

Limiting Factors to Participation in USA Ultimate in Comparison to US Lacrosse

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(1.) INTRODUCTION

Ultimate, originally known as Ultimate frisbee, is a growing sport originally developed in New Jersey in 1968. “Combining the non-stop movement and athletic endurance of soccer with the aerial passing skills of football, a game of ultimate is played by two teams with a flying disc on a field with end zones, similar to football. The object of the game is to score by catching a pass in the opponent’s end zone.” (Source 4.1.1) Data in regards to official participation (i.e. participating at least once in a given year in an event organized by USA Ultimate) in the sport is lacking, and thus usage of data (such as the participation trends found on USA Ultimate’s website) in a formal setting is hard to find. The major reason for this study is the lack of official research on Ultimate’s participation trends. In addition, this study will conclude what blocks might exist that limit the growth of Ultimate. Through comparison with participation numbers in US Lacrosse and research into factors that exist in both sports that inhibit growth, it becomes easier to determine what steps can be taken to increase participation, as well as what would benefit from having more focus.

Section 2 of this paper will be divided into the methods taken in this research, separate questions regarding participation in Ultimate, and a further evaluation of the Ultimate participation data. Lacrosse will always be used as a baseline for comparison regarding the questions. Each question will be introduced, followed by the data relating to answering that question, and ending with an analysis on the findings of the data and the results. The body will be followed by conclusions reached by this research, as well as possible solutions to specific pre existing problems, and ending with other assumptions which could be addressed by further research.

What will be talked about due to this research are as follows:

1. How do the growth rates of Ultimate compare to that of Lacrosse?

2. Why does Ultimate participation differ at different age groups?
3. Further Evaluation of Ultimate Participation Data in 2016

Finding solutions to these answers through this research, in combination with the data at hand provided by each sports respective US-run organization, will help to understand what steps are necessary to make the best future improvements. Sports such as these two at hand, as well as all future up-and-coming sports, will benefit from this research. Further assumptions can also be made and can be proven through further research in combination to what is found here. Correct first steps and allocation of resources at different points in the growth process will be able to be decided upon quickly and thus will provide for the quickest growth in that sport.

(2.) BODY

(2.1) Methods

The Ultimate membership data was gathered from the USA Ultimate website. (Source 4.4.1) The data contains the totals of people who participate in the sport, categorized by age group. The Lacrosse participation data was gathered from the US Lacrosse website (Source 4.4.2) and is also categorized by age group. The data is for four consecutive years for each sport (2013 to 2016) and the goal is to see the percent growth of each sport across each year.

The data came in different forms that had to be edited before being imported into R Studio for further manipulation. The Ultimate data came in Excel format, however the format of the data did not match that of the Lacrosse data. The age groups for Ultimate were grouped in many different smaller sections within two to five years of one another. To solve this, the Ultimate data was simplified into the four categories used in the Lacrosse data; these categories are Youth, High School, College, and Post-Collegiate. The US Lacrosse data came in PDF and

had to be put into Excel before direct import. Once all of our data was properly formatted, it was imported into R Studio for further manipulation.

