An Evaluation of Two Methods of Introducing the Two Hands Snatch for the Purpose of Determining a Preferred Method for Beginners in Weightlifting

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AN EVALUATION OF TWO METHODS OF INTRODUCING THE TWO HANDS SNATCH FOR THE PURPOSE OF DETERMINING A PREFERRED METHOD FOR BEGINNERS IN WEIGHTLIFTING

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CHAPTER ONE

THE PROBLEM AND ITS BACKGROUND

Introduction

One of the characteristics of a sound physical education program is a wide choice of activity. In recent years the variety of activities has reached such proportions that mastery of all aspects of it by any single educator is an impossibility.

There must be a reasonably wide choice of activities for the curriculum of each grade and many considerations must be weighed before final selection is made. A major factor in these decisions is the selection of a proportion of activities with intrinsic developmental benefits. Many sports selected for their carry over value and social merits contribute little in the area of subjective development but satisfy other aspects of the well rounded program.

During the latter stages of high school, and at the college level, there are few suitable sports which satisfy the demand and need for increased strength and power. Gymnastics and wrestling are excellent media to accomplish these goals. However, gymnastics is not popular with these students lacking a background in the sport, and students beginning gymnastics at this time are often slow learners. In fact, even physical education majors are often unable to reach a satisfactory level of competence in the time allocated to the sport. Conditioning programs designed to achieve
development of cardio-vascular fitness and enhanced muscle function are important but lack inherent interest and carry over value to many students.

One sport which can supplement this rather weak area and which aids in the increase of both strength and power is olympic weightlifting. It is a growing sport, and is second only to track and field in the number of participating countries in the olympic games.

The sport requires strength, speed and agility. It necessitates a spirit of aggression, and yet is capable of modulation through the setting of standards of achievement which limit performance demands for beginners. Added to this is the relative simplicity of the techniques in lifting and the possibility of achieving reasonable standards which allow the participant satisfaction within the time limits of the normal physical education schedule.

In the ultimate analysis, this paper is concerned with furthering knowledge of techniques affecting presentation of this sport with emphasis on personal appeal. Weight lifting is a sport which, by its very nature, nurtures those physical qualities which reflect many of the primary objectives of a sound physical education program.

Historical Review

The sport of weightlifting consists of three lifts, the two hands press, the snatch, and the clean and jerk. The first movement is a simple extension of the arms overhead against the
resistance of the barbell and is probably the oldest strength test known to man. In the second lift, the snatch, the bar is raised from the ground to arms length in one movement while the lifter lowers himself under the bar. The clean and jerk is very similar to the snatch with the bar being raised first to the chest and then jerked with leg assistance and a body dip to the overhead position.

The techniques of these lifts have advanced tremendously over the last twenty years. In both the snatch and the clean and jerk, two different methods of performance have evolved. These are known respectively as the squat and the split techniques. Both methods are technically sound.

Problem

The purpose of this study is to determine if either of these two methods of snatching is preferable for the beginning weightlifter.

Need for the Study

The snatch is often considered the most important lift of the "Olympic Three" when the sport is being taught to beginning weightlifters. Further, the lift is regularly required in schedules of applied weightlifting in which weight training exercises are used to develop greater ability in other sports.

The importance of the lift to beginning lifters is due to the following factors: (1) correct technique can be established by the use of moderate poundages, thus enabling the beginner to perform sufficient repetitions to establish the correct neuro-muscular patterns fairly quickly; (2) the snatch demands the development of
sufficient joint flexibility in the spinal, shoulder and hip complexes to enable the beginner to deal with heavier stresses safely at a later stage; and (3) the vigorous and rhythmic character of the lift appeals to most beginners who derive an immediate feeling of achievement and subsequent motivation from improvement in the lift.

Proficiency in the snatch aids in achieving competence in the third lift, the clean and jerk, due to an apparent transfer of identical elements existing between the two lifts at this level of competence. Thus, the snatch is often considered to be the key to learning other techniques in the sport of weightlifting.

Though many weight training schedules include the snatch due to its merits as a power builder, little advice is available as to how the lift should be learned or which technique should initially be used. Unless such information is available, much of the advantage which could be gained from its use is lost due to poor technique, continued limitation in the poundages being used, and subsequent lack of motivation.

The existence of two different techniques or methods of performance poses many problems in the teaching of the sport. The position of the teacher is very similar to that which existed in the teaching of competitive high jumping in track and field until very recently. In spite of the proven superiority of the straddle technique over the western roll, many coaches continued using the latter technique with beginners due to its simplicity and more foolproof take off. Many good jumpers who were thus taught and
then later changed to straddle were plagued for the rest of their careers by periodic appearance of western roll elements in their technique during crucial stages of competition. We are now aware of the strength of retention of established motor skills and of the importance of careful early selection of a technique the athlete can retain throughout his career.

A closely parallel situation exists in weightlifting today. The two techniques have enjoyed popularity since the lift was first recognized at the turn of the century. However, squatters have been in the minority until recently due to the lingering effect of the old rule confining lifters to a shoulder width grip. Many of the squatters of previous years were very bad technicians. The result was that squatting had a poor reputation. The lift was believed to be unreliable due to the performer's narrow base (the length of his feet) or the lifter was considered to possess a kinesthetic sense not possessed by the average lifter.

Today, the pendulum is swinging in the other direction. Coaches report eighty per cent successes with the squat technique with heavy training lifts. In the nineteen forties and fifties, most world records were held by splitters. Today, as at the Mexico Olympics, every record is held by a squatter.

Coaches are divided into two camps. Some feel that in physical education classes the split is superior because of its stability, while others feel that this is the very time the squat should be introduced. The opinion is held that the simpler squat is more appealing to non-technically minded beginners and that
its demand for spinal flexibility is valuable from a physical education point of view. Others advance the idea that the more aggressive split structures a better mental approach than a technique like the squat which requires greater sensitivity. Squat proponents maintain that well taught squatting is not unstable and demands no more flexibility than does the split.

