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Effects of Different Weight Training Routines on Mood States

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ABSTRACT

Tharion, W.J., Harman, E.A., Kraemer, W.J. and T.M. Rauch. Effects of different weight training routines on mood states. *J. Appl. Sport Sci. Res.* 5(2):60-65.1991.—*An experiment was designed to determine if two frequently-used weight training protocols differentially affect mood state in novice lifters, possibly also influencing adherence to training programs. Mood states of nine males and nine females were examined before and after six different weightlifting workouts, varied according to inter-set rest interval (one versus three minutes), total work (low versus high), and weight lifted (light for 10 repetitions per set versus heavy for five repetitions per set). The Profile of Mood States was given two minutes pre-, and at two minutes, two hours, 24 hours and 48 hours post-workout. Stronger perception of negative moods including tension, depression and fatigue resulted from higher work, lower weight with higher repetitions per set and shorter inter-set rest periods. With the lower weight, higher total-work routine, the one-minute rest period produced more tension and depression than the three-minute routine, probably due to physical fatigue. In contrast, for the heavier weight, lower total-work routine, three minutes of rest produced more tension and depression than did one minute, possibly because of impatience brought on by the longer rest periods when fatigue was minimal. In conclusion, for novice lifters, the 5 RM, lower total work type routine with an inter-set rest period of three minutes is likely to produce relatively high rates of compliance and low attrition.*

KEY WORDS: psychology, weightlifting, emotion, fatigue, exercise compliance

INTRODUCTION

Psychological fitness has been linked to physical fitness, although a cause-effect relationship has not been proven. Folkins, Lynch and Gardner suggested that the effect may be the result of feedback from the heart, skeletal muscles and limbs (10).

There has been considerable research devoted to the assessment of mood states associated with exercise. Morgan and Pollock (16) examined the psychological characteristics of elite runners using the Profile of Mood States (POMS) (13). Compared to college norms, elite runners reported higher subjective feelings of vigor and lower levels of negative moods (tension, depression, anger, fatigue and confusion). With T-scores listed on a graph's y-axis and moods listed along the x-axis in the order tension, depression, anger, vigor, fatigue and confusion, a line connecting the runner's plotted scores formed an "iceberg profile" (16). In subsequent studies, the iceberg profile has been reported in wrestlers (15), rowers (14), non-elite runners (11), swimmers (1), and ultramarathoners (17).

Research over the past decade has been focused on changes in mood states before and after physical exercise (6, 8, 9, 11, 12). Most of the studies to date have assessed mood states immediately before and after acute bouts of physical exercise or before and after chronic exercise programs lasting six to 20 weeks. The exercises studied were primarily aerobic in nature, such as running, aerobic-dance, calisthenics and swimming. Both acute and chronic exercise programs resulted in improved affective states including lower levels of depression (6).

While it has been shown that regular weight training improves self- and body concepts (3, 18, 19, 20, 21), few

studies have dealt with the effects of resistance exercise on mood states. Dishman and Gettman (7) reported that a 20-week circuit weight training program significantly improved feelings of vigor as measured by the POMS as well as physical self-esteem.

There is a high rate of attrition in the early states of weight training. An individual who has developed the habit of exercising regularly is likely to continue doing so, while a novice can become easily discouraged, and is likely to drop out of a program which fails to improve, or even degrades his or her affective state. The present study was designed to provide insight into what types of training routines are least likely to bring about the development of negative moods and most likely to result in compliance with training regimens. Although actual adherence to different types of workouts was not directly measured, it seems very probable that the emotional effects of a workout relate to adherence. Workout variables examined include weight handled, repetitions per set, length of inter-set rest period and total work.

METHODS

The POMS Questionnaire

The development of the POMS involved identification of mood factors that could be reliably measured among various

Table 1. The Six Resistance Exercise Protocols

Exercises	Repetitions Per Set[a]	Sets	Rest (min)	Total Work
Workout A				
Bench press	5	5	3	Low
Leg extension	5	5	3	Low
Military press	5	3	3	Low
Weighted sit-up	5	3	3	Low
Pull-down	5	4	3	Low
Seated Row	5	3	3	Low
Preacher Curl	3	5	3	Low
Leg press	5	5	3	Low
Workout A1				Low
Same exercises	10	[b]	3	(Same as A)
Workout A2				Low
Same exercises	5	[c]	1	(Same as A)
Workout B				
Same exercises	10	3	1	High
Workout B1				High
Same exercises	5	[d]	1	(Same as B)
Workout B2				High
Same exercises	10	3	3	(Same as B)

-[a] The amount of weight on the bar always matched the nominal repetitions per set, i.e. a 5 RM weight was always used for five repetition sets and a 10 RM weight for 10-repetition sets.