(2.2) Questions

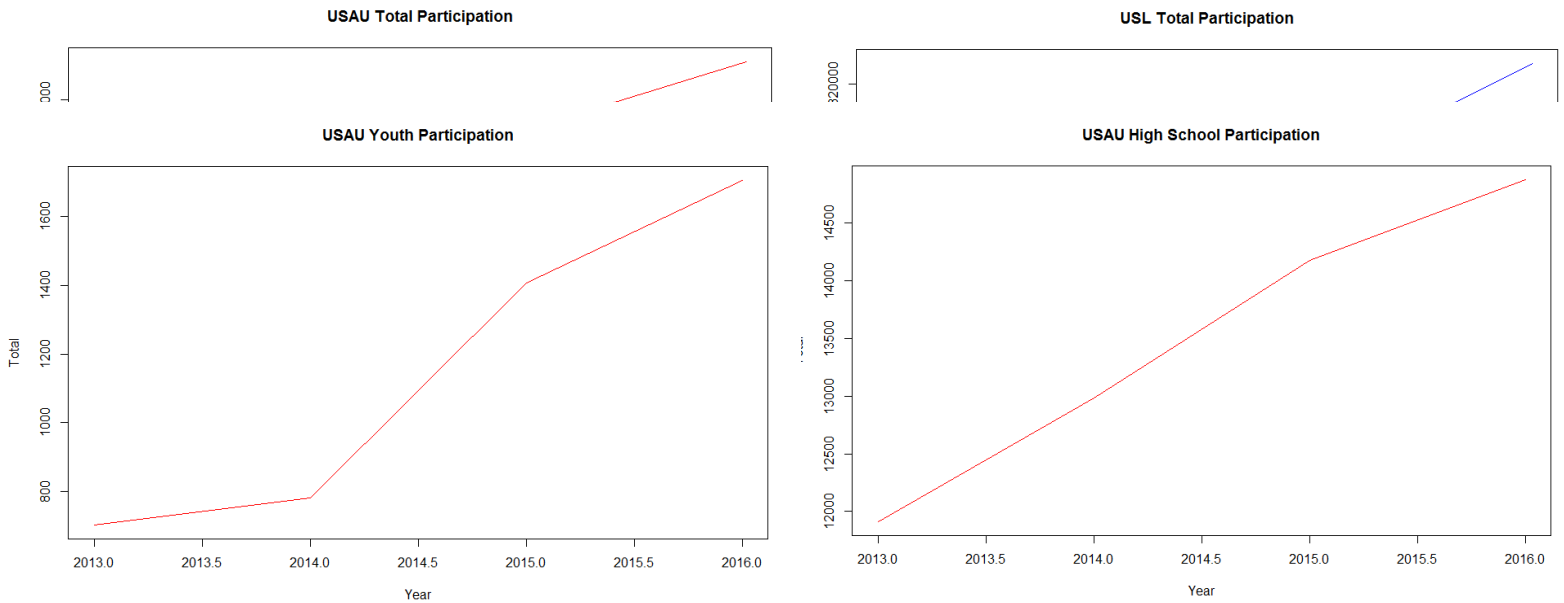
(2.2.1) How do the growth rates of Ultimate compare to that of Lacrosse?

Total participation numbers in Ultimate grew from 47,138 in 2013 to 54,849 in 2016.

(Table 4.2.1) This 16.35835% increase in growth can be attributed to many things.

Due to Ultimate being a small sport in terms of total participation numbers compared to other mainstream sports such as Lacrosse, it has more room to grow. Compared to Lacrosse's 10.40598% increase, this is a win, but the truth lies within the actual numbers. Lacrosse has participation numbers that are an order of magnitude higher than that of Ultimate. Lacrosse participation grew from 746,859 in 2013 to 824,577 in 2016, an increase of almost 80,000 total participants, more than the total Ultimate participants for the entire year of 2016. The fact that these numbers that Lacrosse are working with are so high justify why the USL Total Participation line graph appears to be a straight line to the naked eye; only a major outlier in a given year could make a drastic change to the line. For the small numbers being worked with in the USAU Total Participation line graph, each year's growth is important and differ, as can be seen to the naked eye by the slope between each year. This is why research into what limiting

factors exist that inhibit the growth of a sport is so important, especially for that of a new up-and-coming one. Any existing impediment is important to solve, overcome, and approve upon.



Youth participation in any sport is a clear place to start to increasing participation numbers. If you get somebody to start something at a young age, it is safe to assume that person

will bring it with them throughout their lives and remain involved in it. That person can get others to join, get future generations involved, et cetera. Youth participation in Ultimate more than doubled from 2013 to 2016, with an increase of 142.532%. Due to focus changes to youth outreach, especially in areas not previously reached by the sport, and also to people of ethnicities not usually tied with the sport. Once again, due to the numbers being worked with in Ultimate being so much smaller in comparison to that of Lacrosse (in which youth participation increased by 12.57077 % from 2013 to 2016), there is more room for huge increases in participation.

Changes in outreach focus are drastic to Ultimate as it is still considered to be in its early years in terms of growth, participation, availability, awareness, et cetera.