There is another important aspect to this problem. It is no more realistic or logical to expect strong carry over into the field of competitive lifting than to expect the majority of our tennis students to go beyond a reasonable level of "enjoyable" tennis skill. In the case of lifting, we teach it to capitalize on a youthful interest in strength with deep roots in social and emotional factors. Through utilizing the activity wisely at the right time, we can make an immediate contribution to physical development. It is therefore important from this viewpoint to utilize techniques which give the best immediate results. Though we hope for carry over in all sports, in this instance long-term interests for a very few must be balanced against immediate results for the great majority.

Need

There was, therefore, a need for a study on the snatch for beginners in weightlifting. This study was designed to show the comparative merits of the two techniques used in the lift. Conditions in the study should be the same as those likely to prevail when the sport is taught at high school and college level.
Delimitations of the Study

This study was designed to investigate the teaching of the snatch lift under conditions usually prevalent in high school and college physical education programs. Experiments carried out under ideal conditions in terms of available time and equipment seldom yield results which are applicable in the teaching situation. The experimental conditions in terms of equipment conform to that which can be procured without undue expense by most institutions. Since the author desired to know what results students can be expected to accomplish from their activity classes in specific activities, the experimental time was restricted to that which prevails throughout the typical activity program at Western Kentucky University.

Definition of Terms

1. Angular Momentum. - One part of the object remains fixed in comparison to the other and rotation takes place round this part, e.g., the trunk rotating around the hip fulcrum in the snatch pull.

2. Catch Position. - The low body position assumed by the lifter in dropping under the bar.

3. Hang Position. - A position used for successive snatch repetitions with the bar at knee height.

4. Linear Momentum. - Movement of a body with various parts traveling at the same speed and direction.

5. Line of Pull. - The path taken by the bar from the floor to the final position.

7. Repetitions. - Successive repeats of the exercise movement.


9. Split Technique. - A method of performing the snatch by splitting the feet forwards and backwards to drop into the catch position.

10. Squat Technique. - The alternative method of performing the snatch by dropping under the bar into a flat footed squat position.

11. Two Hands Snatch. - "The bar shall be placed horizontally in front of the lifter's legs. It shall be gripped palms downward, and pulled in a single movement from the ground to the full extent of the arms vertically above the head, while either 'splitting' or bending the legs."¹

Summary

There are a wide range of motor skill and sport activities available for selection and inclusion in the physical education program, but only a relatively few are of a subjective developmental character. Olympic weightlifting has a place in the curriculum because it is a sport which demands physical qualities normally only attainable through subjective conditioning courses. However, it remains to be established how best the sport should be introduced.

One major area of contention centers around the merits of the alternative methods of performing the two fast lifts, the snatch and clean and jerk. There is a need to examine the position especially as it pertains to physical education classes. The object of this study was to examine this problem with a view to finding if one of the two popular techniques was preferred for beginners in weightlifting on the basis of future success in the skill.
CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

Though weightlifting has been performed in many forms throughout the centuries, its acceptance as an activity by the physical education profession is comparatively recent. In many respects the sport is still struggling to free itself from the bonds of ignorance and the clutches of charlatans.

In view of this recent emergence, the paucity of sound literature is not surprising. Most books and magazine articles have been written by enthusiasts, who based their writings more on empirical practice than on scientific research. The competitive sport of Olympic weightlifting has not been taught in the majority of physical education departments even to physical education majors. As a result, few teachers have acquired more than a superficial knowledge of the sport.

The snatch is the second of the three lifts used in international competition. It has also come into prominence as a training exercise due to its value in producing power in the spinal and hip extensors.

Due to its importance in competition, knowledge of the lift has grown considerably in the last two decades. Nevertheless, due to poor communication between the top competitive coaches and
the educators writing texts for use in schools, coverage of the lift in these texts is still insufficient. Such coverage has generally given a spurious picture of the lift and teaching from the limited explanations proffered would not be likely to be successful.

A distinction is often made between weight training and weightlifting. Such a division hinges around the primary objective for which the lifting is being done. The weightlifter (in the competitive sense) gets stronger in order to lift more weight while the weight trainer lifts more weight in order to get stronger. By a mere changing of objective, as when the weightlifter does his early season training for strength, the two approaches can reverse positions. The important thing is that research on the effects of lifting weights yields results applicable to both approaches.

The Effects of Weightlifting

Working with the system of one single set of repetitions, Berger\(^1\) established that between three and nine repetitions were most effective for increasing strength. In another experiment he established that using three sets was more effective than using one or two sets. He further established that training with six repetitions was more effective when using three sets than with either two or ten repetitions.\(^2\) This research confirmed the


efficiency of practices followed by astute laymen who arrived at similar conclusions by trial and error.

Weightlifters normally work below six repetitions and with more than three sets. In this approach, the usual practice is to consider use of the pyramid system as advocated by Pickering\(^3\) as best when using weightlifting as an aid in athletics. This system was used in this study.

The opinion has been held that weightlifting achieved strength at the expense of speed. However, in an extensive study, Zorbas and Karpovich\(^4\) using speed of arm movement as a criterion proved that weightlifters were faster than non-weightlifters in this movement.

Since weightlifters are usually heavily muscled, the impression can be given that general agility and fitness is lacking. Studies by Chui,\(^5\) Capen,\(^6\) and Masley, Hairabedian, and Donaldson,\(^7\) have indicated that systematic weightlifting improves speed and


general endurance. Capen's study showed weightlifting to be as effective as standard conditioning classes in the production of muscular and circulorespiratory endurance. In another study, Massey and Chaudet \(^8\) showed that no hypertonic state is developed through weightlifting practice provided that the joints are exercised through their full range of movement.

Such evidence, produced by independent investigators would seem to indicate that a well constructed and executed weightlifting program has a place in the physical education curriculum.

