Exploring the Standing Barbell Overhead Press

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ABSTRACT

THE PURPOSE OF THIS COLUMN IS TO EXPLORE THE STANDING BARBELL OVERHEAD PRESS (SBOHP) IN TERMS OF ITS EXECUTION, MUSCULATURE INVOLVED, POTENTIAL BENEFITS, PRACTICAL APPLICATIONS, AND ITS EVOLUTION. THE SBOHP IS AMONG THE MOST ELEMENTARY TESTS OF UPPER BODY AND OVERHEAD STRENGTH. BECAUSE OF ITS REMOVAL AS A CONTESTED BARBELL LIFT, GENERAL EMPHASIS ON THE MOVEMENT HAS DECLINED SLIGHTLY, BUT IT IS STILL WIDELY IMPLEMENTED IN A PLETHORA OF SETTINGS FROM RECREATIONAL AND PROFESSIONAL SPORTS PERFORMANCE TO UTILITY IN REHABILITATION.

INTRODUCTION

The standing barbell overhead press (SBOHP) traditionally held a place in history as one of the basic tests of upper-body strength (6). The 1928 Olympics marked the inception of contesting 3 standardized lifts, including the press, the snatch, and the clean and jerk in international weightlifting events (6). Because of the pressing movement's removal from competition preceding the 1972 Munich Olympics, overhead pressing movements, including the SBOHP can be viewed as relatively underemphasized compared with other competitive lifts in weightlifting and powerlifting. This lack of emphasis can be interpreted in USA weightlifting's 2014 Advanced Training Course manual recommending athletes commit only 10% of their total training volume for assistance exercises to overhead pressing movements. Of 1,250 total repetitions used monthly, only 125 were dedicated to pressing, whereas squatting movements alone comprised 600 repetitions, or approximately 50% of the monthly training volume for assistance exercises (18).

Considering the number of scholarly articles written about the snatch, clean, squat, bench press, or deadlift, articles covering the subject of overhead pressing of any kind remain relatively rare in comparison with the overwhelming amount of studies examining the movements contested in both weightlifting and powerlifting (3,9,16,21). Kraemer and Fleck's 2007 book *Optimizing Strength Training* cites 4 studies validating the efficacy of nonlinear strength training protocol. Of the 4 studies, only 1 incorporated the "shoulder press," whereas all studies used the bench press (8).

Although it has fallen into relative obscurity over the past few decades, the overhead pressing movements have been a staple in many successful recreational and professional strength training and rehabilitative programs (10). This complex, multi-joint movement has potential for heavy loading, along with the incorporation of multiple muscle groups, across multiple planes of movement. These aspects help make the SBOHP an effective means to improve overhead and trunk stability, strength and power for a wide variety of athletic populations (21). Therefore, the purpose of this article is to discuss the technique intricacies of the overhead press and its application use to a wide range of populations including general populations, clinical, athletic, and tactical performance.

It is necessary at this point to address the common misconception of using the term "military press" interchangeably with almost any version of pressing a barbell overhead. Multiple authorities on the execution of barbell lifts, such as USA Weightlifting and the National Strength and Conditioning Association, have released instructional information on the "military press" with conflicting definitions regarding foot position and stance, even though both organizations specifically define different movements as the "military press" (5,7). Because of the confusion caused by this absence of unanimous agreement in terms of definition, it should be explicitly stated that this article describes a standing press using a barbell, executed with a vertical trunk and the feet positioned parallel on a hard surface at approximately shoulder width on the same line. Further information on positioning is provided in the proceeding Execution section. These details separate the SBOHP from what could specifically be labeled a "military press" or any alternative form of pressing.

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KEY WORDS:
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Figure 1. Ideal front rack position (front). Front view of an appropriate rack position before the press. The entire body is rigid, with the balance located toward the middle of the foot, the shoulders elevated to make contact with the barbell and the wrists are in extension.

Figure 2. Ideal front rack (side). Side view of an appropriate rack position before the press. The entire body is rigid, with the balance located toward the middle of the foot, the shoulders elevated to make contact with the barbell and the wrists are in extension.

