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Seasonal Changes in Body Composition, Block Jump, Attack Jump and Lower Body Power Index in Male Collegiate Volleyball Players

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ABSTRACT

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Jumping ability in volleyball players is crucial to a team's success. There are both muscular and neural components in jumping. Coaches often test jumping ability and body composition prior to the start of the competitive season, but many fail to monitor these important variables during the course of the season. Jumping ability can decrease over the course of the season as the focus moves from strength training in the weight room to skill development on the court. It is imperative that players maintain their jumping ability and body composition over the course of the season. Seasonal changes in elite-male volleyball players were determined by testing the players body composition, spike jump, block jump and lower body power index at three distinct time points: prior to the first game, during their bye-week, and at the end of their regular season. It was found that these players were able to maintain their vertical jump and lower body power index. Also, those who were deemed players (those who played throughout the course of the season) had lower body fat percentages and higher jump scores. These results will aid coaches in understanding the changes that occur over the course of the season in elite-male collegiate volleyball players.

Keywords: spike jump, block jump, lower body power index, volleyball

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Introduction

Volleyball is characterized by brief moments of very high-intensity activity followed by moments of low intensity activity. Centered around a net that is 2.43 meters high makes maximal vertical jump ability integral to the game of men's volleyball [1]. During play, and especially while in the front court, players are involved in both defensive and attack jump activities. It is essential for coaches to understand the ability of their athletes to perform these critical movements.

During play, volleyball players need to be able to generate large amounts of power from their lower extremities in repeated bouts. This is because on many occasions during a "volley" the same player is jumping multiple times, as quickly as possible. Lower body power index is a measure of an athletes' ability to generate power from the lower body in consecutive jumps [2]. The research using this measurement is limited; however, Peeni [2] used it with collegiate volleyball players before and after an 8 week strength training protocol. No research has documented its use for studying changes that occur within the season.

Over the course of a grueling season of volleyball, the ability to maintain maximal vertical jump is crucial to a team's success. Without the proper strength training protocol during the season, vertical jump height may decrease [3]. Vertical jump can decrease over the course of the season because team efforts are focused primarily on skill development and maintaining muscle mass rather than stimulating lean muscle to hypertrophy or on explosive power. There has been some research done measuring the changes in jumping ability over different amounts of time [3-7]. The length of time has varied (4 weeks in one study all the way to one year in another study) and the populations have differed. The studies that measured the changes only from the beginning of the season to the end of that season were all testing experimental protocols

aimed at trying to improve vertical jump over the course of the season. They did not verify whether there was already a change in vertical jump height that occurred over the course of the season. What is needed is a study done in elite level male college volleyball players that measures the change in ability from the beginning of the season to the end of the regular season.

Analyzing the difference between players and non-players will also be important for coaches, considering the length of the volleyball season and the different training protocols for these two groups on the team (non-players typically strength train more often during the season than players; there are also differences in what players and non-players perform during practice). It is, therefore, important that coaches understand the changes that occur in their athletes, both in players and non-players, over the course of the season and not solely how effective their athletes are at jumping at one brief moment during the season.

Morphological features play an important role in determining the capability of an athlete [1]. Volleyball players are typically lean and very tall [1]. Changes in body composition can alter jump height ability in volleyball players by either increasing fat mass or decreasing lean body mass [8]. Understanding the changes that occur in body composition can aid coaches when developing strength, conditioning, and nutrition programs for their athletes. Up to this point research in volleyball players that has looked at the change in body composition over the course of the season have utilized skin calipers [4-6]. Lacking, is a study using a more precise measurement method that will indicate the change in fat mass and lean mass. Dual-Energy X-Ray Absorptiometry (DXA) is now considered to be the gold standard of body composition testing [40-41] and utilizing the DXA will allow researchers to discover more minute changes in body composition than would be possible with other methods.

Researchers have only recently begun to include strength training programs in their articles to quantify what type of workouts they are performing. This is important as ballistic style weight lifting has been shown to attenuate a decline in vertical jump [3]. Another limitation to the current research is the lack of data indicating the change in lower body power index. This additional information will greatly aid strength and conditioning coaches in determining proper strength and conditioning programs.

In this study we determined the effect of a competitive season on body composition, block jump height, attack jump height and lower body power index of Division I male collegiate volleyball players. Secondly, we compared the differences between players and non-players. We hypothesized that the season would have no effect on body composition, block jump height, attack jump height or lower body power index. We also hypothesized that there would be no difference between players and non-players in their body composition, block jump height, attack jump height or lower body power index.

Methods

Experimental Approach to the Problem

This study was a 16 week longitudinal study of one men's collegiate volleyball team. The subjects were tested at the end of their preparation period (PP) just prior to their first game (week 0), during their bye week (BW) (week10) and at the conclusion of the competitive period (CP) just after their final regular--season game (week 17).

Subjects

Seventeen National Collegiate Athletic Association (NCAA) Division I male volleyball players from a single volleyball team were recruited to participate in this study. Chronological age and collegiate playing experience at PP test was 20.9 ± 2.2 years and 2.5 ± 1.4 years

respectively. Mean physical characteristics of the subjects at PP, BW, and CP are shown in Table 1. The individual physical characteristics at PP, BW and CP are contained in Appendix A. The volleyball team won the Mountain Pacific Sports Federation championship and made it to the NCAA championship game before losing to the reigning national championship team. Table 2 contains a list of the awards given to the various players. Subjects were free of all musculoskeletal or other injuries during testing, although two players did experience mild ankle sprains between the PP and BW test periods. This was monitored and controlled by the athletic training staff of the volleyball team as well as the head coach and these players were able to participate in all testing measurements. This study was approved by the Brigham Young University Institutional Review Board and all qualified participants signed an approved informed consent form and a copy of this form is found in Appendix B.

