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Prolonged Effects of Anabolic Steroid upon Muscular Contractile Force

This 1974 study investigated the prolonged effects of an anabolic steroid (methandrostenolone) on muscular contractile force in male weightlifters. The study involved a sample of twenty subjects aged between 19 to 25. The subjects were divided into two groups, with one group receiving 15 mg of methandrostenolone daily for four consecutive weeks, while the other group received no supplement.

The results revealed that the increase in muscular force obtained during drug administration was significantly maintained following a 15-week detraining period. In contrast, subjects who trained without the drug lost a significant amount of their muscular forces following the detraining period.

The study concluded that anabolic steroids could be actively involved in the maintenance of strength, even after a period of detraining. This suggests that the use of anabolic steroids may have long-term effects on muscle strength, beyond the period of active use.

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Below find a reprint of the 3 relevant pages of the article "Prolonged effects of anabolic steroid upon muscular contractile force" in "Medicine and Science in Sports":

Prolonged effects of anabolic steroid upon muscular contractile force

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ABSTRACT. There is an established body of literature with respect to the pharmacological properties of anabolic steroids. However, researchers have ignored the possibility of latent behavior of these drugs. The purpose of this study was to investigate the prolonged effect of an anabolic steroid (methandrostenolone) following cessation of drug administration and a 15 week detraining period. The population consisted of male weightlifters. A sample of twenty subjects ranging in age from 19 to 25 was used. Maximum dynamic muscular forces were determined by testing 1-RM (Repetition Maximum) in the bench and military presses and the squat exercises. The anabolic steroid, 15 mg of methandrostenolone each day, was administered during consecutive four weeks of training period which was then followed by a 15-week detraining period. The results of the present study revealed that the increase of muscular force obtained during drug administration was significantly maintained following 15 weeks of a detraining period. Subjects who trained without the drug lost a significant amount of their muscular forces following the detraining period.

Clinically, anabolic steroids have been used to relieve pathological conditions involving excessive nitrogen loss and reduced protein synthesis (7,9). Interest has been further increased through the use of these steroids at the opposite end of the spectrum, i.e., in an effort to increase body mass to enhance physical performance. World-class power, event athletes are reported to be using anabolic steroids as complements to training regimens. Early work in this area has been hampered by the lack of research concerning the residual effect of anabolic steroids. Two recent studies (1,2) reveal the possibility of biochemical as well as psychological effects of anabolic steroids. Using a double-blind control, statistically significant increases in muscular force under the placebo condition, and significant changes in reflex components as a result of drug administration were observed.

The present study was designed to investigate the prolonged residual effects of an anabolic steroid (15 mg of methandrostenolone daily during four consecutive weeks) following cessation of drug administration and a 15 week detraining period.

METHOD

The population consisted of male weightlifters registered at the University of Massachusetts during the Summer of 1973.

1971-1972 school year. Twenty volunteers ranging in age from 19 to 25 served as subjects in this study. Their height averaged 179.5 cm and their mean weight was 87.25 kg.

The twenty subjects were divided into two groups. Ten subjects in group 1 (experimental group) received 15 mg of methandrostenolone, an oral anabolic steroid, daily during four consecutive weeks, while the ten subjects in group 2 (control group) received no supplement.

For a period of four weeks prior to the beginning of the drug administration, all subjects lifted weights five days a week. They were tested on the seventh day for maximum lifts in the bench and military presses and the squat exercises. Maximum dynamic contractile force measurements were determined by 1-RM. Techniques used in performing the three lifts were those prescribed by the Amateur Athletic Union rules for weightlifting competition. The anabolic steroid was administered during a subsequent four week training period which was then followed by a 15-week detraining period. During the training period the subjects exercised five times per week for approximately two hours each day according to a program designed to work the major muscle groups of the body utilizing a progressive over-load principle. The detraining period extended from June through August during which no training was reported by any of the subjects. This period constitutes the traditional summer vacation schedule, and since the subjects were absent from the campus, no formal regulatory procedures governing their activity were possible.

Analysis of variance was used in order to analyze the differences of strength levels between the training period and the detraining period for each group.