-[b] As many total repetitions as necessary were performed to match the total work of protocol A. The last set usually consisted of less than 10 repetitions, e.g., 37 repetitions were performed in three sets of 10 and one set of seven repetitions.

-[c] Because of the short rest period the subject often could not complete five repetitions per set after the first set. In such cases, an additional set was added to make up the missed repetitions.

-[d] As many sets as necessary of five or less repetitions each were performed to match the total work of B.

populations. The POMS is a questionnaire that has been used extensively in assessing moods of athletes and has been proven to be a reliable tool. Each of 65 adjectives is rated on a five-point scale from feelings of "not at all" to "extremely." Subjects indicate how they feel "right now" for each item. The six mood states assessed are tension, depression, anger, vigor, fatigue and confusion. The tension factor describes feelings of panic, uneasiness, restlessness, nervousness and anxiety. The depression factor subsumes unhappiness, loneliness, misery, helplessness and guilt. Subfactors for anger include grouchiness, annoyance, spite and feelings of deception. Within the vigor factor are liveliness, energy, cheerfulness and nonchalance. Fatigue refers mainly to a lack of physical energy, while confusion includes lack of efficiency, forgetfulness and uncertainty.

Data Collection

Nine male and nine female physically active subjects between the ages of 19 and 35 with varied athletic backgrounds volunteered to participate in the study. None of the subjects was a competitive lifter. **Table 1** summarizes the six different resistance exercise protocols, including the two primary workouts, A and B. The A workout was a 5 RM-based workout which incorporated longer rest intervals (three minutes) and greater weight lifted than the B workout. The B workout was a 10 RM-based workout with one minute rest between sets. While both workouts develop strength and hypertrophy, the A type workout is normally used to develop strength (1 RM ability), while the B type workout is used for bodybuilding or to improve local muscle endurance and hypertrophy. The additional workout variations were performed to help determine if differences between the effects of the two primary types of workout were more closely associated with weight handled (a 5 RM weight is heavier than a 10 RM weight), rest period or total work. The A1 workout was the same as the A workout in total work and inter-set rest period (three minutes). However, subjects used a lighter weight, so that they could perform 10 instead of five repetitions per set, with the number of sets adjusted to keep total work the same. The A2 workout was the same as the A workout in weight handled, total work and repetitions, but the inter-set rest period was one instead of three minutes long. The B1

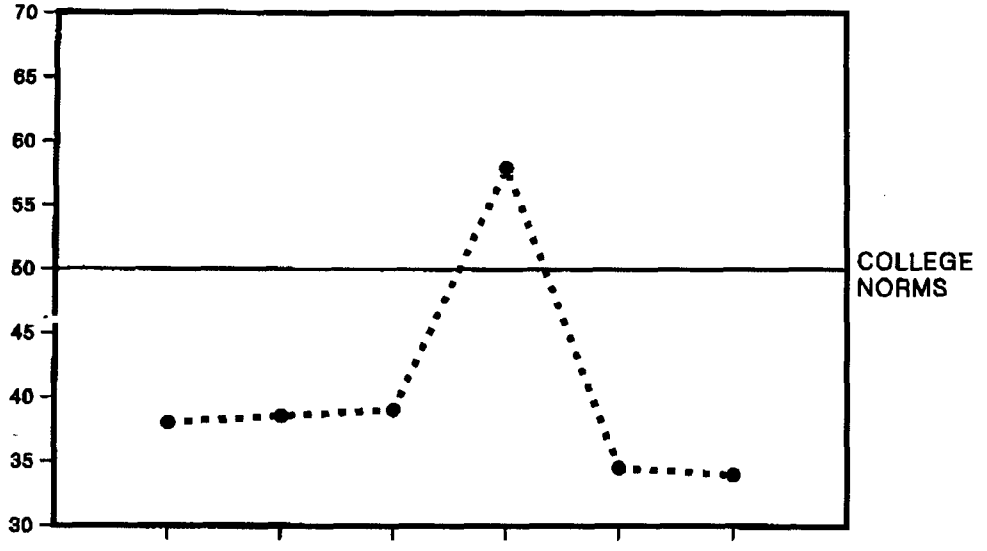

Figure 1. Pre-workout Average Mood State Profile.

workout was the same as the B workout in total work and inter-set rest period (one minute). However, subjects used a heavier weight, so that they could perform only five instead of 10 repetitions per set. The B2 workout was the same as the B workout in weight handled, total work and repetitions, but the inter-set rest period was three instead of one minute long. All A workouts were equivalent in total amount of work performed as were all B workouts. Total work was less in the A than B series.

