak performance after maturation, specializing early has been questioned.

Insights into the dilemma of early specialization in volleyball are given through research. Researchers of one study have found that in international male senior athletes, of volleyball, soccer, swimming, and judo, early specialization, or even athletes who show success early is not a prerequisite for future success as senior athletes (Barreiros & Fonseca, 2012). Also, in 2014, a sample of 234 volleyball, tennis, and handball coaches were surveyed, and only 8% of the coaches are assured of the positive benefits of early specialization (Buchtel, Kocib, & Tuma, 2014). Most of the coaches sampled support specialization in only the older, more senior, age categories (Buchtel et al., 2014). As volleyball is a sport where peak performance is after maturation, the results from Buchtel et al. (2014) align with the findings of Callendar (2010) and Gould (2010). Callendar (2010) and Gould (2010) both found that sport sampling, as opposed to early specialization, does not hinder the future of the adolescents' sport participation.

Research supports that athletes who play a sport with a peak performance age before maturation are recommended to specialize early for success, but less research is available for specific sports with a peak performance after maturation, and even less for a specific gender (Cote, Ldor, & Hackfort, 2009). As there is growing pressure for early specialization, and little research to support the main reason for specialization, there is a gap in the available research (Buckley et al., 2017). Little to no research has focused on female volleyball athletes and their future success. By investigating this topic, research will be available for players, coaches, and parents to make informed decisions about young female volleyball athletes specializing in a single sport with the intent of future success.

Variables Defined

Ferguson and Stern (2014) explain that there is no standardized definition for early sport specialization, but many researchers define it similarly (Ferguson & Stern, 2014). Early sport specialization is commonly defined as intense year-round training in one sport from a young age (Ferguson & Stern, 2014). The available research that focuses on early specialization has it defined as at or before the age of 12 (Callender, 2010; Waldron, DeFreese, Pietrosimone, Register-Mihalik, & Barczak, 2020). Athletic success has been defined as the competition level at which athletes compete (Steca et al., 2018, as cited in Allen, Greenlees & Jones, 2011). Athletic success is also defined by Allen et al. (2011) as the athletes' capacity to perform (Allen et al., 2011).

With volleyball being a commonly introduced sport not until this age, or shortly before, and the fact that participants peak in volleyball after maturation, it is unrealistic to define early specialization, relative to volleyball athletes, at or before the age of 12. Early specialization in

this study, for female volleyball, will be defined discretely as ‘at or before the age of 14’ and continuously as ‘competing in volleyball exclusively all year long in adolescents’. In this study, success will be defined discretely as what ‘league’ the participants play after secondary school graduation and continuously as ‘the role that the participant plays on their team’. The purpose of this study is to investigate the correlation between the future success of young adult female volleyball players and sport specialization in their youth.

Methodology

The effects of early specialization on female volleyball athletes' success will be the focus of this research. A quantitative approach with a survey design will be used. Cross-sectionally athletes will be placed in different categories (i.e., what level they achieved) (Recreation [Rec] < CCAA < U-Sports < Team Canada), and analyze it with what age they specialize at (i.e., at or before 14, or 15 years old and older). This discrete data will be analyzed through descriptive statistics. Additionally, we will look at the athletes' success on their respective teams, correlated against their degree of specialization. This continuous data will be analyzed with inferential statistics. The Ethics Board of Douglas College will approve the research methodology.

Participants

A women’s volleyball team of players will be chosen from each success level: rec, CCAA (Canadian Collegiate Athletic Association), U-Sports, and the Canadian National Team. Women’s teams will be selected, based on coaches we know, from the same geographical location, British Columbia, Canada, to reduce confounding variables. The rec team will be a team registered under VolleyballBC, a CCAA and a U-Sports team that is based in B.C., and the women’s Canadian National Team, based out of Richmond, B.C. There were 48 participants who

all self-identified as female. Of the 48 responses, 41 participants reported their current age. The 41 participants had an average age of 23 years-old (SD=6.3; Range=18-49). Coaches of the teams were contacted and briefed about the study. Once we received written consent from the coach, the online survey was sent to them to distribute it to their team. Once the athletes had the survey, they voluntarily participated and gave their informed consent. Minors, 18 years old or younger, will be required to have parental/guardian consent.