Weightlifting Schedules

Weightlifting schedules are extremely flexible and their construction varies with their aim. Programs designed to aid athletes in their various sports have veered in recent years from a pattern based on sectional exercises to one based on massive exercises of a competitive weightlifting character. State \(^9\) in his original book written for the English Amateur Athletic Association, included the snatch among a series of sectional exercises. In these early days, weightlifting authorities had to proceed very slowly in view of the prejudices of the day. Pickering \(^10\) in writing an updated manual, showed how concepts

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have changed since these early days. Great stress is laid on fundamental power development through the fast competitive lifts of snatching and cleaning plus their various derivatives in simpler form. Hoffman advocates a similar approach and type of schedule as best meeting the needs of the competitive athlete. Both of the above authors recommend that athletes place themselves in the charge of a competent weightlifting coach for instructions in the technique of the lifts.

Available Literature

General texts do not offer sufficient technical information or teaching methodology on the snatch. However, the lift is often recommended either as an exercise or incorporated as part of the competitive set of lifts. Hooks recommends that olympic lifting be taught as an integral part of any physical education activity course at the high school and college level. Massey, Freeman, Manson and Wessel make a similar recommendation. They also make specific mention of the dilemma of choice between the squat and snatch techniques of lifting. Miller lists the characteristics


of the two techniques but makes no suggestions as to a choice for beginners or a method of selection.

Some of the best technical information is to be found in publications written by dedicated coaches for the participants and followers of the sport. Britain has been fortunate in having two leading physical educators interested in the sport and able to apply their professional knowledge to the field of competitive weightlifting. Murray, chief coach of Great Britain since 1948, worked with all standards of lifters during his lecture tours of Great Britain. His findings constituted the first kinesiological approach to lifting. His pioneering on split snatching is the basis of coaching schemes in many countries. He later combined with Webster, who succeeded this author as national coach for Scotland, in the production of a specialist text on the two hands snatch.

Teaching the Snatch

There are two important areas in the presentation of the lift—how it should be taught and what should be taught. The former is the least controversial area. Since class scheduling predetermines the regularity of practice periods, the teacher has no control over the matter of distributed or mass practice. In summarizing research


in this area, Singer\textsuperscript{17} indicates that evidence favors slightly the distributed practice method.

In respect to part or whole practice, Murray\textsuperscript{18} advocates the part method in the early stages, an approach confirmed by this researcher in practical experience. Studies on large muscle activities of a complex nature, such as that of Naylor and Briggs,\textsuperscript{19} indicate that the more complex skills are best taught initially by the part method with progression to the whole method as rapidly as possible. The progressive part method is particularly suitable to the snatch once the ability to assume a sound catch position has been learned. Knapp\textsuperscript{20} summarizes that such a teaching procedure is more suited to skills like the snatch where the component parts are successive than in skills where the movements are simultaneous.

What to teach in the snatch is certainly controversial so far as the selection of technique is concerned. The author has corresponded with leading authorities to gain their opinions on this matter. State,\textsuperscript{21} a leader in the teaching of weightlifting as


\textsuperscript{18}Murray, Loc. cit., p. 24.


sport in high schools in England, indicates preference for the split in these circumstances. Weissbrot\textsuperscript{22} is in favor of an almost exclusive teaching of the squat. Holland\textsuperscript{23} indicates that Caucasians should utilize the split initially while Orientals who utilize the squat method of sitting should emphasize the squat. Both Murray\textsuperscript{24} and Webster\textsuperscript{25} indicated that the squat is receiving increased attention at British coaching courses.

Summary

Research has shown weightlifting to be a valid means of increasing strength and power. There has been a trend in recent years to make more use of the massive movements available instead of relying on the simple sectional weight training movements. In this context, the snatch has been recognized as making a sound contribution toward the development of bodily power. However, opinion varies as to the best method or technique for a beginner to learn. The purpose of this study is to throw some light on the problem and thus contribute to a more effective teaching of the sport.

\textsuperscript{22}Letter from Morris Weissbrot, American Summer Youth Clinic Coach, Dec. 19, 1968.

\textsuperscript{23}Letter from Walter Holland, Secretary, British Weightlifting Coaching Association, June 12, 1968.

\textsuperscript{24}Letter from Alastair Murray, British National Weightlifting Coach, Nov. 28, 1968.

\textsuperscript{25}Letter from David Webster, Scottish National Weightlifting Coach, Dec. 10, 1968.
CHAPTER THREE

EXPERIMENTAL PROCEDURES

Selection of Subjects

The subjects selected in this study were freshmen male students at Western Kentucky University who were participating in the required physical education program. They had no previous experience in competitive weightlifting. The students were selected from four classes, each of which had twenty-five students enrolled. Therefore there were one hundred students available for study.

It was important that no physical restrictions should prevent selected subjects from developing full potential in the technique to which they were assigned. Since the author believed that the squat technique might prove difficult initially for some men, only those men readily adaptable to the technique were used in the squat group. This procedure enabled an equitable comparison to be made between the two techniques by having in each group men equally adaptable to the demands of their respective technique.

Accordingly, twenty-six students were selected for the squat group because of their ability to adopt the squat catch position without stress. These subjects and the remaining seventy-four students who were taught the split technique practiced their respective lifts for four practice sessions.
At the end of this time, both groups were tested for one repetition maximum on the snatch. Each lifter was then matched with a member of the split group on the basis of poundage lifted. Where more than one split lifter was available on this basis, that man nearest in body weight to the squat lifter was selected. Thus two parallel groups of twenty-six subjects each were finally selected for study.

Experimental Design

The two groups were exposed to training programs extending over ten additional sessions of fifty minutes duration. Each participant performed a fifteen minute program of flexibility and technique exercises. The first two exercises were designed to produce spinal flexibility in the sagittal plane and to increase dorsi flexion in the ankles. The remaining four movements were based on the snatch technique, stressing the pull and the respective catch positions of each technique. This was followed by a typical weightlifting type schedule based on the one repetition maximum recorded in the test. Each schedule consisted of twenty-two snatches, ranging from forty pounds to fifteen pounds below the recorded maximum. The resistance was increased every third session to provide the overload required for a strength increase.