RESULTS

Figure 1 presents the strength level differences during the training period and following the detraining period. Table 1 presents the analysis of variance for the data and Table 2 presents the muscular force levels for the experimental and the control groups.

In the bench-press exercise, the experimental group lost 6.6 kg of mean force while the control group lost a mean force of 19.9 kg. In the military press, the experimental group lost a mean force of 4.76 kg compared with 9.52 kg for the control group. In the squat exercise,

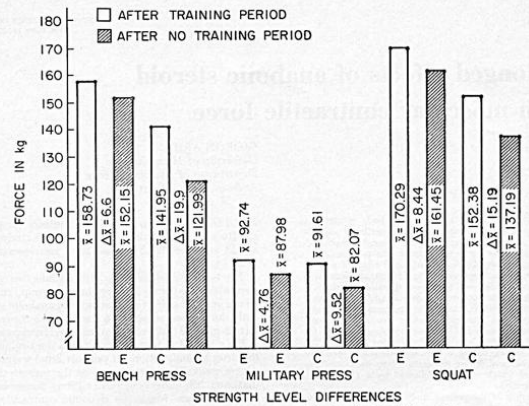


Figure 1. Strength level differences during the training period and following the detraining period.

the experimental group lost 8.44 kg compared with 15.19 kg for the control group.

Table 1 shows statistically significant differences in muscular strength level between the two experimental periods at the .01 level of confidence only for the control group.

DISCUSSION

The present study shows that the increase of muscular force obtained during drug administration was maintained following a 15 week detraining period. Subjects who trained without the drug lost a significant amount of their muscular force following the detraining period. These findings may be considered in the light of work of other investigators who found that administration of androgens and anabolic steroids results in the increased formation of extragenital protein-containing tissue (3,4,6). Part of this extragenital protein is formed in the skeletal muscle (6), and may be maintained dur-

ing the detraining period. An increase of muscular tissue due to the administration of anabolic steroids was found by several investigators (6,8). Komer (8) found that the chemical composition of the protein newly formed by the influence of anabolic steroids was different from that of natural protein. Johnson and O'Shea (5) emphasized the need for a "severe" exercise regimen and a protein dietary supplement to accompany the administration of the drug. The genesis of increased muscular protein, which has been observed with all anabolic steroids (6), is still unclear.

CONCLUSION

It was observed in the present study that subjects who trained with the anabolic steroid were able to maintain their strength level after the detraining period, while the subjects who trained without the anabolic steroid demonstrated a significant loss of strength. Hence, it is concluded that the anabolic steroid could be actively involved in the maintenance of strength.

TABLE 1. Analysis of variance of mean strength levels between the two experimental periods.

Source of Variation	Sum of Squares	d.f	Mean Squares	F-ratio
Bench-press				
Experimental Group				
Grand Mean	2349551.25	1		
Treatments	1051.25	1	1051.25	
Error	10322.50	18	573.47	1.83 (1,18)
Control Group				
Grand Mean	1693620.00	1		
Treatments	9680.00	1	9680.00	
Error	7950.00	18	441.67	21.92**(1,18)
Military-press				
Experimental Group				
Grand Mean	794011.25	1		
Treatments	551.25	1	551.25	
Error	10162.50	18	564.58	0.98 (1,18)
Control Group				
Grand Mean	733045.00	1		
Treatments	2205.00	1	2205.00	
Error	2000.00	18	111.11	19.85**(1,18)
Squat				
Experimental Group				
Grand Mean	2675461.25	1		
Treatments	1901.25	1	1901.25	
Error	16912.50	18	939.58	2.02 (1,18)
Control Group				
Grand Mean	2038411.25	1		
Treatments	5611.25	1	5611.25	
Error	4302.50	18	239.03	23.48**(1,18)

** F-ratio significant to the .01 level of confidence.

TABLE 2. Mean muscular force levels (Kg).

Exercise	Experimental group			Control group		
	Before	After	Diff	Before	After	Diff
Bench-press	158.73	152.15	6.58	141.95	121.99	19.95**
Military-press	92.74	87.98	4.76	91.61	82.09	9.52**
Squat	170.29	161.45	8.84	152.38	137.18	15.19**

** F-ratio significant to the .01 level of confidence.

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