The matching of total work between routines was performed by a computer program which, given a specific exercise, weight and number of repetitions, calculated the number of repetitions required to produce the same total work using a different weight. Lifting work was calculated as weight times vertical distance moved per repetition times number of repetitions. The program took into consideration the vertical distance moved of both the weight plates and the centers of gravity of the lifter's body segments. These distances were obtained from measurements on the subjects and equipment when they were in the starting and ending exercise positions. Anthropometric tables (22) were used to locate body segment centers of gravity and estimate body segment weights from total body weight.

The exercises were performed in the following order: bench press, double leg extension, military press, weighted sit-ups, pull-downs, seated rows, preacher arm curls and leg press. All exercises were performed on Universal (Cedar Rapids, Iowa) equipment with the exception of preacher arm curls and weighted sit-ups for which free weights were used. Workout loads (5 RM and 10 RM) were determined using the standard procedures described by Delorme and Watkins (4, 5) and Berger (2). All subjects had recreational experience and received instruction and familiarization in the eight exercise routines prior to the actual study. All experimental workouts were held at the same time of day to minimize possible diurnal variations. All subjects were tested on all six resistance exercise workouts. Workout order was randomized across subjects to control for order effects. Mood states of subjects were assessed via the POMS. The POMS questionnaire was administered two minutes pre-, two minutes post-, two hours post-, 24 hours post- and 48 hours post-workout.

Results were analyzed by repeated-measures analysis of variance. The five independent variables analyzed include total work (A Series versus B Series), work intensity (5 RM versus 10 RM), rest interval (one minute versus three

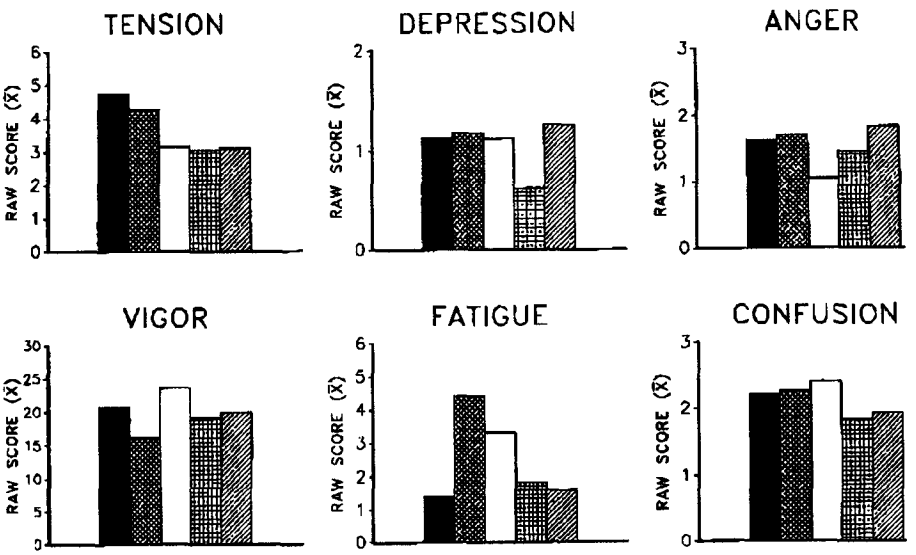

Figure 2. Average Mood State Raw Scores by Administration.

minutes), subject gender and time of administration of the POMS.

Results

The pre-exercise subject mood plots showed the classic iceberg profile found in many athletic populations. **Figure 1** shows the mood scores expressed as T-score values to provide comparison to college norms and to compare the relative intensities of the different moods. Mood changes by administration are depicted in **Figure 2.**

There was a significant $F(1, 16) = 7.58$, $p < 0.02$, main effect of rest interval on fatigue, with the shorter rest interval producing more fatigue. An interaction effect was found with work level, rest interval and repetitions on fatigue $F(1, 16) = 12.69$, $p < 0.01$; more fatigue was experienced with shorter rest in combination with either more total work or the same total work with more repetitions. Fatigue was greater with one than three minutes rest for up to two hours post-workout. There was a significant interaction between rest interval and time of test administration on fatigue $F(4, 13) = 3.61$, $p < 0.03$. At two minutes pre-, 24 hours post- and 48 hours post- there were virtually no differences in fatigue between the two rest interval conditions. However, two minutes post-work-out and two hours post-workout fatigue was considerably higher with the shorter rest interval (one minute).