Body Composition Measurement

Subjects reported for testing on three separate occasions. The first test day was prior to the first game of the season (PP), the second test day during the bye-week of the season (BW) and the last test day was after the final regular—season game (CP). Subjects reported to the Human Performance Research Laboratory in the Richards building at Brigham Young University early in the morning at an appointed time. On the first test day, subjects filled out a demographic questionnaire detailing their name, age, ethnicity and number of years playing collegiate volleyball (Appendix C). Body weight and height were measured using a standard calibrated scale (Tanita Corp., Tokyo, Japan) for accuracy to the nearest hundredth of a kilogram and a digital stadiometer (Seca Corp., Chino, CA) accurate to the nearest hundredth of a centimeter. Participants arrived in a fasted state of the previous eight hours and refrained from physical activity for the same amount of time prior to their arrival. Body composition analysis was

performed using the DXA (GE Healthcare, Waukesha, WI). Full body scans were taken on each of the three testing days.

Attack Jump

Players performed the three attempts at the attack jump with rest periods of 30 seconds in between each attempt. Each player self-determined whether to use a 2 or 3 step approach, whichever they were more comfortable with. A bounce jump combined with an arm swing was followed by the quick vertical jump; jumping as high as possible. The player then swung his arms as if attacking the ball as forcefully as possible. (The photocells did not include the very beginning stage of the attack jump, but each player was within the photocell area before the bounce jump and takeoff of the vertical jump) Each subject chose the jump protocol (2 or 3 step approach) that they were accustomed to using.

Block Jump

The block jump procedure was performed from the defensive position in volleyball. Hands were placed in front of the chest and knees were slightly bent. Each player was to visualize preparing to make a block. From this defensive position players performed a counter movement jump with the normal depth they would use during a match. Because of the nature of the defensive position a full arm swing was not utilized, but each player chose the arm movement that was natural to them. Three attempts were measured with a 30 second rest period in between each attempt.

Lower Body Power Index

The subject's lower body power index was obtained using a standard protocol [2]. Each participant stepped into the middle of the jump mat and performed four vertical jumps attempting

to reach maximal height with each jump. The jumps had to be in rapid succession and the goal was to have the feet on the ground for the least amount of time possible.

Table 3 contains the means and standard deviations of body fat percentage, spike jump, block jump and lower body power index at the end of the preparation period (PP), at the bye-week (BW) and a the end of the competition period (CP).

Strength Program

The seasonal strength training program was recorded as well as how many days a week each player participated in strength training. The training program can be found in Appendix D.

Statistical Analysis

Statistical Analysis Software (SPSS version 19, Chicago, IL, USA) was used to analyze the data collected. A between within analysis (between players and non-players and within each group individually) was performed to test for significance between differences in the jumping and body composition variables between PP, BW, and CP. Alpha was set at $p \leq 0.05$.

Results

Figure 1 contains an analysis of the mean spike jump values for players and non-players for the three testing periods. The height of the spike jump in both players and non-players did not change significantly over the course of the season. There was a significant between group difference at PP ($p \leq 0.05$) and at BW ($p \leq 0.05$). At both points the players spike jump was significantly higher than the spike jump of the non-players. At CP there was no significant difference between the players and the non-players.

Figure 2 contains an analysis of the mean block jump values for players and non-players for the three testing periods. At the first testing point (PP) there was no significant difference between the players and non-players in their block jump height. However, over the course of the

season the players did improve enough to create a significant between group difference in their block jump height at BW ($p \leq 0.05$) and an even greater difference at CP ($p \leq 0.05$). There was no significant change over the course of the season.

Figure 3 contains an analysis of the mean body fat percentage values for players and non-players for the three testing periods. Body fat percentage between groups did not reach significance at PP, however, there were significant differences at BW and CP ($p \leq 0.05$). On average, players had a lower body fat percentage than their non-player teammates. Within the players group their body fat percentage decreased between PP and BW significantly ($p \leq 0.05$).

Figure 4 contains an analysis of the mean lean tissue values for players and non-players for the three testing periods. Figure 4 demonstrates that there was no significant difference between players and non-players at any of the 3 test days. As such players and non-players were examined as an entire group for seasonal changes. Figure 4 demonstrates that there was a significant decrease in lean tissue between BW and CP ($p \leq 0.05$).

Figure 5 contains an analysis of the mean lower body power index values for players and non-players for the three testing periods. Lower body power index failed to reach significance in all between group testing days indicating that players and non-players had the same LBPI. The non-players did see a significant improvement in their LBPI from PP to CP ($p \leq 0.05$).

Sphericity of the within variable was met for each of the five variables body fat, lean tissue, block jump, spike jump, and lower body power index with a Huynh-Feldt score of 0.964, 0.971, 0.884, 0.836, 0.889 respectively. These scores indicate that any violation of sphericity is considered to be insignificant and the F-ratio is valid and therefore interpretable.

Discussion

The purpose of this study was to examine the effect of a season of NCAA collegiate volleyball on elite level male volleyball players. Differences between players and non-players were also examined. As a result of this study we found that as the season progressed this population was able to maintain their jumping performance, even as the focus of their training moved away from strength training toward skill progression and on-court skill development. What was of interest was that for all the variables there was an upward trend from PP and BW, though it did not reach significance. At the end of the season, directly before the CP test day, an intense bout of influenza spread through most of the team. Most members of the team were intensely sick for three or four days. It would have been interesting to see whether this upward trend in the variables would have continued and reached significance had the players not gotten sick before the final testing period. Another factor to consider when dealing with elite athletes, is that they often reach a point where it is difficult to see improvement in measured variables such as the vertical jump. This is often commonly termed the "ceiling effect." The athletes have already been training at such a high level that it is difficult to elicit an improvement in their abilities.