High school participation is where the most has happened for growth in Ultimate. Though it is second in participation numbers (to that of college participation), it is a close second. With the growth rate being so high at 24.86359%, the high school age group is an important one to target. Once again, this growth can be accounted to that of targeted outreach programs.

Additionally, Ultimate reached national headlines when Vermont became the first state to approve Ultimate as a High School Varsity Sport. (Source 4.1.4) This is a huge milestone for the sport and can lead to further declarations such as this across the US. With official school funding and recognition, the ceiling is raised exponentially. Meanwhile, Lacrosse increased from 290,046 participants in 2013 to 315,877 in 2016 (Table 4.2.2), an 8.905829% increase.

College is the age group where the most participants exist in Ultimate, which is very different in comparison to Lacrosse. Participation in College Lacrosse is supported by the NCAA, in which certain standards are met, guidelines are followed, and scholarships are frequently given out. Thus, this population of College Lacrosse players is a highly athletic bunch in which only the best come out of high school and get to continue competition within a system managed by schools in college. This fact makes College Lacrosse the second smallest (to post-collegiate) grouping of participation numbers for the sport. Though this is all true, Lacrosse saw a solid increase in college participation of in which there is only a participation growth increase of 16.07285% from 2013 to 2016, a resultant of an increase in College Lacrosse programs across the country and its continued national growth. At the same time, USA Ultimate is making it easier for colleges to become involved in the College Series and compete in higher levels of ultimate. With an increase of 9.90749%, it seems that its growth is slower than that of other

sections for Ultimate, which is true, but it is important to remember what will happen in the coming years. Due to the massive increase in youth participation over 2013 to 2016, these numbers should translate to college participation in a future interval, thus proving the importance of targeting younger age groups for sport growth.

(2.2.2) Why does Ultimate participation differ between age groups?

Starting from youth to high school Ultimate has a very lackluster participation compared to other sports including Lacrosse. In Ultimate high school is considered in the youth category. Starting from 1998 youth Ultimate has grown to include over 15,000 players and over 400 school based teams. Lacrosse on the other hand has a massive lead on Ultimate in this category. In just the youth category of Lacrosse(14 & under) there are over 450,000 players on teams. This age group actually has the highest participation out of all age groups in Lacrosse. For the high school level Lacrosse has over 315,000 participants in teams around the country. Lacrosse is a more popular sport in general than but there is a big reason why there aren't so many youth players. The big advantage Lacrosse has over Ultimate is that it is an interscholastic sport. It is recognized as an official sport by over 21 states and that means that most of the high schools in those states have Lacrosse programs. To create an Ultimate team in a high school a student must gather members on his own and once gathered he must find a teacher to advise the team. After all this the student must still ask for approval from the high school to create the club. After all that students must find tournaments on their own which usually means they must find tournaments to play against college teams. These teams also may not get funding so they would have to raise their own money to buy into these tournaments and get transportation.

(Source 4.1.5) If Ultimate became recognized as an interscholastic sport, awareness of it would increase and participations would skyrocket.

