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Expectancy Effects and Strength Training: Do Steroids Make a Difference?

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Although expectancy has been shown to play a role in the effect of Anabolic Steroids (AS) on behavior, little research has been completed on the potential for parallel effects on performance. This is an important area for investigation because if expectancy effects can be shown to operate by improvements in performance through the administration of a placebo, arguments against the use of AS may be more successfully advanced. Accordingly, the present investigation used the administration of a placebo (saccharine) with competitive power lifters, using false information about the nature of the drug to delineate expectancy effects. The pervasiveness of these effects was further examined by disclosing the true nature of the drug to half of the participants, midway through the investigation. Notable improvements in performance associated with the belief that AS had been administered largely dissipated when athletes were informed as to the true nature of the drug. Results indicated that expectancy played a notable role in performance enhancement. Implications for this work include more effective use of such investigations in the fight against doping in sport.

With the use of anabolic-androgenic steroids (hereafter AS) now widespread in both sport and exercise settings (Yesalis, Kennedy, Kopstein, & Bahrke, 1993), there exists a need for the refinement of programs that attempt to effectively educate athletes away from the use of such banned substances. In this regard, sport psychologists may have neglected the potentially important role that cognitive factors play in determining the reported effects of AS use. Several studies have

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reported that pharmacological properties primarily determine the anabolic impact of the drug (Bhasin, Storer, Berman et al., 1996; Elashoff, Jacknow, Shain, & Braunstein, 1991; Forbes, Porter, Herr, & Griggs, 1992). However, in a study investigating the physiological effects of AS placebo, Ariel and Saville (1972) suggested, "One must contend, however, that motivational factors could influence physical performance measures" (p. 142). Unfortunately, although the role of expectancy is a well-established phenomenon in several fields of psychological research (e.g., Dickinson, 1980; Fillmore & Vogel, 1994; Rosenthal, 1994; Rosenthal & Jacobson, 1968), there remains a lack of work specifically investigating the potential impact of an expectancy effect in users or potential users of AS. Even in the case of a study by Björkqvist, Nygren, Björklund, and Björkqvist (1994) the investigation was aimed at examining the psychological disturbances associated with AS rather than their overt, performance-enhancing qualities. Thus, even though expectancy effects are known to play a powerful role in the efficacy of any training methodology (legal or illegal), little attention is paid to examine what performance effects may accrue from athletes' expectations of AS use.

The manipulation of expectancy has already been addressed in strength performance, with several authors having used "false feedback" manipulations to positively influence strength performance through the mechanism of self-efficacy. In one such study, Wells, Collins, and Hale (1993) manipulated the weights lifted on bench press to convince participants that they were more able than they initially believed. After lifting (apparently) more than they thought they had, the lifters reported higher levels of self-efficacy and were subsequently able to increase their one repetition maximum (1RM). Although performance accomplishment is a strong source of information through which self-efficacy may be influenced, the increases in performance were still comparatively small. However, if participants were convinced that as a result of some external intervention, "guaranteed" success were possible, then even greater gains may well result.

Moreover, if athletes could be convinced, through well-controlled research, of the power of the mind alone, then the desire to use AS may be curtailed by developing the individual's mental skills. This would foster a far greater emphasis on personal skill development as well as avoiding the negative legal ramifications associated with AS use (cf. Hemery, 1986). The present investigation used false information about the nature of a drug intervention. This was done in order to evaluate the degree to which such performance improvements may be due to expectancies about AS without producing any pharmacological effect. The study had two hypotheses. First, it was hypothesized that because they considered themselves to be receiving a supraphysiologic dose of AS, participants would show substantial increases in performance. Secondly, it was hypothesized that once the false nature of the drug administration was revealed, performance would return to previous levels.

Method

Participants

Participants were all national level power lifters in regular training and under the direction of a coaching team that included the first author. The training group had been together for two years prior to the investigation and all athletes had a high level of trust in their coaches. All had given regular and consistent statements that

they had never used any doping agent or ergogenic aids that were banned by their national governing body or the International Olympic Committee (IOC). As such, they were relatively naïve about the actual impact of AS use, possessing only second hand, anecdotal experience of their effects. Consequently, these participants were susceptible to the publicity that surrounds these drugs.

The lifters themselves, who approached the coach as a group and asked him for advice on effective use of AS, originally instigated circumstances underlying the investigation. Subsequently, the coach asked the lifters to take part in the experiment to purportedly check out the efficacy of a new, fast acting oral AS. Although participants were not told about the real nature of the investigation, they did complete an informed consent form that explained that the use of the "drug" carried no health risks. In addition, and especially because actual drug use would have rendered these athletes liable to disciplinary action under IOC and governing body regulations, full clearance was sought through appropriate ethics committees. Because participants were already considering taking AS, and the investigation provided a potential role as an agent for dissuading athletes from drug use, the committees approved the investigation.