Some studies have shown a statistically significant improvement in jumping performance in volleyball players. Gonzalez-Rave [4], Stanganelli [5] and Sheppard [6] all showed improvements in jump performance (professional female players, under 19 year old (U-19) males and professional male players respectively), however in these studies their first test period was prior to pre-season training and included a periodized strength training program between test periods (Sheppard's study lasted 12 months). Stanganelli reports that the jump improvements mainly came between this first test session and the beginning of the season. This complete

periodized weight training program between, test 1 and test 2, elicited the highest vertical jump performance on the second test giving them a better chance of finding a significant difference. Rousanglou et al. [7] demonstrated an improvement in U-19 women volleyball players from the beginning of the season until the end of their competitive season 16 weeks later. Newton [3] also showed an improvement in NCAA Division I women volleyball players. After a decrease in vertical jump from the beginning of the season to the mid-point, Newton installed a strength training program of ballistic style exercises to determine the effect of this type of exercise on vertical jump. This increased the jump performance from the mid-season to the end of the season; however, there was no significant difference between the beginning of the season and the end of the season. Both of these studies utilized in-season strength training protocols that focused on improving "explosive movement stimuli" and not on strength alone [3] [9].
In this study players and non-players were able to maintain their jump performance through the course of the season. However, it is unclear how close they were to their maximum capacity in their jumping performances. As evident in Sheppard's study even in professional players it is possible to see improvements through the course of a 12 month training cycle.

Future research is needed in elite college men to experiment with in-season training protocols to verify whether improvements can continue during the season without limiting their on-court performance or causing overtraining. This in-season strength training protocol should include depth jumps which have been shown to be highly correlated with VJ as they train the athletes in producing high amounts of force and power as well as having short contact times [6].

Improving the stretch-shortening cycle performance of elite volleyball players should be the focus of an experiment protocol to improve jump performance during a competitive season of volleyball. This training would entail improving depth-jump ability as this has been shown to

elicit changes in spike jump and counter movement vertical jump ability of elite players and it should also focus on loaded and unloaded jump squats as this has also been correlated with increases in jump performance of elite athletes [6].

Also, additional research is needed in volleyball players that aims to correlate the relationship between variables. In this study we saw a significant difference in players and non-players between PP and BW, but not at CP. It will be important for coaches to understand what caused the non-players to increase their spike jump to the point that they were not significantly different from the players.

Body fat percentage in the players was lower and their jumping ability was better in most variables measured. The difference between players and non-players was probably not as significant as shown herein. One non-player's body fat percentage was much higher than the rest of the team. However there was still a difference between players and non-players. Future research could look at the correlation between body fat percentage and lean tissue with the jumping and power variables measured in this study.

Lean tissue mass decreased from BW to CP after increasing from PP to BW. This is an interesting finding and may be due to the bout of influenza that struck the team. Additional studies need to be performed to measure whether lean tissue does decrease from mid-point in the season to the end. This will be very important for coaches to understand so that they can try to maintain their lean tissue.

Conclusion

As a result of the findings, we conclude that when examining players and non-players as groups, the players had better lower body fat percentages, higher block jump and spike jump ability during most of the testing points. Lower body power index was not different between

players and non-players at the three testing periods. Players and non-players were able to maintain their level of performance in the measured variables as a group over the course of the season.

Non-players attempting to find a position in the starting line-up or coaches looking to help non-players become players may look at these variables as key indicators for areas needing improvement. Body-fat percentage, spike jump, block jump and lower body power index are areas that were shown to be better in players than non-players. Over the course of their collegiate careers these non-players should focus on improving in these areas to help them to potentially improve their abilities and earn themselves a position on the court.

Practical Application

The purpose of this study was to determine the effect of a season of NCAA volleyball on elite male volleyball players. There was a statistical difference between players and non-players. The use of the measurement of these variables might aid coaches when determining which players they will select to participate on their team. An examination of the variables measured in this study might be helpful in the designing of the in-season strength and on-court skill development that could have a positive effect on the competitive season. Periodic testing of these variables might be helpful in planning the in season conditioning program. Also, an examination of the maintenance program the strength and conditioning coach created for these players proved to be effective in maintaining vertical jump and body composition over the course of the season even when their strength training frequency declined dramatically.