Data Collection: The Survey

Qualtrics will be used to distribute a modified survey to participants to give their informed consent, electronically, and complete the survey remotely at their convenience. At the beginning of the survey, there will be five questions to define the sample, ensuring that they are eligible, and categorical questions for the discrete variable operational definitions. From there, five questions will collect data on early specialization, and five questions on their success. These ten questions will utilize the Likert Scale, for continuous data, as their five answers for early specialization, and five answers will be quantified by averaging them, respectfully, and correlating the results. A one on the Likert scale will reflect, ‘corresponds not at all’, while five on the scale will represent, ‘corresponds exactly’. One on the scale will represent low specialization and limited success, while the five on the scale shows high specialization and great success.

Questions regarding sport specialization are based on a “Specialization Scale” (Jayanthi, LaBella, Fischer, Pasulka, & Dugas, 2015). The reliability and validity of the “Specialization Scale” by Jayanthi et al. (2015) has been doubted, based on one of the questions in the scale; “have you quit other sports to focus on a main sport” (Miller, Malekian, Burgess, & Labella,

2017)? Athletes who specialize may likely have never played another sport, meaning participants are misclassified in this scale, making the results unreliable (Miller et al., 2017). The survey for this study was modified to address this, eliminating that question and replacing it with the proposed question by Miller et al. (2017), 'have you only ever played one sport?'. Although numbers were not reported for the reliability and validity of the specialization scale, this change will likely increase those values.

Questions to assess sport success will be based on the 'Sport Success Scale' (SSS) (Mousavi & VaezMousavi, 2014). The SSS content validity ratio (CVR) and content validity index (CVI) were found to be 0.91 and 0.89, respectfully. An internal consistency (0.89) and a 21-day test-retest interval (0.90) was used to test and determine the reliability of the scale (Mousavi & VaezMousavi, 2014). Because of the SSS results in reliability and validity, the scale is considered a suitable tool for measuring sport success (Mousavi & VaezMousavi, 2014).