Depression was significantly greater with higher total work $F(1, 16) = 5.86$, $p < 0.03$. The effects of RM load and rest on both tension $F(1, 16) = 4.55$, $p < 0.05$ and depression $F(1, 16) = 4.76$, $p < 0.05$ showed significant interactions. The combination of a 10 RM weight and higher total work produced more tension and depression with one minute rest than with three minutes. In contrast, the combination of 5 RM and lower total work produced more tension and depression with three minutes rest than with one minute. Most probably, the cause of tension and depression in the higher work group with one minute rest was physical fatigue, while the source of these negative moods in the lower work group may have been impatience about mandatory three minute rest periods when fatigue was minimal. Total workout time was considerably greater when three minute rather than one minute rest periods were used.

Males reported feeling significantly more vigorous than females $F(1, 16) = 6.34$, $p < 0.02$. No other main or interaction effects on vigor were found. Females reported feeling significantly more confused than males $F(1, 16) = 6.68$, $p < 0.02$.

Discussion

It must be noted that the negative mood scores of the test subjects were all well below college norms. Thus, the greater depression scores associated with the B than the A type workout does not mean the subjects were in a depressed state, but rather that the A workout had a greater attenuating effect on depression than did the B workout. Simply put, the A workout felt better than the B workout.

Subjects were not specifically pre-trained for either workout, but had recreational experience with resistance training. The B workout appears to be more taxing even for recreationally trained individuals. The B workout probably requires a higher overall fitness level than the A workout, due to its shorter rest period, greater total work and more repetitions. After an individual becomes physically and psychologically conditioned to specific weight training protocols, the B workout might cease to have more negative effects on mood than the A workout.

Males exhibited more positive mood states during and after weight training than did females, showing slightly more vigor and less confusion. These differences are probably due to greater experience and familiarity with resistance exercise among males than females, rather than to innate physical and/or psychological differences between the genders.

Practical Applications

The B (bodybuilding) workout was characterized by more total work, less rest and more repetitions with a lower weight than the A (strength) workout. The fact that the bodybuilding routine was associated with stronger feelings of tension, depression and fatigue has implications for strength and conditioning program directors, teachers and coaches wishing to improve training program compliance rates.

When an individual embarks upon a weight training program, his or her individual training goals should be ascertained. There are distinct differences in physical development associated with each variety of workout. If an individual has specific and immediate goals requiring a bodybuilding type workout, he or she should not be discouraged from engaging in such a program. However, if there is no specific training goal requiring a bodybuilding type workout, then it should probably not be recommended for the novice lifter. If an individual merely wants to get stronger and/or look more muscular, and doesn't care much about specific training effects, then the strength type workout is more likely to result in a positive outlook and good mood along with a concomitant higher compliance rate than is the bodybuilding workout, which is physically more demanding.

One distinct limitation of the strength type workout is that it requires more time to perform a given amount of work than does the bodybuilding routine. Within a limited time period, less work can be performed with the strength protocol. However the most important consideration when prescribing for a novice lifter is to encourage development of the exercise habit. In the early stages of training, it is usually less important that the individual make the greatest possible progress in the shortest possible time. In order to

minimize attrition among novice lifters, it is probably best to prescribe the maximum weight with which five to six repetitions can be performed in conjunction with comfortably long inter-set rest periods, even at the expense of total work. As trainees become conditioned, and develop the habit of exercising regularly, then total work performed within a given amount of time can be increased. Physical training instructors should use careful judgement in deciding when an individual's level of motivation and experience warrant increases in work per unit time.

An individual engaged in a strength type workout is reinforced by seeing improvements in strength, feeling unpressured, having time to talk to friends in the weightroom, seeing a relatively high amount of weight moved and being under less cardiopulmonary, metabolic, and thermal stress. Individuals whose goals are bodybuilding, the training of local muscle endurance, or completion of a full workout in a short amount of time, are subject to the psychological and physiological stresses mentioned previously. In order to maintain a positive attitude under such conditions and adhere to a demanding routine, the trainee would have to be more goal-oriented or be provided with a creative workout design that incorporates a variety of effective reinforcements.

Note on U.S. Army Human Research

Human subjects participated in these studies after giving their free informed voluntary consent. Investigators adhered to AR 70-25 and USAMRDC Regulation 70-25 on Use of Volunteers in Research.

The views, opinions, and/or findings contained in this report are those of the authors and should not be construed as an official Department of the Army position, policy or decision.

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