The ninth session was used as a second test for maximum poundage to assess comparative improvement and allow for a more accurate training load adjustment. Training then continued as outlined before, until the fourteenth session when a final measurement was made in terms of maximum poundage snatched for one maximum repetition.
Experimental Equipment

The study was conducted with three standard six foot bars and one olympic type bar. The discs for the one inch diameter bars were weighed and equated. Separate sets were made up and each was painted a different color. The sets were balanced for weight to two hundred and five pounds each. This weight was found to be sufficient for the purposes of the study. A University owned beam balance was used for weighing both the equipment and the students after its calibration was verified.

A set of wooden blocks was made for use with each set of weights. These were used to bring the bars up to the regulation nine inches from the floor when the twenty-five pound plates were used.

Four different lifting areas on the floor of the experimental room were used throughout the experiment for the placement of bars. The areas were covered with hardboard with the rough side facing up. This surface proved to be excellent; and the lifters had a secure and safe footing. Each area was marked with a Murray training cross. Each cross, twenty-two inches by twelve inches, was used for teaching purposes and was also used in conjunction with a rating scale to assess technique competence.

Information to Subjects

All subjects were told that they were involved in a weightlifting study. They were forbidden to practice outside of scheduled practices. They were then issued an instructional brochure on the technique they were to learn. This brochure included diagrams of the assigned lift stressing lifting positions and principles. Also
included in their packets were a series of performance standards suggested as a possible scale of standards for grading. (It should be remembered that subjects were enrolled in weightlifting classes.) They were told that their grades would depend upon their achieved competence in terms of technique and poundage lifted.

Training and Teaching Procedures

The experimental period was divided into the following three sections:

(1) four orientation practices prior to the first test;
(2) four practices between the first and second test;
(3) a final four practices before the final test.

The aim of the first four practices was to facilitate rapid learning of the fundamentals and permit a sound first test. To this end, emphasis was placed on the flexibility and assistance exercises. For work on the bars, the selected squatters were kept together and splitters were provisionally grouped by bodyweight. During the first of these initial four periods, all subjects were tested in the squat end position, weighed, and taught the warm-up routine. Twenty-six out of the one hundred subjects were selected for the squat group. Twenty-one were considered very adaptable while five were considered to be moderately adaptable to the end position. During the next three periods the lift was taught by the part-whole method both on the platforms and through the warm-up exercises.

Each subject did three sets of pulls with the emphasis being placed on the full trunk extension and weight transference. Five repetitions were included in each set. The subjects then practiced
dropping into the catch position for their respective techniques. Three sets of five repetitions were performed with the emphasis being placed on a modest mastery of the end position and an understanding of the significance of the position. Finally, the subjects performed three sets of five snatches to link the pull with the catch position. Each set was done with a poundage ten pounds in excess of the previous one. During the third session, all snatches were done from the blocks, the subjects were told of the impending test in the next session, and a record was made of the approximate starting poundage for each lifter.

Following the first test, the training schedule was adjusted to a typical weightlifting schedule based on one maximum repetition. The subjects started lifting with a poundage forty pounds below their recorded maximum and performed two sets of five snatches from the hang. All other snatches were taken from the blocks or the floor if the fifty pound plates were used. Two sets of four repetitions were performed with thirty pounds below maximum, then a further two sets of three repetitions with twenty-five pounds below maximum. At twenty pounds below maximum two sets of two repetitions were lifted. Finally, three singles were snatched with fifteen pounds below the one repetition maximum.

The subjects continued to exercise in this manner throughout the remainder of the experiment. Poundage increments were made according to the planned schedule and after the intermediate trial of session nine. Coaching was conducted following the "whole" pattern and reinforced by the assistance exercises which were continued throughout the experimental period.
Testing Procedures

In finding the maximum snatch poundage of each student it was decided to allow five successive attempts following the ascending poundage system. Although in weightlifting competitions only three attempts are allowed, it was felt that with beginners, the five attempt system would insure a more reliable measurement. Such a procedure made allowance for the elementary level of technique attained and allowed a more gradual and therefore safer approach to be made to the limit lift. It also allowed the subjects to repeat a lift which may have failed only for technical reasons. It was not felt that the five attempts introduced a significant fatigue factor.

It was most important that the first test give a true reflection of the lifter's initial ability. To ensure this, in the fourth session (immediately preceding the first test) each subject performed each set with a progressively heavier poundage using ten and five pound increments. The final poundage reached was recorded on the group training board and used as an initial poundage in the first test. From their initial poundage the subjects then advanced in ten and five pound increments with the object of reaching a limit in four attempts, which made available one attempt for a repeat if needed. The author felt that if the subjects failed with their last attempt it was reflective that the poundages achieved were indeed close to an absolute maximum within the limits of the multiples of five and two and a half pounds allowed under weightlifting regulations. However, in several instances, subjects were stopped on their fourth attempt when it became obvious that the excitement
and motivation had caused such a deterioration in technique that a further attempt would be physically dangerous to the student. These students were in any case very close to a maximum accomplished with a resemblance of safe sound technique.

This same procedure was repeated during the intermediate test and the final test to yield the primary comparison figures of poundage lifted.

Assessment of Technique

Lifting ability in terms of poundage lifted is the ultimate criteria of ability in weightlifting. However, for the purposes of assessing the two techniques more thoroughly it was felt that a measurement of the degree of competence in form attained in each method would make the study more valuable.

A rating scale was therefore developed after consultation with a number of outstanding coaches. The scale was designed to measure the degree of technical ability attained by comparing the achieved standard in the key positions of the lift with those considered technically correct.

It is recognized that many great performers in activities with an objective evaluation such as lifting, throwing, etc., do not have perfect form. However, there are certain mechanical principles to which good technique in lifting should conform. These are elucidated in appendix A. The final form of the rating scale was based on these principles and degrees of variation from them.