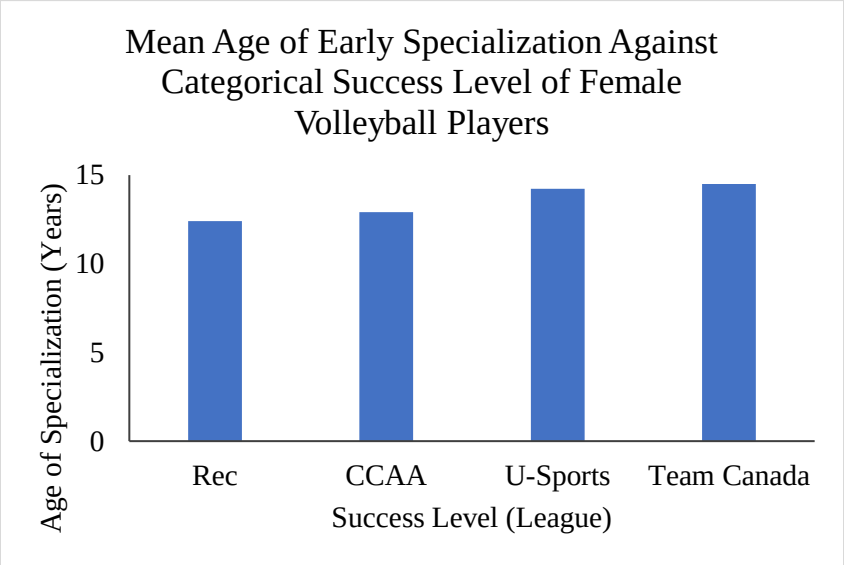
Statistical Analysis

Discrete Data

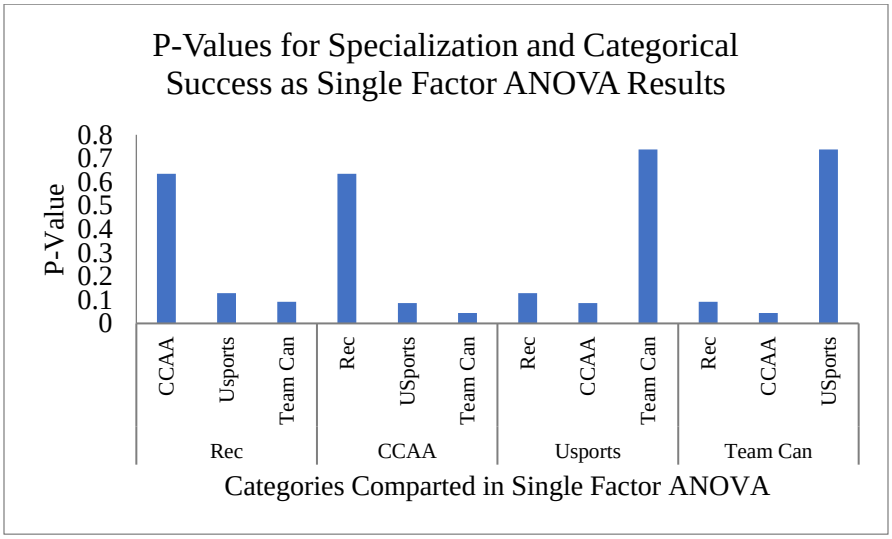
Our discrete data analysis includes comparing the categorical success (Rec, CCAA, U-Sports, and Team Canada) with the average age of specialization. The age of the participants who specialized was averaged. A single factor ANOVA test was used to compare, in pairs, each categorical success level with each of the others for statistical significance for the age of specialization. Discrete data analysis was also used to compare the amount, in percentages, to account for varying amounts of participants per category, the participants who specialized early (14 years-old or earlier) and those who specialized late (15 years-old or later).

Continuous Data

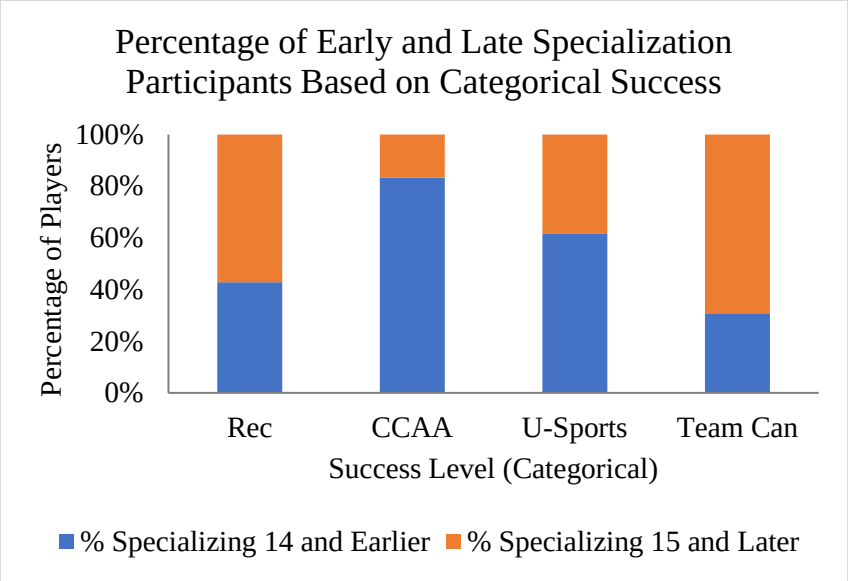
Our continuous data analysis involved calculating a Pearson's R Correlation Factor from the results of the Likert Scales within each categorical success level. The Pearson's R Correlation Factor correlated the degree of specialization and the degree of success. The participants' data of those who specialized at or before the age of 17 was used to calculate the correlations.



