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Comparison of On-Campus and Off-Campus Summer Training on Strength Performance of College Football Players

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ABSTRACT

The purpose of this study was to assess changes in one-repetition (1RM) strength performances during summer training in college football players who remained on-campus and those who did not. NCAA Division II players (n = 85, weight = 102.2 ± 22.8 kg) self-selected to stay on-campus for 90% of the summer (ES, n = 14), 50% of the summer (PS, n = 24), and 0% of the summer (NS, n = 47). 1RM for bench press (BP) and squat (SQ) were performed at the beginning of summer and prior to fall training camp. Each player received individualized resistance training programs throughout the summer based on pre-test maximal strength measurements. Comparison of post-training BP improvement scores indicated significantly greater gain (p<0.01) for ES and PS (10.5 ± 8.5 kg and 8.0 ± 6.2 kg, respectively) than for NS (1.5 ± 5.1 kg). Post-training gain scores for SQ indicated ES (39.4 ± 30.6 kg) was significantly greater than PS (22.7 ± 18.8 kg) which was significantly greater than NS (1.7 ± 10.7 kg). Whether due to more consistent routine of training and/or greater motivation, resistance training under the supervision of a strength and conditioning specialist during the summer produced significantly greater improvements in both BP and SQ for those athletes who remained on-campus compared to those players who left campus for the entire summer.

Keywords: resistance training, off-season training, bench press, squat.

INTRODUCTION

Muscular strength is an essential component of most athletic performances, and its formal development can no longer be neglected in the preparation of any athlete. Enhancing strength is essential for better performance and is one aspect that must be built upon on a continual basis since detraining may reduce strength within a short period (2,11,15,19,20). Amigo et al. (2) noted significant decreases in muscle fiber cross-sectional area and enzymes in soccer athletes given 4-8 weeks rest. While most college sports are limited to specific season durations, strength training is a yearlong process that should continue over the entire career of most collegiate athletes (28). This is especially true when it comes to American football (27).

Although the goal for most strength and conditioning professionals is to have athletes train year-round, collegiate rules limit the number and duration of summer workouts (4). In addition, some schools may not have the financial means to maintain support for athletes to remain on campus during the summer. Therefore, many strength and conditioning coaches provide a summer training manual outlining the specific schedule for resistance training when they otherwise may not have direct contact with some

players for extended periods (12-14).

In order for athletes to maximize their potential for strength gains, they must be motivated to train at a level that supplies sufficient stimulus for muscle growth (9). Duda and Treasure (8) classify motivation as a combination of the personal experiences of each athlete and the environment in which a sporting contest or training takes place. During the summer, the training environment for some athletes may consist of the college campus with their teammates. In this setting, they have supervision for safety and motivation from a coach as well as accountability from their teammates. If athletes are not on campus for the summer, they may have limited access to a training facility or the one they have may have limitations to the equipment available for training. In these environments, accountability and safety precautions may be minimal and motivation may be lacking. Coutts, Murphy, and Dascombe (6) noted that rugby players who trained together under the supervision of a strength and conditioning specialist made significant improvements in bench press and squat strengths compared to those that trained unsupervised and alone. Amigo et al. (2) observed strength decrease in young soccer players over the summer when not under supervision of a strength coach. Kovacs et al. (18) likewise found similar results with tennis players who left their training facility for winter break. Even though these athletes were given training manuals, they came back with a significant loss in anaerobic power, increases in fatigue index, and slower sprint speed. Jovick et al. (17) found that American football athletes leaving for the summer did not reach the same level of development in jump and agility performance as those who stayed on campus.

Sport psychologists might suggest that social facilitation or a behavioral effect on performance in a familiar environment can have a facilitating training effect. According to Rhea et al. (24), social facilitation can be divided into two factors which might distinguish athletes who remain on campus from those who leave for an extended period. Co-action is one form of social facilitation that refers to a situation where individuals work alongside one another while independently performing the same type of activity with rivalrous incentives. In the weight room, this might manifest when athletes exercise simultaneously but using separate pieces of equipment. They may be performing similar activities independently but be motivated by the coactive environment. To the contrary, athletes who go home for the summer may be in gym facilities where others around them are older or younger which can disconnect them from any motivating stimulus. In this case, their actions in the weight room do not affect other individuals, and their identity is independent of those around them. Competitive coaction is an extension of the original form in that an individual performing an independent activity may be motivated by an explicit but unspoken rivalry with close associates. Competitive coaction tends to be more descriptive of the on-campus training environment and provides additional motivation not seen in a dissociative environment. Dalamitros et al. (7) have suggested that competitive athletes may need more challenging activation stimuli to induce the desired adaptability in performance improvement, a factor which may be lacking when football athletes leave campus for the summer.

While there is evidence of the benefit of off-season group strength training in some sports (14,22,26), examination of this phenomenon among college football players is limited (17). Therefore, the purpose of this study was to assess the level of strength gain attained in the squat and bench press during a 12-week summer period between athletes that stayed on campus with supervision and athletes who went home for the summer. It was hypothesized that athletes that stayed on campus would perform better in the two lifts.