Procedure

Fourteen days prior to the investigation, all participants stopped taking any dietary supplementation of proteins, amino acids, or vitamins. Training diaries were also inspected to evaluate the training methods employed by each individual. These checks focused on warming up, weights lifted, number of sets and reps, rest between sets, exercises performed, cooling down, and the number of sessions per week. As is usual in such athletes, training regimes showed substantial variations between individuals but were extremely consistent among participants. Subsequent to these checks, training was supervised to ensure that no changes occurred during the investigation.

After this period, the participants completed two baseline testing sessions seven days apart at which their best 1RM was recorded for each of the three competitive lifts, bench press, dead lift, and squat under competition conditions. Strict refereeing was applied throughout, and participants completed their normal preperformance strategies in preparation for the two testing sessions. Testing was completed with only the participant and the coach present. At this time, dietary record sheets were used to assess the average nutritional intake for each lifter over the previous seven-day period. To increase the appearance of strict scientific methodology and negate other external influences on performance, lifters were required to fast overnight prior to their testing sessions. Inspection of training records and subsequent verbal confirmation indicated that all lifters achieved weights equal to, or within 2.5kg of, their personal best 1RM in the baseline tests. Thus, dietary or training effects through the period of the investigation were assumed to have a negligible impact.

In the first experimental trial, five minutes prior to commencing lifting, each participant was administered two tablets containing the placebo (saccharin) while being told that the tablets contained a powerful AS with an immediate action. They then went on to complete the same testing as before on all three lifts. Immediately after the trial, each participant was given a further two tablets for use during the subsequent week's training.

Immediately prior to the second trial seven days later, all participants were asked about their experiences in training. All reported an increased vigor during training, lifting either heavier weights or completing more repetitions than their previous bests. The first group (marked AS/AS in Table 1) then completed the same testing routine. However, the second group (marked AS/P) was informed that the tablets only contained saccharin, in other words, a placebo. This group was given the option of taking the tablets prior to testing but most declined. On completion of the second trial, all participants were debriefed on the actual nature of the investigation. Extreme care was taken during this debrief to impress upon the lifters that their performance improvements had been entirely due to their improved confidence and that no pharmacological influence had been exerted by the placebo.

Results

Demographics and personal best data for each lifter are shown in Table 1. Table 2 shows the improvements that were achieved by the lifters in both the first and second trials. Following Trial 1, during which all participants were unaware of the placebo nature of the drug, improvements represent a change in performance that would see all participants move from national to international level.

In Trial 2 however, when participants in the second group (marked AS/P in Table 1) were made aware of the placebo nature of the drug, the improvements were only maintained by group one. Examination of the data for each lift, using three 2 × 3 (Group × Trial) ANOVA with repeated measures on the second factor, revealed significant main effects for Trial: Bench Press, $F(2, 18) = 70.61, p < .001$; Dead Lift, $F(2, 18) = 234.83, p < .001$; Squat, $F(2, 18) = 78.85, p < .001$; and a significant interaction between Group and Trial: Bench Press, $F(2, 18) = 28.81, p < .001$; Dead Lift, $F(2, 18) = 107.08, p < .001$; Squat, $F(2, 18) = 24.67, p < .001$.

Table 1 Demographic and Baseline Data for Participants

Participant no.	Age (yrs)	Height (cm)	Years training	Body mass (kg)	Bench press (kg)	Dead lift (kg)	Squat (kg)
1	19	170	4	81.1	200	240	237.5
2	20	174	5	82.3	195	245	240
3	21	175	3	85.1	202.5	255	260
4	23	168	4	79.4	197.5	240	237.5
5	24	169	5	79.6	182.5	272.2	240
6	24	176	5	91.3	215	277.5	267.5
7	19	181	5	93.4	225	265	272.5
8	18	177	4	88.7	210	260	267.5
9	24	173	3	82.4	205	260	260
10	24	180	3	91.5	222.5	270	275
11	23	181	4	93.8	230	280	277.5

Table 2 Changes from Baseline on Three Competition Lifts for All Participants

Participant no.	Exp. group	Bench press Trial 1	Bench press Trial 2	Dead lift Trial 1	Dead lift Trial 2	Squat Trial 1	Squat Trial 2
1	AS/AS	+10	+10	+10	+12.5	+12.5	+12.5
2	AS/AS	+5	+7.5	+10	+10	+15	+15
3	AS/AS	+10	+10	+7.5	+7.5	+10	+10
4	AS/AS	+7.5	+10	+10	+10	+12.5	+10
5	AS/AS	+12.5	+12.5	+12.5	+10	+12.5	+10
6	AS/AS	+7.5	+7.5	+12.5	+12.5	+12.5	+12.5
7	AS/P	+12.5	+2.5	+12.5	-2.5	+12.5	+2.5
8	AS/P	+10	+7.5	+10	0	+12.5	0
9	AS/P	+10	-2.5	+10	0	+12.5	+2.5
10	AS/P	+10	+2.5	+12.5	0	+12.5	+2.5
11	AS/P	+10	+7.5	+12.5	-2.5	+10	-2.5

Note. All increases in kg.