1: The Average Age of Specialization for the Categorical Success Levels



2: P-Values for Specialization and Categorical Success as Single Factor ANOVA Results



3: Percentage of Early and Late Specializers Distributed Across Success Levels

Table 1

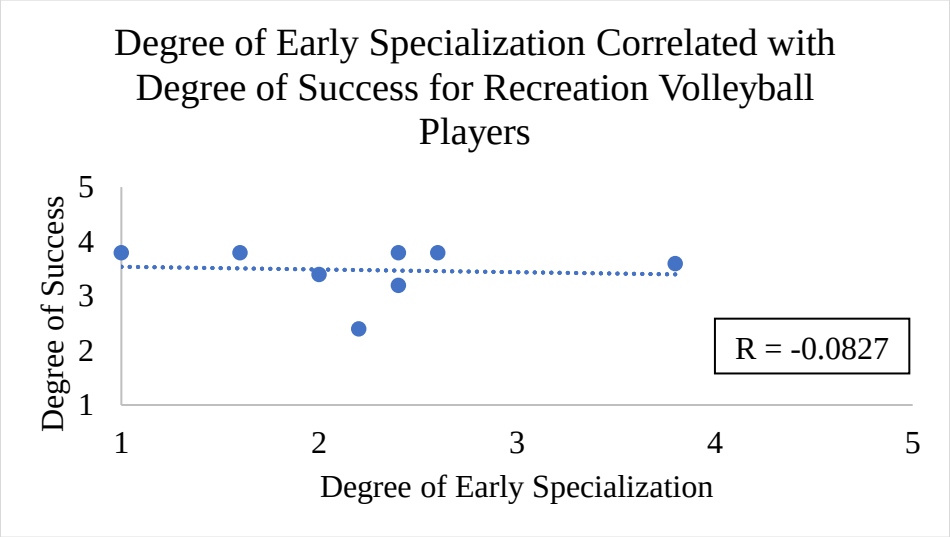
Between Group ANOVA P-Value Results

Category 1	Average	Category 2	Average	P-Value
Rec	12.40	CCAA	12.92	0.63
		U-Sports	14.23	0.13
		Team Can	14.50	0.09
CCAA	12.92	Rec	12.40	0.63
		U-Sports	14.23	0.09
		Team Can	14.50	0.04
U-Sports	14.23	Rec	12.40	0.13
		CCAA	12.92	0.09
		Team Can	14.50	0.74
Team Canada	14.50	Rec	12.40	0.09
		CCAA	12.92	0.04
		U-Sports	14.23	0.74