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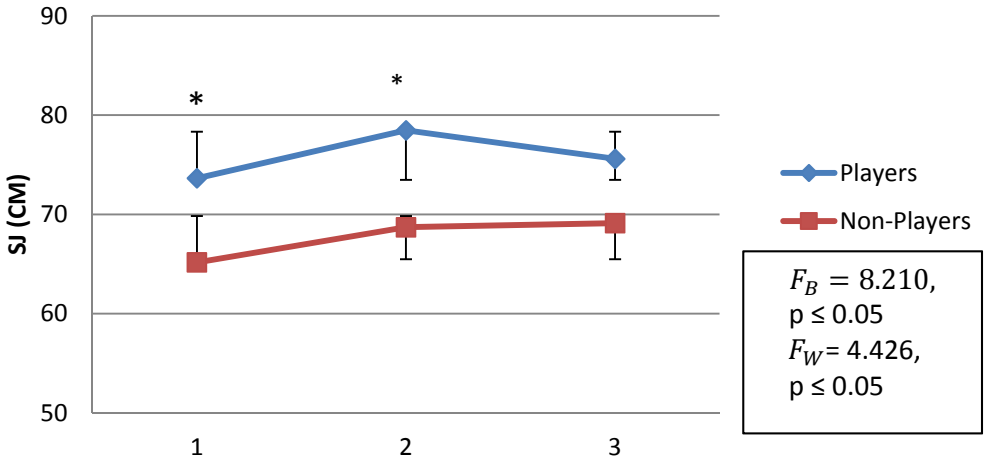
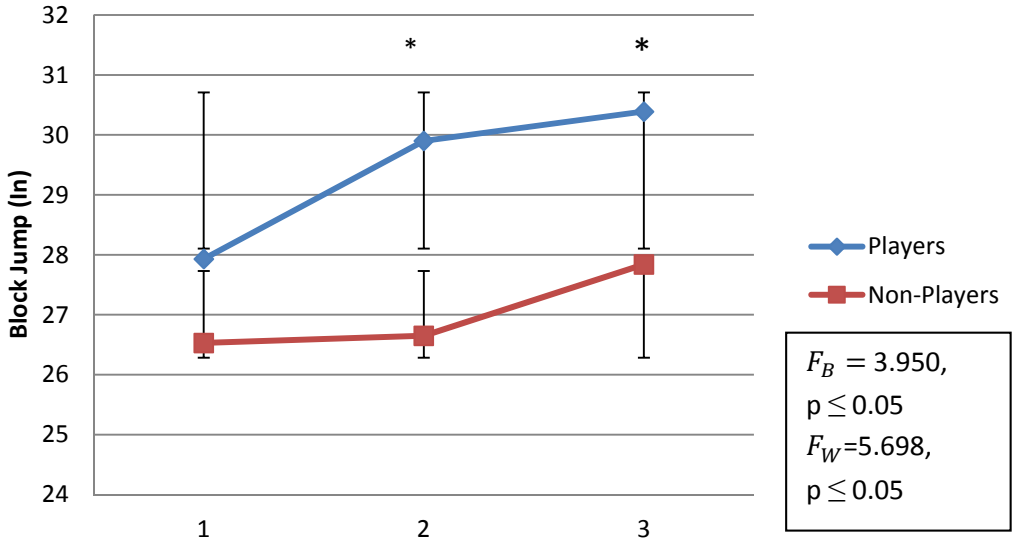


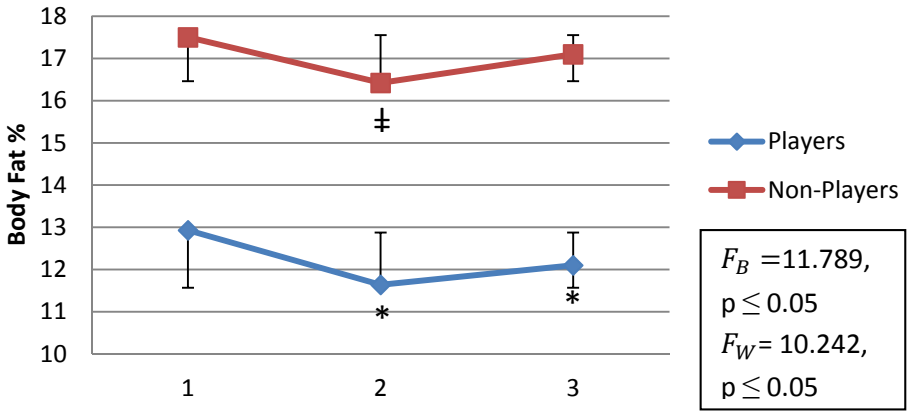
* Significant difference between groups P ≤ 0.05.

Figure 1. Mean spike jump values of players and non-players at the preparation period (1), Bye-Week (2) and at the end of the competitive season (3).



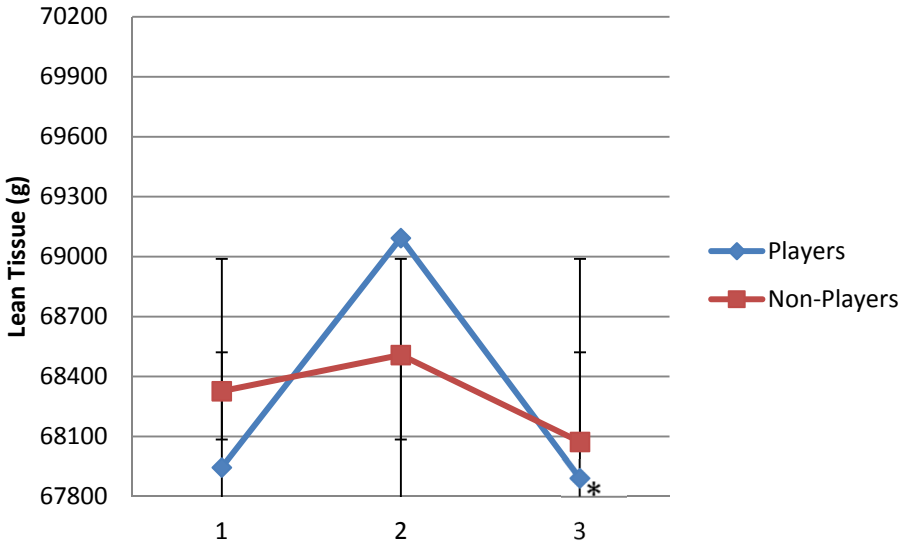
* Significant difference between groups P ≤ 0.05.

Figure 2. Mean block jump values of players and non-players at the Preparation Period (1), Bye-week (2) and at the end of the competitive season (3).