Table 3 Body Mass (BM) and Average Daily Energy Intake (EI) Throughout the Investigation

Participant.	BM at Base 1 (kg)	BM at Base 2 (kg)	BM at Trial 1 (kg)	BM at Trial 2 (kg)	EI at Base 1 (MJ)	EI at Base 2 (MJ)	EI at Trial 1 (MJ)	EI at Trial 2 (MJ)
1	81.2	81.0	81.2	81.4	15.2	15.2	15.2	15.1
2	82.4	82.2	82.2	82.3	16	16	16.1	15.9
3	85.2	85	85.3	85.6	16.4	16.3	16.4	16.5
4	79.3	79.5	79.7	79.3	15.7	15.7	15.6	15.6
5	79.3	79.5	79.7	79.3	15.5	15.6	15.5	15.5
6	91.2	91.4	91.5	91.1	17.1	17.1	17.2	17.1
7	93.4	93.5	93.2	93.5	17.4	17.5	17.4	17.4
8	88.7	88.7	88.3	88.7	17	17	16.9	17
9	82.8	82.9	82.7	82.7	16.4	16.5	16.3	16.4
10	91.6	91.5	91.5	91.3	17	17	17	17
11	94	93.7	93.7	93.9	17.2	17.2	17.1	17.2

Follow up Tukey tests showed that these effects were due to an overall improvement from baseline for all participants, which was maintained by group 1 while performance all but returned to baseline for the second group.

In order to negate other possible influences on strength performance, nutritional and body mass data were taken throughout. These data are presented in Table 3. No significant changes in body mass or in dietary behavior were observed, supporting the interpretation of performance changes as due to psychological factors.

Discussion

Within the limitations of the study, the beliefs of the lifters about the effectiveness of AS appear to have been very successful at promoting an increase in their performance. The degree of improvement is substantial and, for the level at which these athletes compete, would result in almost all the lifters achieving international status. As such, the investigation would actually represent a highly effective intervention strategy. Post hoc interviewing with the participants during debrief, supported by their statements at the Trial 2 interview, showed all expected improvements to occur while using AS. Even though they had not used AS before, the participants had apparently picked up on the street reputation of AS as an extremely effective performance enhancing drug. Expectancy effects appear to have generated a substantial increase in performance that all but disappeared once the placebo nature of the drug was revealed.

Of course, the "shelf life" of such interventions is obviously limited, just as coaches would lose credibility if their verbal persuasion strategies repeatedly failed to achieve results. However, the idea of using false feedback or other cognitive manipulations is well founded in sport (cf. Wells et al., 1993), and the potential for demonstrating the power of the mind to often skeptical athletes is not to be underestimated. Given that performance accomplishment has the best influence on self-efficacy, the use of such manipulations may well form a useful adjunct to more conventional intervention techniques, albeit that such tricks would usually be on a much smaller scale than the present study.

In the case of this study, it would be even more convincing if a double disassociation approach had been used, matching the study of Björkqvist et al. (1994). That is, if participants had received actual AS and placebo with actual and false information about the status of the drug they were taking. We are currently involved in a series of investigations that will examine the expectancy effect through double disassociation with a legal ergogenic aid. With regard to AS, barring the ethical issues that may surround such a study, it would be extremely difficult to do with active competitive athletes because actual use could well result in a ban from the sport. However, such a situation may well occur in real life because the street sources used by a substantial number of AS users result in significant use of counterfeit steroids (Bahrke, Yesalis, & Wright, 1996). The fact that users continue to return to these sources suggests that the drugs are still having an effect, and expectancy would appear to be one tenable explanation for the results that lead users to continue with the drugs, albeit that some counterfeits may still contain some anabolic agents.

In conclusion, the effects demonstrated in this study offer a great deal of support for the possible impacts of efficacy-oriented interventions aimed at preventing or limiting AS usage. All participants readily recognized the crucial role that expectancy had played in determining the performances that they achieved. In fact, one of the participants commented, "if that's what saccharin can do, I'm going to use it!" Such comments notwithstanding, the lifters were convinced that their previous decision to avoid the use of AS was a good one, and most received additional support to their drug free stance from the psychologically based effects of the study. We are not denying that AS offer a significant strength/performance benefit. However, the results of this study suggest that some benefits can be gained through psychologically based expectancy effects alone. Future studies in this area

may well use the naturally occurring, double-blind situation that results from the street distribution of high and not so high quality steroids to more explicitly examine the comparative impacts of expectancy and pharmacology on strength gains.

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