In its final form the scale follows the pattern established in the sports of gymnastics and diving where performance is rated
by evaluation of position and aesthetic worth. It was found expedient to adopt the principles used in these sports to the problem of evaluation in weightlifting.

As in the sports mentioned, the participant was credited initially with a perfect score, in this instance a value of four points. Thereafter, points were deducted for technical errors.

The rating scale was constructed around four positions dictated by the principles of mechanics. The performer must conform to these positions to execute a technically sound snatch.

The positions are as follows:

1. The relative position of the shoulders to the bar as the bar reaches knee height.

2. The degree of trunk and leg extension reached at the completion of the pull together with the relative position of the center of balance.

3. The position of the lifter in the catch position together with his total position relative to the training cross.

4. The degree of stability in his recovery to the standing position.

The selection of these positions permitted a reliable evaluation. The four positions followed each other in sequence during the lift. The second, third and fourth positions were almost static and allowed adequate time for assessment. The author felt that his twenty years of work with the lift plus his training in judging much more complex movement in competitive gymnastics should allow, over the full period of the study, a sound evaluation of the form in the movements concerned.
The scale gave four points for a perfect performance within the positions selected. One point was deducted for a minor infraction, two points for an error showing greater deviation from sound form, three points for errors showing a lack of mastery of the essentials of the movement, and no points were awarded for a failed lift. In essence this gave a five point rating scale.

Specifically, points were deducted according to the following criteria.

Positions One and Two

One point penalty. - an incorrect position of the shoulders in relation to the bar sufficient to cause a reduction in the speed of the bar plus limited weight transference while still permitting the fully extended position to be reached.

Two point penalty. - (1) a failure to extend the hips fully, or (2) faulty direction with the combined center of gravity of the lifter and the bar traveling backwards.

Position Three

One point penalty, split only. - (1) foot placement left or right of the training cross sufficient to indicate a one legged pull but insufficient to cause a balance adjustment, or (2) a front knee angle of not less than ninety degrees.

One point penalty, squat only. - (1) a trunk lean greater than twenty degrees from the vertical, or (2) positioning the hips no lower than the level of the knees.
Two point penalty, split only. - a catch position with the front feet on or behind the front line of the training cross.

Two point penalty, squat only. - feet jumped back behind the front line of the training cross or placed excessively wide thus restricting the hip sink into the correct catch position.

Three point penalty, split only. - a poor alignment of the bar, shoulders and hips in the catch position.

Three point penalty, squat only. - bar lost after reaching the catch position.

Position Four

Two point penalty. - an accentuated balance problem with the lift being saved.

Three point penalty. - an extensive platform stagger or foot adjustment to recover balance.

General

Four point penalty, split. - failure to complete the lift.

Four point penalty, squat. - bar lost without reaching the catch position.

Following the initial test and matching of the two groups, a limited number of subjects were selected from each group by random sampling for analysis of form. These subjects were assessed by means of the rating scale at every session for the remaining portion of the experimental period.

The technique assessment was made on the last three single lifts of each session. The subjects were then thoroughly prepared
and orientated in their respective techniques. These subjects were lifting within fifteen pounds of their maximum and it was felt that the best reflection of their technical ability was obtained at that point. Research showed that the mean score of the three lifts would be the best indication of acquired skill. This procedure was adopted in the use of the rating scale.

Summary

One hundred freshmen students were initially tested in this study after a period of preliminary practices. The equivalent group method was used in which twenty-six students using the squat technique were matched on the basis of poundage lifted and body weight with twenty-six students using the split technique. Both groups were exposed to the same training schedule. The two groups were compared on the basis of poundage lifted and in degree of technique acquired. A rating scale was developed to make the latter measurement.

Two groups of subjects were matched on initial weightlifting ability with bodyweight also being equalized. They then practiced the two hands snatch for a period of six weeks; one group using the squat technique and the other the split technique.

Maximum lifting capability was measured at the beginning, in the middle and at the end of the learning period. Additionally, a selected number of subjects were rated on technical form on the lifts throughout the study.

The value of this study rests in the determination of a preferred method of snatching for beginners, such preference being determined by superior lifting ability after instruction and practice in one of the two snatching methods. The t test was used to statistically compare lifting ability of the two groups. These tests between groups were designed to determine the truthfulness of the null hypothesis that any difference between the groups could be attributed to chance. Should the null hypothesis be retained, the differences between the techniques would be minimal. Should the hypotheses be rejected, one of the techniques would be significantly advantageous in the teaching of the snatch to beginners.
General Analysis of Progress

Table One shows the general progress of the two experimental groups during the study.

**TABLE 1.**--The means and standard deviations of poundages lifted by both groups in the three tests used during the experimental period

<table>
<thead>
<tr>
<th></th>
<th>FIRST TEST</th>
<th></th>
<th>SECOND TEST</th>
<th></th>
<th>THIRD TEST</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S. Dev.</td>
<td>Mean</td>
<td>S. Dev.</td>
<td>Mean</td>
<td>S. Dev.</td>
</tr>
<tr>
<td>Squat Group</td>
<td>118.4</td>
<td>14.23</td>
<td>123.0</td>
<td>15.92</td>
<td>133.8</td>
<td>13.96</td>
</tr>
<tr>
<td>Split Group</td>
<td>119.0</td>
<td>14.68</td>
<td>126.0</td>
<td>15.50</td>
<td>135.6</td>
<td>15.56</td>
</tr>
</tbody>
</table>

The accuracy of the initial matching of subjects is reflected in the means of 118.4 and 119.0 pounds for the respective groups.

The differences in the means between the first and the third test for both the split and the squat groups show that each group improved in lifting ability during the experimental period. The split group increased 16.6 pounds between the first and third tests and the squat group 15.2 pounds.

The split group showed slightly faster initial improvement between the first and second tests, their mean poundage rising from 119.0 pounds to 126.0 pounds compared with the squat group's improvement of from 118.4 to 123.0 pounds.