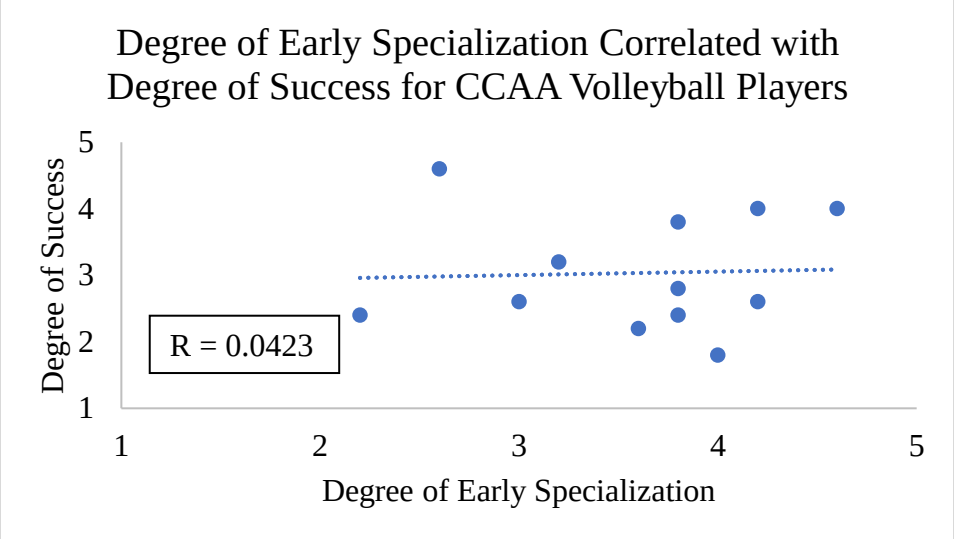
Table 2

Percentage of Early and Late Specializers

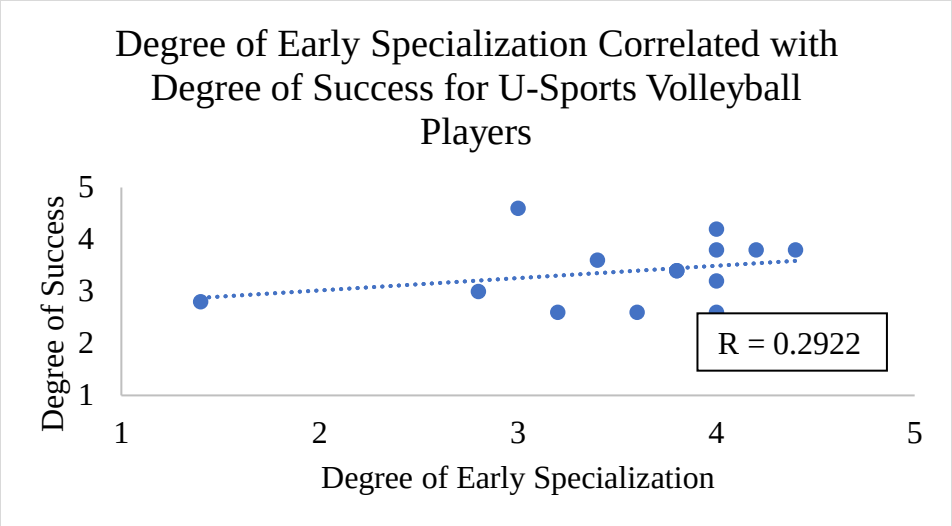
Success Level	% Specializing 14 and Earlier	% Specializing 15 and Later
Rec	42.86%	57.14%
CCAA	83.33%	16.67%
U-Sports	61.54%	38.46%
Team Can	30.77%	69.23%



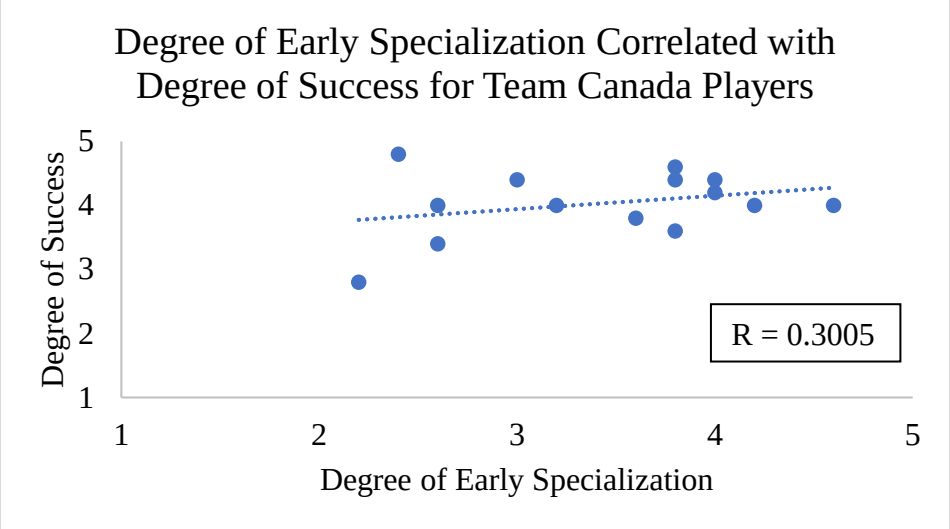
4: Degree of Early Specialization Correlated with Degree of Success for the Rec Participants



5: Degree of Early Specialization Correlated with Degree of Success for the CCAA Participants



6: Degree of Early Specialization Correlated with Degree of Success for the U-Sports Participants



7: Degree of Specialization Correlated with Degree of Success for the Team Canada Participants

Table 3

Pearson's R Correlation Factor for Success Levels

Success Level	Pearson's R Correlation
Rec	-0.083
CCAA	0.042
U-Sports	0.29
Team Canada	0.30