MUSCLES INVOLVED

The muscles involved in overhead pressing movements comprise a significant portion of the trunk and upper extremities, with contributions provided from the lower body during the standing variations (14). Instructional content from Waller et al. state that as load increases in the standing barbell press, isometric activity from the lower extremities must increase as well (19). The anterior and medial deltoids and the triceps brachii are often viewed as the prime movers in the movement, but the musculature of posterior trunk are incorporated as well (19). The execution of the lift not only includes shoulder flexion from the deltoid and elbow extension through the triceps brachii (1) but varying degrees of shoulder abduction and scapular stabilization (17). Shoulder abduction is brought about by contributions from the rotator cuff (supraspinatus) and the trapezius and deltoids (15). Scapular stabilization plays a crucial role during articulation at the glenohumeral joint, and stabilization of the scapula is contingent on efforts from the serratus anterior, trapezius, levator scapulae, and rhomboids (13). Contributions from the serratus anterior and specifically middle trapezius allow for a "co-activation" force helping to stabilize the scapula and can potentially help mitigate forces associated with shoulder impingement (4).

Cervical and thoracic portions of the spine go through periods of both flexion and extension, as the barbell ascends through a full range of motion, making the spinal erectors significant in their role in maintaining sound positions during the execution of the lift (10). Trunk stabilization is also critical for proper execution and bar placement during exercise which loads the spine vertically (1). Keeping the spine stable requires athletes to brace the trunk using deep abdominal muscles including the transverse abdominis, rectus abdominis, the external and internal oblique and the diaphragm, to generate large amounts of intra-

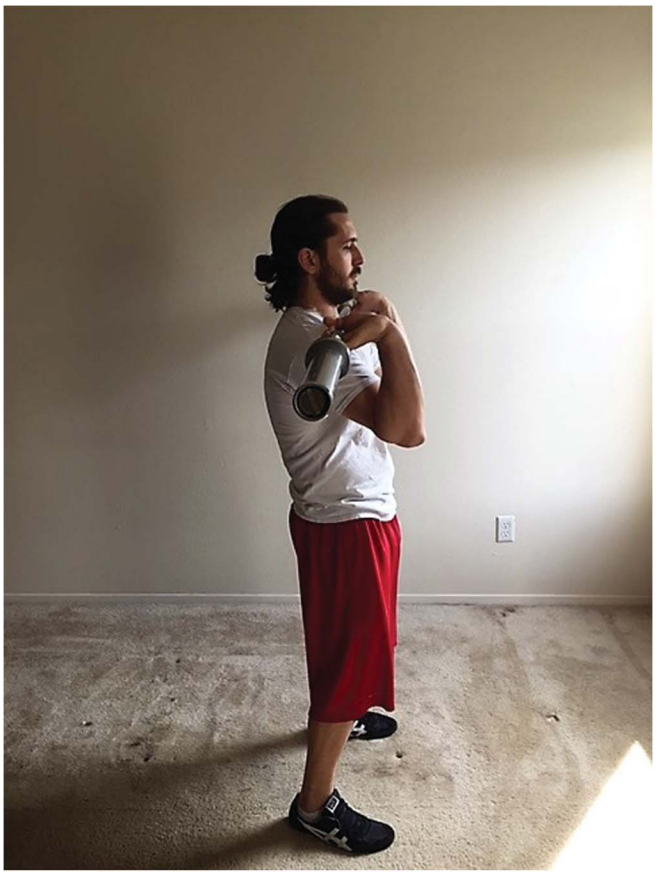

Figure 3. Poor front rack position (side). Poor front rack position. Shoulders are depressed rather than elevated. A kyphotic posture assumed with the barbell resting across the fingertips rather than evenly distributed across the palms and shoulders. The wrists are in hyperextension and the hips are forward shifting the balance toward the toes rather than the midfoot.

abdominal pressure (IAP). IAP is critical for execution of the SBOHP at heavy intensities (1).

BENEFITS

Including the SBOHP in a workout regimen provides athletes with a litany of positive outcomes. Versatility makes the movement a wonderful addition for beginner to advanced trainees. SBOHP requires limited skill when compared with more complex overhead lifts like the snatch, jerk, or even the relatively simplistic push press (12).

Because of this relatively low skill requirement, the press can be used within most any conventional repetition range, from testing maximum strength with 1 repetition maximums to challenging the upper-body's metabolic pathways with sets of 20 or more repetitions (1). This aspect alone makes the SBOHP a great choice for the vast majority of athletes including but not limited to sports with varied skill sets such as volleyball, basketball, wrestling, swimming, American football, water polo, and golf.