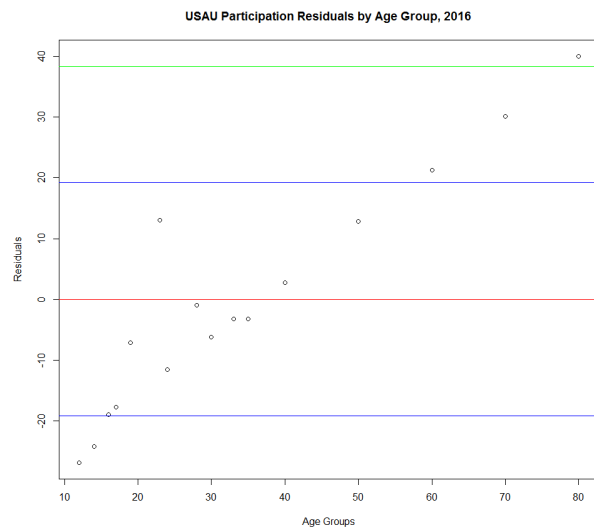
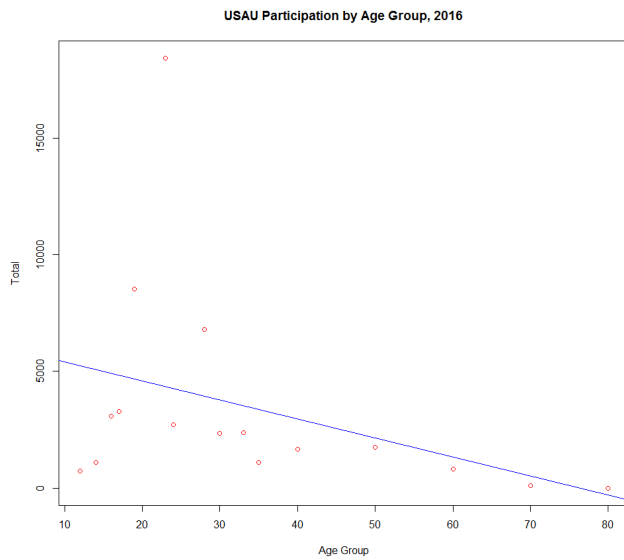
College is where the biggest concentration of Ultimate players lies. Starting in 1984, the college division has grown to include more than 18,000 players and over 800 teams. These numbers only include those teams that have participated in AUDL sanctioned events. The college Lacrosse scene is much smaller than the high school scene but still has many similarities. Lacrosse is still the fastest growing sport in college like in high school. However Lacrosse only had a little over 42,000 people participating at the college level in 2016. This number is drastically lower than in the high school or youth age groups. The reason for this is that many players coming from high school do not meet the standards of the NCAA level or they want to focus on their studies and give up on competitive sports. Due to the high level of competition many hopeful lacrosse players will not be able to play in college unless play in outside programs and clubs, some will give up on lacrosse or whatever sport they play and join in other extracurricular activities. This is a big reason why participation in Ultimate is so high in college. Many people who don't make an NCAA team will look for something to fill that athletic activity in their life an ultimate is a great option. Also Ultimate is generally a very inclusive sport so people of all levels tend to join. Most people don't even know about the sport until college and decide to enter when they discover it. (Sources 4.1.2, 4.1.3)

College and post collegiate takes up about $\frac{2}{3}$ of the total Ultimate population. The reason post collegiate is so high is that many of the college players will continue to play in clubs or league teams. A small amount of graduating college players will choose continue their Ultimate careers after every year and that number adds up to rival the College Ultimate scene. The youth programs of Ultimate have doubled from 2014 to 2015 and have been steadily increasing. This is due to certain outreach programs that target younger audiences. The high school population

hasn't changed very much. However, recently in Vermont, Ultimate has been made an official sport in high schools so the population is likely to skyrocket. (Source 4.1.4)

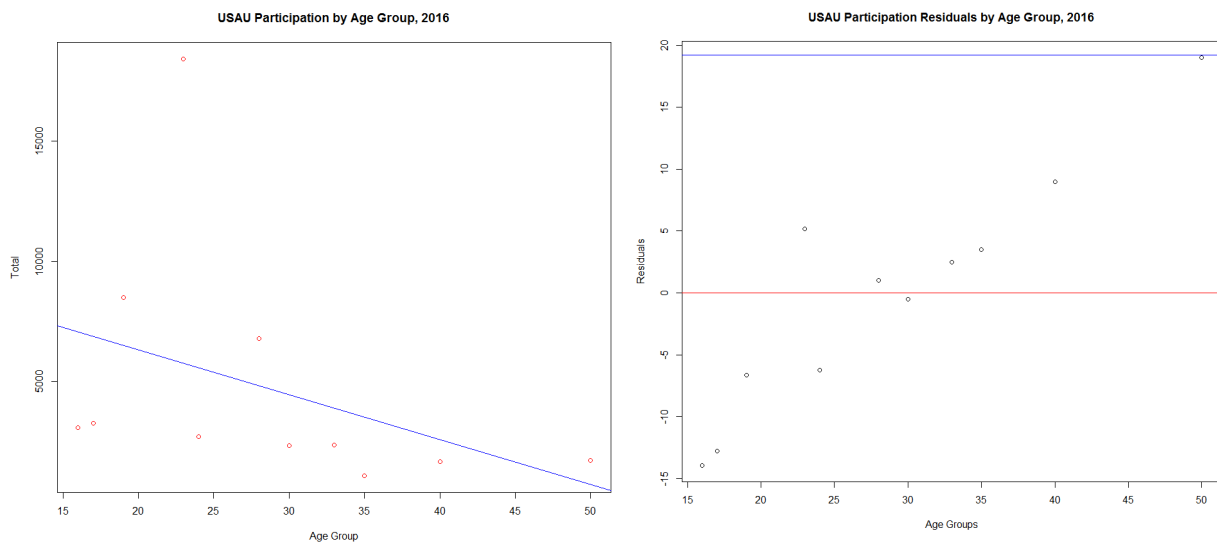
(2.3) Further Evaluation of Ultimate Participation Data in 2016