There was little change in variability as the study progressed. The squat group began with a standard deviation
of 14.23 pounds and finished with 13.96 pounds. The split group was very similar, commencing with 14.68 pounds and ending with 15.56 pounds.

Significance of Improvement of Experimental Groups

Table Two shows the results of t tests between the beginning, middle, and final scores of the group receiving training in the squat technique.

TABLE 2.--The statistical significance of poundage improvement in the squat group during the study

<table>
<thead>
<tr>
<th>Periods</th>
<th>Mean Diff.</th>
<th>6 diff.</th>
<th>t</th>
<th>Level of Sig.</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>First to Second</td>
<td>4.60</td>
<td>1.88</td>
<td>2.44</td>
<td>.05</td>
<td>.82</td>
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<tr>
<td>Second test</td>
<td>15.4</td>
<td>1.7</td>
<td>8.02</td>
<td>.01</td>
<td>.78</td>
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<tr>
<td>Third test</td>
<td>10.8</td>
<td>1.52</td>
<td>7.10</td>
<td>.01</td>
<td>.87</td>
</tr>
</tbody>
</table>

The values obtained for t being significant at the five per cent level between tests one and two, and at the one per cent level in the remaining tests, the null hypothesis was rejected in each instance. With squat lifters, it was evident that the subjects did improve significantly in the ability to lift during the first half, the second half, and the total experimental period.

The pattern of improvement of the split group was similar to that of the squatters. However, the splitters as discussed
previously were slightly better in the initial training period between the first and second tests. The split group recording significant improvement at the one per cent confidence level even at this early stage of practice.

TABLE 3.--The statistical significance of poundage improvement in the split group during the study

<table>
<thead>
<tr>
<th>Periods</th>
<th>Mean Diff.</th>
<th>σ diff.</th>
<th>t</th>
<th>Level of Sig.</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>First to Second test</td>
<td>7.0</td>
<td>1.52</td>
<td>4.33</td>
<td>.01</td>
<td>.86</td>
</tr>
<tr>
<td>First to Third test</td>
<td>16.6</td>
<td>1.59</td>
<td>10.40</td>
<td>.01</td>
<td>.87</td>
</tr>
<tr>
<td>Second to Third test</td>
<td>9.4</td>
<td>1.71</td>
<td>6.52</td>
<td>.01</td>
<td>.90</td>
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</tbody>
</table>

The values obtained for t were significant at the one per cent confidence level with each test. The null hypotheses were therefore again rejected with the split group. There was a significant increase in lifting ability in the snatch as a result of the training during each phase of the experimental period.

Comparison between Groups

It has been previously shown that both groups gained significantly in weightlifting ability during the study, though at slightly different rates. It is important to know whether or not these gains were similar in the two groups. Table Four shows this comparison.
TABLE 4.--A comparison of poundages lifted in the final test between the squat and the split groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>$\sigma$</th>
<th>$\sigma$ diff.</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squat</td>
<td>133.8</td>
<td>13.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Split</td>
<td>135.6</td>
<td>15.56</td>
<td>4.27</td>
<td>.44*</td>
</tr>
</tbody>
</table>

*Non Significant.

After six weeks of training the difference between the mean maximum lift of groups was 1.8 pounds. Such a small difference certainly indicated that in terms of lifting efficiency, there was little to chose between the two techniques. The obtained t of .44 was insignificant and the null hypothesis was therefore accepted. Neither the squat or the split technique was significantly advantageous to the beginner in weightlifting so far as maximum poundage lifted was concerned.

Analysis of Form

Further comparisons were made of the lifting techniques of six pairs of subjects representing each of the lifting groups. The assessment was done with the last three heavy single lifts of each day of practice for seven consecutive practices. Thus, one hundred and twenty six lifts were assessed for each technique. Table Five shows the statistical findings of this comparison.
TABLE 5.—A comparison of form of representative samples of six
lifters from each group

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>S. Dev.</th>
<th>( \sigma ) diff.</th>
<th>t</th>
<th>Level of Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squat Group</td>
<td>2.42</td>
<td>.66</td>
<td>.144</td>
<td>.128</td>
<td>.20</td>
</tr>
<tr>
<td>Split Group</td>
<td>2.60</td>
<td>.61</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The squat group with a mean points score of 2.42 were slightly poorer than the split groups with a mean of 2.60. Since the rating scale ranged from zero to four with a mid point of two, both groups had reached a point of just over fifty per cent efficiency in technique by the conclusion of the experiment.

The obtained t of .128 shows that the small difference in rating of form between the groups might well be attributed to chance. This t was insignificant and the null hypothesis was therefore accepted. In the teaching of the two hands snatch to beginners, neither the squat nor the split technique was significantly easier for the beginner to master.

In the rating scale a record of each failure was made. Thus out of the three lifts rated a zero score could be recorded for any one of the three lifts which was incomplete under the rating scale conditions.

A comparison between the failed lifts recorded for each of the techniques proved of interest.
TABLE 6.--Comparison of the proportion of failures and successes between the two groups

<table>
<thead>
<tr>
<th>Technique</th>
<th>Total No. of Lifts</th>
<th>Number of Failures</th>
<th>Number of Successes</th>
<th>$X^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split</td>
<td>126</td>
<td>7</td>
<td>119</td>
<td>5.789*</td>
</tr>
<tr>
<td>Squat</td>
<td>126</td>
<td>17</td>
<td>109</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .02 level.

Out of the one hundred and twenty six lifts rated, the squat group recorded seventeen incomplete lifts. By contrast the split group recorded only seven failures. A chi square analysis showed the difference to be significant at the two per cent level of confidence.

This greater consistency of the split in terms of completed lifts could be a factor worthy of consideration. Where squat beginners are experiencing frustration through balance problems and little improvement is in evidence it might be advantageous to utilize the split technique.