Results

The age of specialization was averaged for the participants who specialized within each categorical success level. As shown in Figure 1, the average age of specialization for each category was found to be, respectfully, Rec=12.4, CCAA=12.9, U-Sports=14.2, and Team Canada=14.5. The single factor ANOVA test that compared each category's data with all the others provided p-values as depicted in Figure 2 and Table 1. The only single factor ANOVA test that provided statistical significance ($p<0.05$) was the one that compared the CCAA and Team Canada participants' age of specialization. Furthermore, of the participants who specialized, Figure 3 and Table 2 portray the percentage, for each categorical success level, of those who specialized early (14 years-old or earlier) and those who specialized late (15 years-old or later). The results showed that the CCAA had the highest percentage of early specializers at 83% while reporting the lowest rate for late specializers. Team Canada revealed the lowest percentage of early specializers at 30%, meaning that they also had the highest rate of late specializers.

Figures 4-7 and Table 3 illustrate the Pearson's R Correlation Factor found between the degree of specialization and the degree of success for the specializers within each categorical success level. The Pearson R-value for Rec ($R=-0.082$) and CCAA ($R=0.04$) show no correlation between the degree of specialization and degree of success. Simultaneously, the Pearson R-value for U-Sports ($R=0.29$) and Team Canada ($R=0.33$) show an extremely low correlation.

Discussion

With the competitive nature of sport, the pressure to succeed and specialize early has become increasingly common in the hopes of achieving future success (Waldron et al., 2020). There is a current debate whether athletes, in sports with a peak performance after maturation,

should specialize early or not (Gould, 2010; Callendar, 2010). As volleyball is a sport with peak performance after maturation, there is little research available that investigates the relationship between adolescent female volleyball players' future success and early specialization. This present study is unique and fills gaps in the available research by investigating when female athletes specialize in their youth, the degree of specialization, and by relating those variables to future success.

The average age of specialization in our sample for CCAA athletes was 12.9 years old, and Team Canada athletes averaged specializing in volleyball at 14.5 years old. Of the average ages of specialization for each categorical success level (Rec, CCAA, U-Sports, and Team Canada), the difference between the CCAA and Team Canada values were the only statistically significant ones. This result suggests that the athletes who specialized, later on, were more successful in reaching a greater success level (Success level rankings: Rec < CCAA < U-Sports < Team Canada). We believe the Rec age of specialization values was not statistically significant when comparing them to any other category's values due to fewer participants. U-Sports was not statistically significant when comparing them to any other teams' value's, perhaps as the average age was similar, in-between, CCAA and Team Canada. Team Canada athletes specialized later than CCAA athletes, and Team Canada athletes are considered more successful than their counterparts (CCAA < Team Canada). This finding suggests to parents, coaches, and fitness leaders that they should consider supporting female adolescent's volleyball players to sport sample, on average, until the age of 14.5 years-old with future success in mind. A possible reason for this finding is that peak performance in volleyball occurs after maturation (Callendar, 2010). Perhaps, adolescent females are more physically, emotionally, and mentally mature to choose a sport to specialize in that is more beneficial in the long-term. Accompanied with

playing for intrinsic motivation which will possibly lead to less dropout. This explanation is a possible reason for our results, as it explains specialization at a later age for increasing the chances of greater future success. However, more research is needed to investigate this idea.

This study shows that specializing at or before the age of 14 years-old (early), compared to specializing at or after 15 years-old (late), is not a determinant factor in what success level one reaches. For every success level, defined by volleyball leagues, some participants specialized early and participants who specialized late, with increasingly larger numbers of late specializers from CCAA to U-Sports and Team Canada. This distribution shows that early specialization is not a sole factor in predicting an adolescent female volleyball athlete's future success. Additionally, considering that it is statistically significant to specialize later, for a Team Canada success level compared to the CCAA level, our findings show that future success does not support the theory that early specialization is necessary for future success. Additionally, that late specialization may help female volleyball athletes reach a greater success level. Possible explanations for why early specialization is not a determining factor for success are its negative aspects. Early specializers have a greater risk of injury, experiencing mental and physical fatigue, burnout, and external motivation, all increasing the chances of dropout, as supported by research (Walters et al., 2018; Feeley et al., 2016; Waldron et al., 2020; Walters et al., 2018; Myer et al., 2020; & Horn 2015). Female volleyball coaches and teachers need to know that the negative aspects of early specialization are possibly not outweighed with the possible benefit of future success as late specializers are just as likely, if not more likely, as supported by the findings of our study, to reach the same or greater success level.