To get a better understanding of participation trends in Ultimate and the correlation between age group and participation, a graph was made comparing the different age groups and the number of athletes participating in each age group. It is important to note that the age groupings used in the following research are the age groups originally given by USA Ultimate



Membership Data (Source 4.1.2). To reiterate, these age groups were combined to replicate the same age groups used by US Lacrosse Participation Data (Source 4.1.3). In the graph a line of best fit was created to see if participation was more likely to increase or decrease with age. Also a residual plot was created to measure the strength of the correlation between age and participation.

Our original line of best fit shows a decreasing relationship between age and participation meaning that participation would tend to decrease as people became older. However we found that from the ages of 50 to 80 the participation dropped dramatically and it skewed our data. We found that the ages under 14 years were one standard deviation away from the norm so we decided to take those points out as well as the age groups from 50 and up. We believed that this change would give a more accurate representation of the relationship between age and participation in Ultimate. The R-value for this graph was 0.26627053911. This shows that the correlation between participation and age isn't very strong because it is not very close to 1. Age and participation in Ultimate do not have a strong relationship according to our data.



Even after taking out the outlier age groups we found that the line of best fit still showed a decreasing relationship between age and participation. We were expecting to find that relationship would be increasing as Ultimate players tend to concentrate around the college age and up. Looking at our data we have concluded that the relationship between age and participation is increasing for Ultimate until post-collegiate ages where the numbers seem to fall off. After college age the relationship between age and participation is decreasing. This is because college is where most people are usually introduced to the sport of Ultimate and after college many people lose interest in the sport due to lack of accessibility or time to participate due to careers and families. Thus, being college is where the peak participation is for frisbee and the numbers for participation tend to decrease as you get further from college age.

Even after taking out the outliers the R-value for the graph was 0.22908513701. Taking out the outliers made the correlation between age and participation even worse. Doing this showed us that the relationship between age and participation is even less than what we originally thought

(3.) CONCLUSIONS

Ultimate is still a growing sport, even in comparison to Lacrosse, a sport in which the same can be said. Targeted outreach programs are incredibly important in the early years of a sport. Specifically making increases in youth participation numbers of a sport will translate to increase in other age groupings when those youth participants grow up and continue to participate in the sport, spreading awareness and getting others to join, et cetera.

Without diving into specific outreach programs produced by the organizations that run the sport, it is important to understand the what and why behind participation numbers in

Ultimate depending on the age group in question. This can be better understood when compared to the same age groups relating to participation in Lacrosse. A very large percentage of the lacrosse population is in the high school age group. This is because it is an interscholastic sport and it is played in almost every high school within 21+ states. Ultimate however is offered in just one high school as an interscholastic sport (Source 4.1.4) unless a student makes the effort to create a club and get it approved. In college many athletes are not accepted into NCAA programs and cannot participate in their respective sports. In other cases people will not due sports to focus on school work as intercollegiate sports are very demanding. This is why many athletes will look for other programs to participate in and many of these athletes will find Ultimate as a great pass time. College is where most people first discover Ultimate and that's why it has the largest population of players.