Discussion

The results of the study indicate that neither method of snatching is advantageous to the beginner on the basis of poundage lifted or of motor skill mastery. However, the study gave rise to the consideration of further queries, the answers to which would further aid in establishing effective teaching methods for beginners.
It was evident that the utilization of a uniform teaching method did not elicit the best results. The squat snatchers seemed to suffer most from the application of the whole method early in the learning process. More work is required to determine the best merging of part and whole learning relative to the motor educability of the individual.

Summary

The scores obtained for the split and squat groups were statistically evaluated. The t test for single groups was used to establish whether or not the groups had improved significantly in poundage lifted. In both the split and the squat groups significant results were obtained at the one per cent confidence level.

The means of the two groups in poundage lifted at the end of the study were also compared and this difference was found to be non-significant.

The groups were finally compared in their degree of mastery of their respective techniques of snatching. No significant difference was found between the motor skill level reached in one technique as compared with the other. The squatters, however, recorded a significantly higher rate of failure than the splitters, a factor which could influence the choice of technique in some cases.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The problem in this study involved an investigation of the two techniques used in performing the two hands snatch. The purpose was to determine if there was a preferred method of performing this lift for beginners in weightlifting.

Two groups of twenty-six subjects each were matched in initial weightlifting ability and bodyweight. One group performed only the squat technique and the other only the split technique.

The study was conducted over a six week period. The time was divided into three sections; an initial period prior to the first test in which the lift was taught by the part whole method, a second period of lifting practice leading up to the second test, and a third period prior to the final test. In addition to the maximum lifts recorded during the three test periods, a daily assessment was made of technique mastery with a representative sample of subjects.

Maximum lifts and ratings of form were used to examine the comparative merits of the two techniques. Both technique groups were analysed separately to establish the significance of improvement in the poundage lifted. Also, comparisons were made of the final lifting ability and assessments of form of the two groups.
The t-tests employed indicated that no significant differences in either lifting ability or form were observed at the end of the study, and that both groups did gain significantly in lifting ability during the study.

Conclusions

The results of the analysis of data permit the following conclusions:

1. a six week period of practice on the two hands snatch produced a significant improvement in the poundages lifted in both the split and the squat techniques.

2. in the poundage lifted, neither technique was significantly superior to the other.

3. neither of the two techniques was significantly advantageous in terms of motor skill competency at the end of the period of practice.

4. Subjects using the squat technique had a higher rate of failure than those using the split technique.

Recommendations

1. More time appears to be required to establish the sound mechanics of the snatch than was provided in this study. The lengthening of the experimental period might reveal additional information concerning the learning patterns in this specific lift.

2. Further studies could allow for manipulation of learning methods, particularly relating to interposing the part method with the whole method.
3. Investigating the level of knowledge and competency necessary to adequately teach olympic type lifting might prove valuable to the prospective physical educator.
APPENDIX A

Introduction

The teaching of the snatch is firmly based on kinesiological principle. This apparently innocuous movement is difficult to teach if these principles and their implications are not understood.

The lift requires considerable flexibility in the ankle, hip, spinal and shoulder joint complexes. The acquisition of sufficient flexibility is a first priority for any student learning the lift. It is important to use in addition to calisthenic type flexibility exercises, specific movements derived from the lift itself to teach the beginner to adopt the required positions with confidence.

The Starting Position and Arm Spacing

While individual characteristics alter the starting position from individual to individual, certain fundamentals must be observed if the position is to be sound. The feet must be directly under the bar bringing the lifter as close to the intended line of pull as possible, the back must be flat and the shoulders sufficiently in advance of the bar to keep the lifter's center of gravity directly over that of the bar. Variations in arm spacing, trunk and leg lengths and comparative strength of legs and back will affect the
relative angles of legs and back. However, the compromise arrived at by most lifters will find the upper and lower leg angle at an approximate ninety degrees and the shoulder to hip angle some twenty degrees to the horizontal.

The rules allow any width of grip which the lifter may prefer. However, every width of handspacing changes the nature of the lift and care must be taken to arrive at a spacing suitable at that specific stage of the lifter's progress.

The mechanical principles involved are as follows. A very narrow grip would involve pulling the bar very high indeed, and would decrease the effect of body and leg power on the total pull, thus all lifters use a hand spacing in excess of shoulder width. With a hand spacing equivalent to the distance from elbow to elbow, with the arms raised to the horizontal, we have the most efficient spacing so far as leverage is concerned. The effect of a wider spacing is to increase the moment round the shoulder fulcrum.

There are, however, many other factors to be considered. The wider the grip, the less height is required in the pull. However, set against that advantage is the disadvantage of a less efficient starting position. As the hand spacing increases, the shoulders are drawn down and the trunk to upper leg angle is decreased. This, plus the hip fulcrum moving back from the line of the pull of the bar means a starting position of considerable mechanical disadvantage.

Squat lifters have yet another factor to consider. Their hand spacing must be wide enough to permit the bar to be set on a vertical plane at or behind ear level in the catch position.
stiffer they are, the wider the grip must be. In addition, many like a grip which is wide enough to allow the head of the humerus to slide past the acromion process of the scapula to allow a margin of safety for lifts which are lost backwards behind the head.

With split beginners in this experiment, the elbow width grip has been used as being the most effective compromise. With squatters we have stayed as close to this grip as shoulder flexibility and safety would allow.

The Pull

The pull is the key to the lift. Much time must be devoted to increasing its effectiveness in both power and method of application.

Four principles govern a good pull. They are all interdependent but must be considered separately as they each make an independent contribution. The principles are:

1. The principle of uniform acceleration.
2. The principle of large muscles first.
3. The principle governing muscular range of movement and power.
4. The principle that power comes from the ground.

In relation to the snatch, these basics apply as follows:

Principle 1. The bar starts from the floor in a position of inertia. When the poundage involved is within forty pounds of the lifter's bodyweight, the bar must be lifted steadily from the floor. The lifter is in such a position of mechanical disadvantage, that any effort to jerk the weight from the floor will merely pull the lifter's
body out of position in terms of bending or flexing the spine and raising the hips relative to the shoulders. Further, in such a position, it will be most difficult to continue to apply power in such a way as to exploit available strength to best advantage.