There was no correlation between the degree of specialization and degree of future success for the Rec and CCAA participants, and extremely weak correlations for U-Sports and

Team Canada participants. This means that even though athletes specialize, they can specialize to a low degree so female volleyball athletes can be encouraged to try new and be engaged in other activities or sports. It is possible that the positives of being involved in other sports or activities, even for fun, explain the lack of, or weak, correlations in our results. Even if other sports are just for fun, sport sampling is associated with a reduced risk of injury, decreased chances of both burnout and exhaustion, a positive transfer of fundamental movement skills, a lower likelihood of sport devaluation, and a greater sense of accomplishment (Carder et al., 2020; Giusti et al., 2020). It is also essential to explore the external factors such as genetic endowment and family influences that have been shown to affect athletes' athletic future (DiFiori et al., 2019). With volleyball being a sport with peak performance after maturation, female adolescents are not required to specialize at an early age if they wish athletic success in the future, as shown by our results early and supported by other studies (Root et al., 2017; Callendar, 2010; Gould 2010). Coaches and fitness leaders would find this data valuable as it supports encouraging athletes to participate in other sports or activities to increase the likelihood of future success in volleyball. Volleyball can be an athlete's primary sport, and they may wish to specialize in it later on solely, but specializing to a low degree by being involved in other sports has either a lack of or an extremely low correlation to the future success of a female volleyball athlete.

This study has some limitations. First, our sample size was considerably small, which would have affected our results' statistical significance. We suggest to future researchers to involve more than one team per success category. As our participants were chosen from teams with coaches we knew, our results may have been affected. Although this was done to accommodate the fast-tracked timeline for our research study, a more robust methodology would

include a random selection of teams or participants. Additionally, although our self-reporting tools were adapted from surveys shown to be valid and reliable, a positive or negative self-bias with participants who are unrealistic in self-assessing their abilities and a better-than-average effect may have played a role in the results. By generalizing the study to female volleyball players, and not taking into account the position played, the results may have been affected. Different positions may require more or less specialization, or success may come differently. Lastly, we were not able to guarantee a response from every single athlete on each team. Participation was voluntary, and as such, some of the team members may not be represented in the data, affecting our results.

This study adds to the current research available by showing that the average age of specialization is later for a higher future success level, or league, as Team Canada athletes significantly specialized later than CCAA participants. Also, that late specialization will not hinder an athlete's future success and that specializing to a low degree will not negatively affect the degree of future success for female adolescent volleyball players as there is no correlation. However, more research is needed. A suggested study for the future is one that investigates, with a larger sample size, the effects of sport sampling in adolescents concerning future success in a single sport, specifically women’s volleyball. Additionally, more research is recommended to be done with male volleyball players, as we believe the results from the present study cannot be generalized for all volleyball players but rather specific to female volleyball athletes. It also may be of value to conduct research specific to volleyball in different cultures, such as the volleyball European culture, where professional volleyball is very popular.

Conclusion

Coaches, parents, and sport advocators will be able to use this research to help decide why, why not, and when to specialize in female volleyball. When putting the findings of this research into practice, female volleyball players can specialize late (14.5 years-old on average) and still be associated with reaching the categorical success of playing for elite teams. After an athlete chooses to specialize, there is either a lack of or an extremely weak correlation with future success, which means that female volleyball athletes can be encouraged to partake in other sports or activities, even for fun, without hindering the possibility of having a high degree of success in the future. Early specialization in female volleyball is not a determining factor in achieving future success, and therefore it alone should not be used as a ploy to pressure athletes to specialize early. Our findings show that early specialization will not determine athletes' future success, and late specialization will not hinder future success.