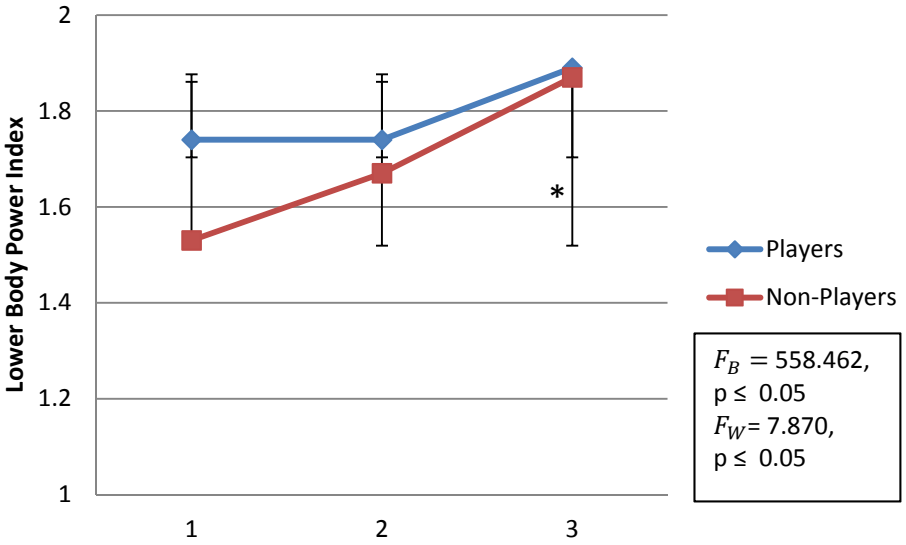
* Significant difference between player and non-player groups P ≤ 0.05
‡ Significant difference within non-player group (trial 1 to trial 2) P ≤ 0.05

Figure 3. Mean Body fat percentage values of players and non-players at the Preparation Period (1), Bye-week (2) and at the end of the competitive season



* Significant difference between trials 2 and 3 P ≤ 0.05 for the entire team as a whole; as there was no significant difference between players and non-players at any point.

Figure 4. Mean Lean tissue values of players and non-players at the Preparation Period (1), Bye-week (2) and at the end of the competitive season (3).



* Significant difference within non-players group from trial 1 to trial 3 $P \leq 0.05$.

Figure 5. Mean lower body power index values of players and non-players at the Preparation Period (1), Bye-week (2) and at the end of the competitive season (3).

Table 1. Mean (SD) of anthropomorphic measurements at preparation period, Bye-week and end of competition period.

	PP		**BW**		**CP**	
	Mean	SD	Mean	SD	Mean	SD
Height (cm)	194.2	7.7	194	7.6	194.2	7.9
Players	192.9	8.8	192.5	8.5	192.8	8.9
Non-Players	195.2	7.3	195	7.2	195.1	7.4
Body Mass (Kg)	85.7	10	85.2	9.3	84.8	9.1
Players	82.3	9.1	82.4	8.5	81.5	6.8
Non-Players	88	10.4	87.1	9.7	87.2	10

PP = Preparation period

BW = Bye week

CP = End of competition period

Table 2. Individual Accolades and Awards

Mountain Pacific Sports Federation	American Volleyball Coaches Association
MPSF Player of the year	2 AVCA Division I-II Men's First-Team All-America
MPSF Freshman of the year	1 AVCA Division I-II Men's Second-Team All-America
3 All-MPSF First Team players	AVCA 2013 Men's Division I-II National Coach of the Year
1 All-MPSF Second Team player	
1 All-MPSF Honorable Mention	
1 All-MPSF Freshman Team	
MPSF Coach of the Year	

Table 3. Mean (SD) of body fat percentage and jumping performance variables at the preparation period (PP), bye-week (BW) and the end of the competition period (CP).

	PP		BW		CP	
	Mean	SD	Mean	SD	Mean	SD
Body Fat (%)	15.62	5.58	14.45	5.24	15.02	5.47
Body Fat-Players	12.93	2.08	11.64	1.93	12.1	1.62
Body Fat - Non-Players	17.5	6.56	16.42	6	17.1	6.32
Block Jump (In)	27.11	2.96	27.99	2.97	28.89	2.82
Block Jump - Players	27.93	3.33	29.9	1.46	30.39	2
Block Jump - Non-Players	26.53	2.71	26.65	3.06	27.84	2.92
Spike Jump (cm)	68.65	9.82	72.73	9.78	71.78	10.1
Spike Jump - Players	73.64	8.29	78.47	6.63	75.6	11.48
Spike jump - Non-Players	65.16	9.6	68.7	9.86	69.11	8.6
Lower Body Power Index (LBPI)	1.61	0.37	1.7	0.34	1.88	0.32
LBPI - Players	1.74	0.38	1.74	0.35	1.89	0.19
LBPI - Non-Players	1.53	0.36	1.67	0.35	1.87	0.39

PP= Preparation period

BW= Bye week

CP= End of competition period

Appendix A

Individual Player Characteristics

Appendix A. Individual Player Characteristics at Preparation Period (PP), Bye Week (BW) and the end of their Competition Period (CP).

	Weight (KG)			Height (CM)			Collegiate Volleyball Experience
Subject	PP	BW	CP	PP	BW	CP	In Years
1	76.2	77.4	77.388	195	195.6	195.2	1
2	77.4	77.3	76.151	181.3	180.8	181.4	5
3	84.4	80.7	81.647	177.3	177.6	176.9	1
4	87.2	87.1	88.52	191	190.2	191.2	3
5	91.8	92.2	93.21	198.6	200	199.1	1
6	92.1	88.4	86.792	202.8	201.7	202.9	1
7	88.1	86.9	86.608	193.5	192.3	193.3	3
8	102	98.6	93.79	199.2	199	199.3	5
9	83.3	86.7	84.985	202.2	201.2	202.1	1
10	73.2	71.9	72.572	184	184	182.7	2
11	113	110.8	111.45	202.3	202.3	202.2	4
12	82.9	83.2	82.506	188.3	188.9	189	3
13	80.2	79.8	81.066	192.2	191.7	192.2	3
14	79.4	78.5	78.97	196.3	196.2	195.8	2
15	78.2	80.1	78.17	196.8	196.5	196.1	2
16	77.9	79.6	79.342	202.8	202	203	4
17	89.7	89.2	88.743	198.5	197.5	198.3	2

Appendix B

Approved Informed Consent Form

Consent to be a Research Subject

Introduction

This research study is being conducted by Geoffrey W. Loomis and Dr. Philip E. Allsen at Brigham Young University to determine the effect of a competitive season on body composition, block jump, attack jump and lower body power index of Division I male collegiate volleyball players. You were invited to participate because you currently are competing on the Brigham Young University volleyball team.