Female athletic populations would be well served to incorporate elements of the SBOHP into their strength training because research from McKean and Burkett show significantly more movement in the trunk and spine during the seated shoulder press at high intensities (3 repetition maximum) when compared with their male counterparts (10). This suggests, on average, females encounter more instability in the spine and torso when lifting heavy loads overhead not only leading to compromised performance but potential injury as well. Incorporation of specific trunk and scapular stability exercises can also aid in preventing injury to the glenohumeral joint when used in conjunction with pressing movements (2,13,14,17).

Nearly all groups of populations would benefit from some improvement in upper-body strength and stabilization from the use of a multiplane, multi-joint exercise that can be loaded to coincide with any strength, power, or hypertrophic goal an athlete may have. The versatility of the SBOHP also allows its use in almost any stage of an athlete's annual periodization cycle (1,8). Examples include using the press for high-speed reps, using the dynamic effort in a conjugate training protocol (20), incorporating higher volumes in an off-season hypertrophy program for a basketball player, or manipulation of the training tempos to increase time under tension, improve stability, and challenge eccentric upper-body strength for an American football offensive lineman (8).

Improvement in athletes' upper-body mobility can be added to the list of benefits the SBOHP provides. Practitioners must possess requisite mobility in the hands, wrists, elbows, and shoulders to achieve a sound front rack position during the initial stages of the lift, in addition to the cervical, thoracic, and scapular mobility and stability required to maintain ideal positions throughout the entire range of motion and well after the barbell has been fixed in the overhead position (5). Alternative positioning of the barbell (in the front rack versus behind the head) and hand spacing, (a standard or "medium" grip versus a wide or "snatch" grip) can significantly affect the mobility and stability requirements during the execution of the lift (10,19).

Although few studies have been conducted on pressing movements compared with other resistance training movements, some research has explored the correlation between performing resistance training on an

Figure 4. Ideal midway position (side). Midway position with the bar at approximately forehead height. Trunk is tight, with activity from the posterior and anterior stabilizing musculature. Weight is evenly distributed through the midfoot. The mandible is retracted, allowing a clear pathway for the bar's ascent. Elbows are under the bar or very slightly in front. Wrists are flexing, allowing for a more neutral position, as the bar travels upward to the finish position.

unstable surface and with enhanced muscle activity. Saeterbakken and Fimland concluded that an overhead press performed with a barbell on a stable surface showed significantly higher electromyography data when compared with an overhead barbell press performed on an unstable surface (14). This suggests athletes and coaches can be encouraged in the efficacy and effectiveness of the SBOHP in traditional training environments when compared with training methods that may be more complex, esoteric, and expensive (i.e., the use of unstable lifting surfaces). Furthermore, space and relatively inexpensive equipment is all that is necessary for performing the SBOHP.

EXECUTION

The starting position of the SBOHP begins with the bar in the front rack position using a prone grip of medium width with the elbows oriented downward and outward but slightly forward of the wrists. The bar is located across the palm of the hand (rather than the fingertips), using a closed grip, with the wrists in slight extension (11) (Figures 1 and 2). A common error is to commence the press with the elbows far too low in the rack position with the wrist directly over the elbows, the upper back in a kyphotic (rounded position) and the barbell's weight resting exclusively in the fingertips rather than evenly distributed across the deltoids and palms, behind the clavicle (18) (Figure 3). A slightly lordotic posture should be assumed, as kyphotic postures have been shown to decrease overhead force, although excessive lordosis should be avoided (10).

The feet should be situated approximately parallel, shoulder to hip width apart with the entire body rigid from bottom to top, providing active involvement of the posterior and anterior musculature throughout the body. The lifter's balance should be maintained throughout the duration of the movement by applying pressure to the middle of the foot (18). The athlete should raise the shoulders through scapular elevation and slight external rotation at the glenohumeral joint in an effort to maximize upper-body contact with the surface area of the barbell (5) (Figures 1 and 2). A deep breath should be taken in an effort to expand the diaphragm as much as possible and increase IAP, creating a rigid conduit to transmit a ground reactive force through the entire skeletal frame (1).