**Principle 2.** The large muscles of legs and back must be exploited to full advantage before the arms and shoulders are brought into the pull. Indeed, the arms are to be regarded as a mere connecting link transmitting bodily power to the bar until the knee and hip joints are almost straight. Only such a movement pattern will apply when heavier weights are reached.

**Principle 3.** The extensor muscles of ankle, hip and spine work strongest in the inner range of movement or as the joints near complete extension. In addition, as the hip nears extension, the perpendicular distance between the linear line of direction of the lift and the hip fulcrum is greatly reduced putting the lifter in a position of mechanical advantage in which he can exert great force against the accelerating bar.

**Principle 4.** In dropping into the catch position, the lifter momentarily loses contact with the floor. He therefore immediately loses the power to impart more upward speed to the heavy weight. However, he can, by continuing to exert force against the bar, lower himself into the catch position as quickly as possible before the bar's upward momentum is terminated.

We will finally consider the pull in two phases in order to appreciate the merging of these principles with other considerations affecting the pull.
The Pull Phase 1

In moving from the starting position until the bar reaches knee height, the lifter must achieve two objectives. He must move the bar steadily to conform to the previously described principles and must also center the combined center of gravity of himself and the bar over his instep. In order to accomplish this, the shoulders must be kept in advance of the bar and the back angle moved little from that assumed at the start of the lift.

The Pull Phase 2

The second phase of the pull extends from that position where the bar is at knee height, to the limit of the pull. The bar accelerates faster due to muscular and mechanical advantages affecting the lifter at this stage. In addition, a further powerful force can be utilized by the lifter to his advantage. The shoulders drive upwards and backwards while the hips drive forwards and upwards, creating considerable angular momentum which is converted to linear momentum of the bar in a vertical direction. However, in order to be most effective, the shoulders must retain their position over the bar as long as possible. Failure to achieve this limits the distance over which the hips can drive and the shoulders pull. The result is a limitation in the momentum imparted to the bar and also an important directional limitation.

The pull is most effective when the lifter finishes on his toes with the combined center of gravity of lifter and bar moving forwards. This is vital in split lifting, indeed, the slightly lesser importance in squat lifting is the only significant
pulling difference between the two lifts. Should the lifter be unable to maintain his shoulders in advance of the bar during the early phase of the pull, or alternately throw his head backwards in the later stage, he will lose in both momentum and direction at a crucial stage of the lift. Similarly, a premature pull with the arms will lead to the bar swinging away from the lifter and drastically reduce the vertical linear velocity which can be imparted to the bar for any given degree of strength.

At this point, it is necessary to discuss separately the drop into the split and the drop into the squat position.

The Split Technique. - At the completion of the pull, the lifter is delicately balanced on his toes. This is a very narrow base, considering the combined weight of lifter and bar. If one foot is moved before the other, there must be a rapid and perhaps disastrous lateral transfer of the center of balance. Add to this the fact that though the split is stable from front to rear due to the width of the base, laterally it might be less than the width of the hips.

We come thus to the crux of split lifting. The feet must leave the ground at exactly the same time. Only thus can we avoid lateral weight transference and ensuing balance problems. Further, the lifter must drop in such a way that in his catch position, the hips and shoulders are directly under the bar which is slightly in front of him. This is why it is essential for him to have his center of gravity moving upwards and forwards at the completion of the pull.
The lifter must be taught to land with the rear foot first. This tends to happen due to the speed of the foot movement and the rear foot's path of movement. However, as it is most important to use the rear foot as a support to push the hips under the bar, it is wise to teach this movement pattern from the beginning. The fore and aft width of the split is determined by practice. The average width of split is thirty inches, with the criterion being the lifter's ability to sink into a low position retaining the foot (front) flat on the floor.

The Squat Technique. - The squat snatch does not involve so many problems as does the split. In this technique, the margin of error in the catch position is very small. Good technique therefore involves two factors. First, ensuring good bar direction to reduce forward and backward checking to a minimum. Second, a displacement of the feet which enables the lifter to bring the seat as close to the heels as possible. If the pull has been executed properly as described, the bar will be traveling vertically upwards to all intents and purposes. The lifter then jumps slightly forward and everts the feet some twenty to thirty degrees to allow the hips access to a low position.

Ideally, the trunk should be at an angle of fifteen degrees to the vertical. An analysis of top lifters shows an average of twenty-five degrees to the vertical. However, the greater this angle, the higher the hips will be. In addition, the bar will be carried further to the rear inhibiting a full arm drive. Lastly, greater shoulder
flexibility will be required to master the technique. An ideal technique will show the deep hip position and most efficient trunk angle commensurate with stability and efficiency.

Summary

The snatch is not a complex movement, but the mechanics behind it must be understood if the lift is to be taught profitably. The pull is very important and correct performance is essential for a technically sound lift. The split technique is very stable from front to rear, but the width of base laterally requires that no lateral weight transference should be allowed. The squat technique is simpler by comparison but the margin of error is very slim due to the narrow base fore and aft, and by the direction which the bar travels. The positioning of the feet and degree of trunk lean are the factors which determine the hip position and the technical quality of the lift.
APPENDIX B

Maximum poundages lifted in the three tests of the study by each of the twenty-six subjects involved.

<table>
<thead>
<tr>
<th>Subject #</th>
<th>SPLIT First Test</th>
<th>SPLIT Second Test</th>
<th>SPLIT Third Test</th>
<th>SQUAT First Test</th>
<th>SQUAT Second Test</th>
<th>SQUAT Third Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>140</td>
<td>150</td>
<td>155</td>
<td>1</td>
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APPENDIX C

Rating scale scores for six subjects in each technique over seven consecutive training sessions. Each figure an average of three separately rated lifts.

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Total number of lifts rated 126
Non-scoring failures on squat 17
Non-scoring failures on split 7
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