Procedures

If you agree to participate in this research study, the following will occur:

- you will fill out a demographic questionnaire
- Body composition analysis will be performed on 3 separate occasions using the DXA scanner. In the Richards building located at Brigham Young University.
- You will undergo your normal warm-up routine prior to the jump analysis which will occur on the volleyball court in the Smith Fieldhouse at Brigham Young University.
- 3 block jump attempts will be measured utilizing the OptoJump system on 3 separate occasions.
- 3 attack jump attempts will be measured utilizing the OptoJump System on 3 separate occasions.
- 3 lower body power index attempts will be measured utilizing the OptoJump system on 3 separate occasions.
- total time commitment will be 45 minutes on 3 separate occasions.

Risks/Discomforts

There are minimal risks for participation in this study. You may, however, feel some discomfort when wearing only spandex underwear in front of the DXA operator. Ankle sprains and lower extremity musculoskeletal injuries are always a possibility when jumping, however, risk of these injuries will be minimized by undergoing a proper warm up protocol prior to jump testing.

Benefits

There will be no direct benefits to you. It is hoped, however, that through your participation researchers may learn about the effect of a competitive season on jumping ability which will indicate to strength training professionals how to better create exercise programs for collegiate volleyball athletes.

Confidentiality

The research data will be kept on a password protected computer and only the researcher will have access to the data. At the conclusion of the study, all identifying information will be removed and the data will be kept in the researcher's locked office.

Compensation

Participants will be compensated according to NCAA regulations for student athletes as deemed appropriate by the compliance director at Brigham Young University.

Participation

Participation in this research study is voluntary. You have the right to withdraw at any time or refuse to participate entirely without jeopardy to your class status, grade, or standing with the university including the volleyball coach and his staff.

Questions about the Research

If you have questions regarding this study, you may contact Geoffrey W. Loomis at geoffloomis@yahoo.com for further information.

Questions about Your Rights as Research Participants

If you have questions regarding your rights as a research participant contact IRB Administrator at (801) 422-1461; A-285 ASB, Brigham Young University, Provo, UT 84602; irb@byu.edu.

Statement of Consent

I have read, understood, and received a copy of the above consent and desire of my own free will to participate in this study.

Name (Printed): _____ Signature _____ Date: _____

Appendix C

Demographic Questionnaire

Demographic Questionnaire

Name:_____

Age:_____

Ethnicity:_____

Number of years playing collegiate volleyball:_____

Position: _____

Appendix D

Strength Training Program

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 1

1 rep max/exercise

Monday 62%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Power Clean	3 X 55	3 X 60	3 X 65	3 X 65	3 X 65	
100 Squat	5 X 60	5 X 65	5 X 65	5 X 65		
100 Single Leg RDL	6 X 55	6 X 60	6 X 65	6 X 65		
0 Lat Pulldown/St. Row	12X____	12X____	12X____	12X____		
0 Rotator Cuff						

Wednesday 58%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Snatch	3 X 45	3 X 50	3 X 55	3 X 55	3 X 55	
100 Reverse Lunge	5 X 50	5 X 55	5 X 60	5 X 60		
100 RDL	5 X 60	5 X 65	5 X 65	5 X 65		
0 Horizontal Pull Ups	8X	8X	8X	8X		
0 Y,T,A Goal Post	30X____	30X____	30X____	30X____		

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 2

1 rep max/exercise

Monday 66%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Power Clean	3 X 55	3 X 60	3 X 65	3 X 70	3 X 70	
100 Squat	5 X 60	5 X 65	5 X 70	5 X 70		
100 Single Leg RDL	6 X 60	6 X 65	6 X 70	6 X 70		
0 Lat Pulldown/St. Row	12X____	12X____	12X____	12X____		
0 Rotator Cuff						

Wednesday 60%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Snatch	3 X 45	3 X 50	3 X 55	3 X 60	3 X 60	
100 Reverse Lunge	5 X 50	5 X 55	5 X 60	5 X 65		
100 RDL	5 X 60	5 X 65	5 X 70	5 X 70		
0 Horizontal Pull Ups	8X	8X	8X	8X		
0 Y,T,A Goal Post	30X____	30X____	30X____	30X____		

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 3

1 rep max/exercise

Monday 70%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Power Clean	3 X 60	3 X 65	3 X 70	3 X 75	3 X 75	
100 Squat	5 X 60	5 X 70	5 X 75	5 X 75		
100 Single Leg RDL	6 X 60	6 X 70	6 X 75	6 X 75		
0 Lat Pulldown/St. Row	12X____	12X____	12X____	12X____		
0 Rotator Cuff						

Wednesday 63%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Snatch	3 X 50	3 X 55	3 x 60	3 X 65	3 X 65	
100 Reverse Lunge	5 X 50	5 X 60	5 X 65	5 X 65		
100 RDL	5 X 60	5 X 70	5 X 75	5 X 75		
0 Horizontal Pull Ups	8X	8X	8X	8X		
0 Y,T,A Goal Post	30X____	30X____	30X____	30X____		