(4.) APPENDIX

(4.1) Sources

(4.1.1) About Ultimate

<https://www.usultimate.org/about/>

(4.1.2) USA Ultimate Membership Data and Further Information

<https://www.usultimate.org/membershiptrends/>

(4.1.3) US Lacrosse Participation Data and Further Information

<https://www.uslacrosse.org/about-us-lacrosse/participation-survey>

(4.1.4) Vermont Becomes First State To Approve Ultimate As High School Varsity Sport

<https://ultiworld.com/2017/11/03/vermont-becomes-first-state-approve-ultimate-high-school-varsity-sport/>

(4.1.5) USA Ultimate Resource Guide, Part 3: Ultimate in Schools

https://www.usultimate.org/assets/1/Page/USAU_Resource_Guide_Part3_Ultimate_In_Schools_08-09-10.pdf

(4.1.6) USA Ultimate Youth Division Information

<https://www.usultimate.org/youth/>

(4.1.7) USA Ultimate College Division Information

<https://www.usultimate.org/college/>

(4.2) Tables

(4.2.1) USA Ultimate Membership Data

Year	Total	Youth	High School	College	Post-Collegiate
2013	47138	703	11913	16755	17418
2014	48914	781	12983	17036	17807
2015	53362	1407	14180	18173	18956
2016	54849	1705	14875	18415	17222

(4.2.2) US Lacrosse Participation Data

Year	Total	Youth	High School	College	Post-Collegiate
2013	746859	403770	290046	36515	16288
2014	772772	424836	297238	38383	12075
2015	799874	444850	305122	38383	11789
2016	824577	454257	315877	42384	11789

(4.3) R Code

```
# Data
years <- c(2013, 2014, 2015, 2016)
```

```

USAU.totals <- c(47138, 48914, 53362, 54849)
USAU.youth <- c(703, 781, 1407, 1705)
USAU.high <- c(11913, 12983, 14180, 14875)
USAU.college <- c(16755, 17036, 18173, 18415)
USAU.post <- c(17418, 17807, 18956, 17222)

USL.totals <- c(746859, 772772, 799874, 824577)
USL.youth <- c(403770, 424836, 444580, 454527)
USL.high <- c(290046, 297238, 305122, 315877)
USL.college <- c(36515, 38383, 38383, 42384)
USL.post <- c(16288, 12075, 11789, 11789)

year1 <- c(703, 11913, 16755, 17418)
year2 <- c(781, 12983, 17036, 17807)
year3 <- c(1407, 14180, 18173, 18956)
year4 <- c(1705, 14875, 18415, 17222)

USAU.2016.totals <- c(728, 1096, 3090, 3269, 8516, 18415, 2725, 6797, 2335, 2366, 1103,
1676, 1741, 815, 95, 4)
USAU.2016.categories <- c(12, 14, 16, 17, 19, 23, 24, 28, 30, 33, 35, 40, 50, 60, 70, 80)

# Total Participation
# Line Graphs
plot(years, USAU.totals, type="l", col="red", main="USAU Total Participation", xlab="Year",
ylab="Total")
plot(years, USL.totals, type="l", col="blue", main="USL Total Participation", xlab="Year",
ylab="Total")

# Growth
cat("USAU Total Growth: ", ((54849-47138)/47138)*100, "%\n")
cat("USL Total Growth: ", ((824577-746859)/746859)*100, "%\n\n")

# Youth Participation
# Line Graphs
plot(years, USAU.youth, type="l", col="red", main="USAU Youth Participation", xlab="Year",
ylab="Total")
plot(years, USL.youth, type="l", col="blue", main="USL Youth Participation", xlab="Year",
ylab="Total")

#Growth
cat("USAU Youth Growth: ", ((1705-703)/703)*100, "%\n")
cat("USL Youth Growth: ", ((454527-403770)/403770)*100, "%\n\n")