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Appendix A

The Survey

Age - _____
Gender - male/female/prefer not to say
Current Team League - recreation / CCAA / U-Sports / Team Canada (professional)

1) At what age in your youth did you exclusively deliberately practice and compete in only volleyball and no other sport? 9 / 10 / 11 / 12 / 13 / 14 / 15 / 16 / 17 / did not specialize in my youth (i.e., deliberately practiced and competed in more than one sport up until at least age 17)

Does not correspond at all 1	**Corresponds a little 2**	**Corresponds moderately 3**	**Corresponds a lot 4**	**Corresponds exactly 5**

Question	1	2	3	4	5
When you think about volleyball in your youth, considering every year between the ages of 9 and 17, I would…					
2. Consider volleyball, as my primary sport, to be more important than other sports / commitments (Miller et al., 2017).					
3. Regularly travel outside my high school and club teams home province/region to compete.					
4. Train for the majority of the year in volleyball (Jayanthi, 2015).					
5. I was in pursuit of a post-secondary athlete scholarship.					
6. It is the only sport I have ever competed in (Miller et al., 2017).					
When I think about volleyball on my current Rec / CCAA / U-Sports / Professional (Team Canada)...					
7. I am a consistent ‘starter’ for my team.					

8. Typically I am on the court the entire game.					
9. I consistently perform well in games.					
10. I perform most techniques well, after a few weeks of no practice (Mousavi & Vaezmousavi, 2015).					
11. Have mastered skills and techniques, as a result of continuous training (Mousavi & Vaezmousavi, 2015).					

Appendix B

Consent Form

DOUGLAS COLLEGE

Title	How is the future success of young adult female volleyball players affected by early sport specialization in their youth?
Investigators	Hannah Bakken (Student, Sport Science, Douglas College) and Olivia Cesaretti (Student, Sport Science, Douglas College)

- I understand that my voluntary participation is being requested to take part in a research project called "How is the future success of young adult female volleyball players affected by early sport specialization in their youth?", carried out by Hannah Bakken and Olivia Cesaretti
- I understand that the general aims of the study are to investigate current female volleyball athletes in various different success categories, recreation, CCAA, U-Sports, and Professional, and analyze the volleyball pathway in my teenage years that brought me to my current team. I understand that the goal is to better understand how early sport specialization affects youth female volleyball players' future in their athletic success.
- I understand that my voluntary participation means I will be asked questions about my volleyball experience from my teenage years and my current volleyball success status.
- I understand that my participation in this research project is entirely voluntary and that I will not be penalized or adversely affected in any way should I decline to participate, withdraw from the study at any time (even after giving initial consent), refuse to answer particular questions, or refuse to participate in a portion of the study.

- I understand that my anonymity will be maintained as no identifying information will be collected and therefore my identity will not be revealed to others.
- Confidentiality with respect to the information I provide will be secured by the investigators on password-protected software and servers. The individual answers that I provide will not be shared or presented in any way that would reveal me as the source of that information.
- I understand that there are no direct benefits from voluntarily participating in this study.
- I understand that the risks of being involved are having stress triggered by recalling information related to my volleyball experience in my teenage years.
- I understand that the time commitment, costs, and inconveniences of participation involve a 5-minute survey that can be completed remotely at my convenience.
- I understand that at the conclusion of this study, the information collected will be analyzed for a school project and stored for the length of one semester, four months.
- I understand that the results of this study will be used for a school project, and presented in class at Douglas College and that results can be provided to me at my request.

If you have any questions or concerns regarding the project, the methods used in the study or your treatment as a participant, please contact (Hannah Bakken at bakkenh@student.douglascollege.ca or Olivia Cesaretti at cesarettio@student.douglascollege.ca) AND SPSC Chair, Ken Anderson; email andersonk@douglascollege.ca.

I, _____, have read and understood the information stated above. I have been given an opportunity to have all my questions and concerns answered fully. I agree to participate in this study and indicate my consent by signing below.

Signature _____ Date_____
(If you are 19 years or older)

Signature _____ Date_____
(If you are 18 years or younger)