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 4

1 rep max/exercise

Monday 65%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Power Clean	3 X 60	3 X 65	3 X 70	3 X 75	3 X 80	
100 Squat	5 X 60	5 X 65	5 X 65	5 X 65		
100 Single Leg RDL	5 X 55	5 X 60	5 X 65	5 X 65		
0 Lat Pulldown/St. Row	12X____	12X____	12X____	12X____		
0 Rotator Cuff						

Wednesday 60%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Snatch	3 X 50	3 X 60	3 X 65	3 X 70	3 X 70	
100 Reverse Lunge	5 X 50	5 X 55	5 X 55	5 X 55		
100 RDL	5 X 60	5 X 65	5 X 65	5 X 65		
0 Horizontal Pull Ups	8X	8X	8X	8X		
0 Y,T,A Goal Post	30X____	30X____	30X____	30X____		

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 5

1 rep max/exercise

Monday 64%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
80 Power Snatch	3 X 40	3 X 45	3 X 50	3 X 50	3 X 50	
100 Squat	5 X 60	4 X 70	3 X 75	3 X 75	3 X 75	
0 Hypers w/Ball Curl	12X____	12X____	12X____			
0 Pull Ups	6X____	6X____	6X____	6X____		
0 Rotator Cuff						

Wednesday 65%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Clean	3 X 55	3 X 60	3 X 65	3 X 65	3x55	
0 Step Ups	4 X	4 X	4 X	4 X		
100 RDL	5 X 60	4 X 70	3 X 75	3 X 75	3 X 75	
0 DB T Row	6 X____	6 X____	6 X____	6 X_____		
0 Rotator Cuff						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 6

1 rep max/exercise

Monday 66%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
80 Power Snatch	3 X 40	3 X 45	3 X 50	3 X 50	3 X 50	
100 Squat	5 X 60	4 X 70	3 X 75	3 X 80	3 X 80	
0 Hypers w/Ball Curl	12X____	12X____	12X____			
0 Pull Ups	6X____	6X____	6X____	6X____		
0 Rotator Cuff						

Wednesday 67%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Clean	3 X 60	3 X 65	3 X 70	3 X 70	3x55	
0 Step Ups	4 X	4 X	4 X	4 X		
100 RDL	5 X 60	4 X 70	3 X 75	3 X 80	3 X 80	
0 DB T Row	6 X____	6 X____	6 X____	6 X____		
0 Rotator Cuff						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 7

1 rep max/exercise

Monday 69%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
80 Power Snatch	3 X 40	3 X 50	3 X 50	3 X 55	3 X 55	
100 Squat	5 X 65	4 X 75	3 X 80	2 X 85	2 X 85	
0 Hypers w/Ball Curl	12X____	12X____	12X____			
0 Pull Ups	8X____	8X____	8X____	8X____		
0 Rotator Cuff						

Wednesday 71%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Clean	3 X 60	3 X 70	3 X 75	3 X 75	3x75	
0 Step Ups	4 X	4 X	4 X	4 X		
100 RDL	5 X 65	4 X 75	3 X 80	2 X 85	2 X 85	
0 DB T Row	6 X____	6 X____	6 X____	6 X____		
0 Rotator Cuff						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 8

1 rep max/exercise

Monday 66%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
80 Power Snatch	3 X 40	3 X 45	3 X 50	3 X 50	3 X 50	
100 Squat	5 X 65	4 X 75	3 X 80	2 X 85	1 X 90	
0 Hypers w/Ball Curl	12X____	12X____	12X____			
0 Pull Ups	8X____	8X____	8X____	8X____		
0 Rotator Cuff						

Wednesday 72%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Clean	3 X 60	3 X 70	2 X 75	2 X 80	2 X 80	
0 Step Ups	4 X	4 X	4 X	4 X		
100 RDL	5 X 65	4 X 75	3 X 80	2 X 85	1 X 90	
0 DB T Row	6 X____	6 X____	6 X____	6 X____		
0 Rotator Cuff						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 9

1 rep max/exercise

Monday 60%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
80 Power Snatch	3 X 40	3 X 45	3 X 50	3 X 50	3 X 50	
100 Squat	4 X 60	4 X 65	4 X 65	4 X 65		
0 Hypers w/Ball Curl	12X____	12X____	12X____			
0 Pull Ups	8X____	8X____	8X____	8X____		
0 Rotator Cuff						

Wednesday 62%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Clean	3 X 60	3 X 65	3 X 65	3 X 65		
0 Step Ups	4 X	4 X	4 X	4 X		
100 RDL	4 X 60	4 X 65	4 X 65	4 X 65		
0 DB T Row	6 X____	6 X____	6 X____	6 X____		
0 Rotator Cuff						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 10

1 rep max/exercise

Monday 67%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 3 Pos. Clean	3 X 60	3 X 65	3 X 70	3 X 75		
100 Squat	5 X 60	5 X 65	5 X 70	5 X 70		
100 Single Leg RDL	5 X 60	5 X 65	5 X 70	5 X 75		
0 Standing DB Sh. PR.	6X____	6X____	6X____	6X____		
0 Seated Row	8 X____	8 X____	8 X____	8 X____		
0 Y,T,A Goal Post						

Wednesday 60%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Snatch	3 X 45	3 X 50	3 X 55	3 X 60		
100 Lunge	5 X 50	5 X 55	5 X 60	5 X 65		
100 RDL	5 X 60	5 X 65	5 X 70	5 X 70		
0 Bent Over Row	8 X____	8 X____	8 X____	8 X____		
0 Lat Pulldown	8 X____	8 X____	8 X____			
0 Plate Stack						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 11

1 rep max/exercise

Monday 70%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 3 Pos. Clean	3 X 60	3 X 70	3 X 75	3 X 75		
100 Squat	5 X 60	5 X 70	4 X 75	4 X 75		
100 Single Leg RDL	5 X 60	5 X 70	5 X 75	5 X 75		
0 Standing DB Sh. PR.	6X____	6X____	6X____	6X____		
0 Seated Row	8 X____	8 X____	8 X____	8 X____		
0 Y,T,A Goal Post						