METHODS

Subjects

NCAA Division II college football players (n = 85) self-selected into groups that stayed on-campus for 90% of the summer (ES, n = 14), 50% of the summer (PS, n = 24), and 0% of the summer (NS, n = 47). All 85 athletes performed a one-repetition maximum (1RM) bench press and squat before beginning of summer and then again upon arrival for fall training camp 12 weeks later. During the 12-week period, each player was instructed to perform an individually prescribed resistance training program based on pre-summer maximal strength measurements.

Procedures

The 1RM bench press procedure followed a standard protocol (1), and each athlete used a grip that was slightly wider than shoulder width (30). Athletes were positioned in a supine position with their head, back, and hips remaining in contact

with the bench throughout the execution of the lift. The touch-and-go method was used in which the bar was required to be lowered slowly to touch the chest before being pressed immediately to full arms' extension. Athletes were not allowed to bounce the bar off the chest during the eccentric phase. Each athlete was allowed to warm up according to personal preferences using light weights of approximately 50% to 75% of estimated 1RM. When testing began, a weight was selected by the player, and one repetition was performed. If that repetition was successful, a minimum of five minutes rest was given before attempting subsequent repetitions with additional weight (25). Most participants reached their 1RM within three to five attempts. Standard Olympic bars and plates were used for all lifts.

The 1RM squat procedure also followed the standard NSCA protocol (5). Proper depth was achieved when the middle of the thigh was parallel to the floor. When this position was achieved, athletes were instructed to return to a standing position while maintaining a straight back (5). During testing, each athlete was allowed to warm up according to personal preferences using light weights of approximately 50% to 75% of estimated 1RM. When testing began, a weight was selected by the player, and one repetition was performed. If this repetition was successful, a minimum of five minutes rest was given (25) before attempting subsequent repetitions with additional weight. Most participants achieved their 1RM within three to four attempts. Standard Olympic bars and plates were used for all lifts.

Statistical Analysis

Multivariate analysis of variance (MANOVA) was used to determine demographic and strength differences among the groups at the pre-test. One-way ANOVA was used to compare differences among the groups for strength gain scores in bench press and squat. Bonferroni *post hoc* tests were used to perform follow-up assessment.

RESULTS

Age, height, weight, and 1RM bench press were not significantly different among the 3 groups at the pre-test (Table 1). Initial 1RM squat was significantly greater ($p<0.01$) in the AS group than in PS and NS groups, which did not differ significantly. ANOVA on strength gain scores for bench press indicated that the AS and PS groups made significantly greater improvement than the NS group but did not differ from one another (Table 1). ANOVA on strength gain scores for squat indicated that the AS group made significantly greater gains than the PS group, which made significantly greater gains than the NS group (Table 1).

CONCLUSION

The findings of this investigation support the hypothesis that summer training under supervision of strength and conditioning specialists lead to greater gains in both bench press and squat strength in college football players compared to those players who lack the same supervision. These results agree with those of Jovick et al. (17) that direct supervision and guidance throughout the summer resistance training program for college football players provides the motivation, guidance, and training intensity necessary for greater strength improvement. Triplett (29) and Rhea (24) previously indicated that group dynamics might contribute meaningful underlying psychological factors in training by providing both intrinsic and extrinsic motivation. Being in a structured environment may enhance motivation as teammates and coaches

Table 1. Demographic and performance data by group.

	90% Stay ***n* = 14**	**50% Stay** ***n* = 24**	**No Stay** ***n* = 47**
Age (yrs)	20.4 ± 1.9	20.8 ± 1.3	20.8 ± 1.8
Height (cm)	185.7 ± 8.1	186.3 ± 7.2	184.9 ± 7.4
Weight (kg)	103.2 ± 21.9	98.8 ± 18.2	103.4 ± 24.8
Bench Press (kg)	148.7 ± 23.7	137.2 ± 20.3	137.1 ± 25.3
Squat (kg)	228.6 ± 53.5*	189.6 ± 22.1	181.9 ± 29.0
Bench Press Gain (kg)	10.4 ± 2.9*	8.3 ± 6.1	1.5 ± 5.1
Squat Gain (kg)	39.4 ± 30.6*	22.7 ± 18.8*	1.7 ± 10.6

**Significant at p<0.05.*

hold each other accountable and provide both overt and covert stimulation (3).

There were several possible limitations in this study. No notation of starters and nonstarters was made among the players. NS players were not required to provide detailed records of the frequency and duration of training sessions, hence there is no way to assess the frequency and repetitions for various exercises. In addition, no detail of the available equipment utilized by players who left campus was indicated.

In summary, it can be speculated that the greater structure of on-campus ES and PS programs provided both physical and psychological stimulations that influenced gains in both strength exercises assessed in this study. In a structured program, time under tension might be more influential as players in the ES could have more spotters and receive more motivational support than players lifting in a non-regulated environment receive. Finally, strict adherence to rest period durations in a structured program could provide greater opportunity for muscle strength and hypertrophy gains.

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