```

```

# High School Participation
# Line Graphs
plot(years, USAU.high, type="l", col="red", main="USAU High School Participation",
xlab="Year", ylab="Total")
plot(years, USL.high, type="l", col="blue", main="USL High School Participation", xlab="Year",
ylab="Total")

#Growth
cat("USAU High School Growth: ", ((14875-11913)/11913)*100, "%\n")
cat("USL High School Growth: ", ((315877-290046)/290046)*100, "%\n\n")

# College Participation
# Line Graphs
plot(years, USAU.college, type="l", col="red", main="USAU College Participation", xlab="Year",
ylab="Total")
plot(years, USL.college, type="l", col="blue", main="USL College Participation", xlab="Year",
ylab="Total")

# Growth
cat("USAU College Growth: ", ((18415-16755)/16755)*100, "%\n")
cat("USL College Growth: ", ((42384-36515)/36515)*100, "%\n\n")

# Post-Collegiate Participation
# Line Graphs
plot(years, USAU.post, type="l", col="red", main="USAU Post-Collegiate Participation",
xlab="Year", ylab="Total")
plot(years, USL.post, type="l", col="blue", main="USL Post-Collegiate Participation",
xlab="Year", ylab="Total")

# Growth
cat("USAU Post-Collegiate Growth: ", ((17222-17418)/17222)*100, "%\n")
cat("USL Post-Collegiate Growth: ", ((11789-16288)/16288)*100, "%")

# Linear Regression
# Original
totals.per.year <- cbind(USAU.2016.totals, USAU.2016.categories)
plot(x=USAU.2016.categories, y=USAU.2016.totals, col="red", main="USAU Participation by
Age Group, 2016", xlab="Age Group", ylab="Total")
abline(lm(USAU.2016.totals~USAU.2016.categories), col="blue")
Cor <- cor(USAU.2016.totals,USAU.2016.categories)
print(Cor)

LinMod <- lm(USAU.2016.categories~USAU.2016.totals)
print(summary(LinMod))

```

```

LinMod.res <- resid(LinMod)
plot(y=LinMod.res, x=USAU.2016.categories, ylab="Residuals", xlab="Age Groups",
main="USAU Participation Residuals by Age Group, 2016")
abline(0, 0, col="red")
abline(sd(LinMod.res), 0, col="blue") # 1 standard deviation above 0
abline(-sd(LinMod.res), 0, col="blue") # 1 standard deviation below 0
abline(2*sd(LinMod.res), 0, col="green") # 2 standard deviations above 0
abline(-2*sd(LinMod.res), 0, col="green") # 2 standard deviations below 0

#Removing outliers
USAU.2016.totals.fixed <- c(3090, 3269, 8516, 18415, 2725, 6797, 2335, 2366, 1103, 1676,
1741)
USAU.2016.categories.fixed <- c(16, 17, 19, 23, 24, 28, 30, 33, 35, 40, 50)

totals.per.year.fixed <- cbind(USAU.2016.totals.fixed, USAU.2016.categories.fixed)
plot(x=USAU.2016.categories.fixed, y=USAU.2016.totals.fixed, col="red", main="USAU
Participation by Age Group, 2016", xlab="Age Group", ylab="Total")
abline(lm(USAU.2016.totals.fixed~USAU.2016.categories.fixed), col="blue")

Cor2 <- cor(USAU.2016.totals.fixed,USAU.2016.categories.fixed)
print(Cor2)

LinMod2 <- lm(USAU.2016.categories.fixed~USAU.2016.totals.fixed)
print(summary(LinMod2))

LinMod2.res <- resid(LinMod2)
plot(y=LinMod2.res, x=USAU.2016.categories.fixed, ylab="Residuals", xlab="Age Groups",
main="USAU Participation Residuals by Age Group, 2016")
abline(0, 0, col="red")
abline(sd(LinMod2.res), 0, col="blue") # 1 standard deviation above 0
abline(-sd(LinMod2.res), 0, col="blue") # 1 standard deviation below 0
abline(2*sd(LinMod2.res), 0, col="green") # 2 standard deviations above 0
abline(-2*sd(LinMod2.res), 0, col="green") # 2 standard deviations below 0

```