After the trunk is placed in an ideal position in relationship to the bar and optimum IAP is achieved, the athlete initiates movement of the barbell away from the body using the prime movers associated with vertical pressing (19). Stability in the scapula, spine, and glenohumeral joint is maintained using contributions from the musculature of the trunk using both the anterior and posterior musculature. Scapular stability calls for specific emphasis on the serratus anterior and middle trapezius to create a "co-contraction" force, allowing the scapula to freely slide throughout the range of motion (4). The mandible should be retracted, as the bar ascends from the starting position. This retraction is the key in allowing the barbell to closely pass the face and ascend to roughly the forehead or midway point. (17) (Figure 4). This midway position involves varying degrees of cervical and thoracic extension. The degree to which this extension occurs largely determines the degree of activity of musculature

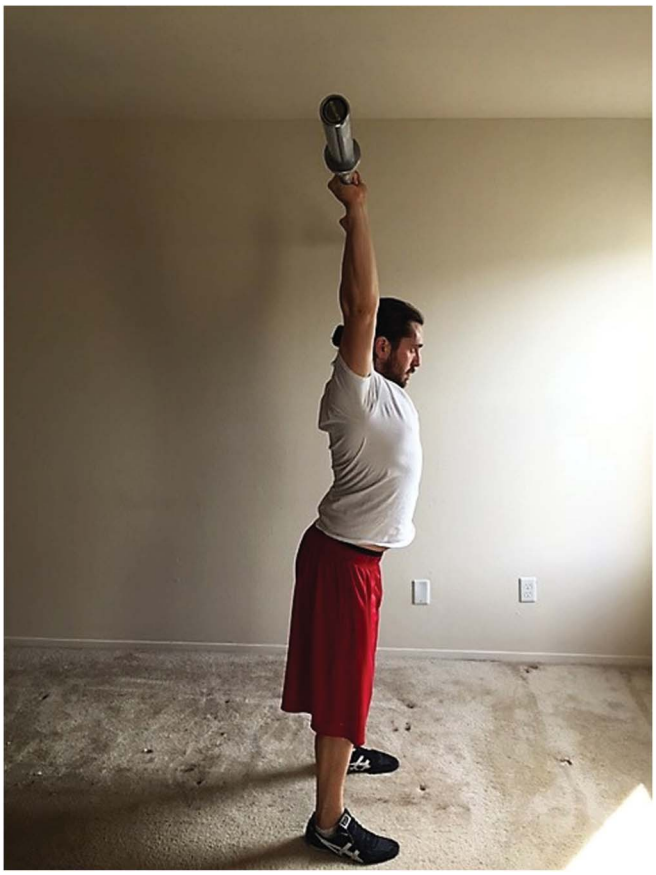

Figure 5. Ideal finish position (side). Ideal finish position with the elbows fully locked. Balance is even over the middle foot; the entire body is rigid. The bar is located over the C2 vertebra, shoulders, hips, and ankles creating a plumb line, where the bar can be supported by the entire body.

associated. (10). It should be noted excessive lordosis in the thoracic or lumbar spine should be avoided to properly activate the musculature associated with pressing movements (19).

Continuing through the midway point, cervical and thoracic flexion occurs immediately after the barbell passes the top of the forehead beginning the final phase of the movement, in which the elbows are fully extended (10). This manipulation of head placement through spinal extension into flexion assists in maintenance of a straight trajectory and appropriately balancing the barbell behind the head located approximately over the C2 vertebra (18,19). The finish position of the movement involves the barbell being centered slightly behind the head with full extension of the elbows and shoulders, scapular elevation and a neutral (as opposed to an extended) wrist position (5,19) (Figure 5).

PRACTICAL APPLICATIONS

Similar to previous statements, the SBOHP has a myriad of uses and applications in a wide array of athletic populations (14). Few other movements possess the potential for improvement in general strength and power in the upper body (10). Because of the low skill requirements and the fluid properties of the SBOHP to encompass such a large portion of the repetition continuum, the SBOHP can be used to improve the strength of a wide variety of athletes over a wide number of different athletic endeavors.

This information provides insight as to the genesis of the tradition that the SBOHP and its variations have long been not only one of the best tests of overall upper-body strength but one of the best tools used in the development of upper-body strength.

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