Wednesday 63%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Snatch	3 X 50	3 X 55	3 X 60	3 X 60		
100 Lunge	5 X 50	5 X 60	5 X 65	5 X 65		
100 RDL	5 X 60	5 X 70	5 X 75	5 X 75		
0 Bent Over Row	8 X____	8 X____	8 X____	8 X____		
0 Lat Pulldown	8 X____	8 X____	8 X____			
0 Plate Stack						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 12

1 rep max/exercise

Monday 72%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 3 Pos. Clean	3 X 60	3 X 70	3 X 80	3 X 80		
100 Squat	5 X 60	4 X 70	3 X 80	2 X 85	2 X 85	
100 Single Leg RDL	5 X 60	5 X 70	5 X 80	5 X 80		
0 Standing DB Sh. PR.	6X____	6X____	6X____	6X____		
0 Seated Row	8 X____	8 X____	8 X____	8 X____		
0 Y,T,A Goal Post						

Wednesday 66%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Snatch	3 X 50	3 X 60	3 X 65	3 X 70		
100 Lunge	5 X 50	5 X 60	5 X 65	5 X 70		
100 RDL	5 X 60	5 X 75	4 X 80	4 X 80		
0 Bent Over Row	6 X____	6 X____	6 X____	6 X____		
0 Lat Pulldown	8 X____	8 X____	8 X____			
0 Plate Stack						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 13

1 rep max/exercise

Monday 65%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 3 Pos. Clean	3 X 60	3 X 65	3 X 70	3 X 70		
100 Squat	4 X 60	4 X 65	4 X 70	4 X 70		
100 Single Leg RDL	5 X 60	5 X 65	5 X 65	5 X 65		
0 Standing DB Sh. PR.	6X____	6X____	6X____	6X____		
0 Seated Row	8 X____	8 X____	8 X____	8 X____		
0 Y,T,A Goal Post						

Wednesday 60%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Hang Snatch	3 X 50	3 X 55	3 X 60	3 X 60		
100 Lunge	5 X 50	5 X 55	5 X 60	5 X 60		
100 RDL	5 X 60	4 X 65	4 X 70	4 X 70		
0 Bent Over Row	6 X____	6 X____	6 X____	6 X____		
0 Lat Pulldown	8 X____	8 X____	8 X____			
0 Plate Stack						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 14

1 rep max/exercise

Monday 72%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Power Clean	3 X 60	3 X 70	3 X 75	3 X 75		
100 Squat	4 X 65	3 X 75	3 X 80	3 X 80	3 X 80	
100 Bird Dog	5 X	5 X	5 X	5 X		
0 Knee Bent Hip Bridge	10 X	10 X	10 X			
0 DB Alt. Sh. Press	5 X	5 X	5 X	5 X		
0 Horizontal Pull UPs	8 X____	8 X____	8 X____	8 X____		
0 Rotator Cuff						

Wednesday 65%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Below Knee Snatch	3 X 50	3 X 60	3 X 65	3 X 70		
100 Reverse Lunge	4 X 55	5 X 60	5 X 65	5 X 70		
100 RDL	5 X 60	5 X 75	4 X 80	4 X 80		
0 DB Row	6 X	6 X	6 X	6 X		
0 Chin Ups	5 X____	5 X____	5 X____	5 X____		
0 Rotator Cuff						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 15

1 rep max/exercise

Monday 75%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Power Clean	3 X 60	3 X 75	2 X 80	2 X 85	2 X 85	
100 Squat	4 X 65	3 X 75	2 X 80	2 X 85	1 X 90	
100 Bird Dog	5 X	5 X	5 X	5 X		
0 Knee Bent Hip Bridge	10 X	10 X	10 X			
0 DB Alt. Sh. Press	5 X	5 X	5 X	5 X		
0 Horizontal Pull UPs	8 X____	8 X____	8 X____	8 X____		
0 Rotator Cuff						

Wednesday 69%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Below Knee Snatch	3 X 50	3 X 60	3 X 65	3 X 70		
100 Reverse Lunge	4 X 55	4 X 65	4 X 65	4 X 75		
100 RDL	5 X 60	4 X 75	3 X 80	3 X 85	3 X 85	
0 DB Row	6 X	6 X	6 X	6 X		
0 Chin Ups	5 X____	5 X____	5 X____	5 X____		
0 Rotator Cuff						

In Season (Some players lifted 1 day a week—these players only did Monday's schedule)

Week # 16

1 rep max/exercise

Monday 65%	Set 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Power Clean	3 X 60	3 X 675	3 X 65	3 X 65		
100 Squat	4 X 60	4 X 65	4 X 70	4 X 70		
100 Bird Dog	5 X	5 X	5 X	5 X		
0 Knee Bent Hip Bridge	10 X	10 X	10 X			
0 DB Alt. Sh. Press	5 X	5 X	5 X	5 X		
0 Horizontal Pull Ups	8 X____	8 X____	8 X____	8 X____		
0 Rotator Cuff						

Wednesday 60%	ñet 1 RPXWT	Set 2 RPXWT	Set 3 RPXWT	Set 4 RPXWT	Set 5 RPXWT	Set 6 RPXWT
100 Below Knee Snatch	3 X 50	3 X 60	3 X 60	3 X 60		
100 Reverse Lunge	4 X 50	4 X 55	4 X 60	4 X 65		
100 RDL	4 X 60	4 X 65	4 X 65	4 X 65		
0 DB Row	6 X	6 X	6 X	6 X		
0 Chin Ups	5 X____	5 X____	5 X____	5 X____		
0 Rotator Cuff						