Overload Underload Training - How it will increase Bat Speed.

HISTORY OF OVERLOAD-UNDERLOAD TRAINING

The concept of overload-underload training is a simple one that has been used since the 1970’s by Olympic athletes to get dramatic performance increases in relatively short amounts of time. Unfortunately, the concept still remained a mystery to the majority of the general public until recent years. Overload Underload training is a training concept that uses resistances slightly above and below what one would encounter in his/her respective sport. So, for baseball that would mean swinging a baseball bat or throwing a baseball that is roughly 20% over and 20% under the normal weight one would usually encounter. The Soviet Union and other Eastern bloc countries studied this concept extensively back in the 1970’s. These countries took great pride in their athletic accomplishments and poured millions of dollars in research into more efficient ways to build better athletes. After experimenting with their Olympic throwers (shot put, javelin, hammer, and discus) they discovered that by increasing or decreasing the resistance of the projectiles that were thrown in practice, they could produce significant gains in throwing distance (and velocity) with objects of regulation weight. This was a huge find since strength and power gains from traditional weight training often doesn’t transfer well to more complex sporting motions such as throwing and hitting.

The Soviets also found out that when greater than 20% resistance was added or subtracted from the training implements, it not only didn’t increase performance but it actually decreased it. By using too much or too little resistance you will be putting in a lot of effort and time to make yourself better, but it is actually time and effort wasted. This again goes back to the fact that timing and biomechanics are essential to sports, which require a high technical component. When objects 20% heavier or lighter than the original objects are used, then the biomechanics of the movement is changed. That means in order to accommodate the additional or reduced load, the athletes would change their movement pattern—which means, in baseball terms, they would change the way they swing or throw, making the training essentially useless. Coaches often use the phrase “practice makes perfect”, but in reality only perfect practice makes perfect. That means someone wishing to increase his bat speed must take each practice swing with perfect technique at game speed in order to have the hope of making noticeable improvements. To become fast and explosive, you must train to be fast and explosive. Quality always wins over quantity. A quick example would be looking at a marathon runner vs. a sprinter. A marathon runner runs for miles at a time in training. A sprinter runs a few short sprints. They are both running, but the differences lie in a) intensity, b) volume of training, and c) rest intervals. Changing those 3 variables makes the outcome of the training drastically different. The take-home message is: if you want to throw faster, you need to practice throwing FAST. If you want to increase your bat speed, you have to practice swinging as fast as possible with perfect mechanics.

Today, a number of the world’s top athletes use overload underload training to gain the edge on their competition. Elite sprinters and swimmers have been effectively using a form of overload underload training to continually surpass old world records. The sprinters and swimmers attach themselves to cords that either provides resistance from behind or a slight tow from in front of them to create a pace that is slightly slower or slightly faster than their top times. This has provided excellent results and was recently used by soccer phenom Freddy Adu who trains at IMG academies, a training academy that has a history of improving the performance of the world’s best athletes.
Many throwers from track and field continue to use the overload underload concept with great results. Baseball, which has a history of lagging behind the times in improving sports performance through science, is even beginning to catch on. The New York Yankees have a strong emphasis on overload underload training for their hitters during the off-season. A number of pitchers have been using overload underload training to drastically improve their throwing velocity as well as strengthen their arms for the wear and tear of a professional season.

Steven Ellis, a pitching instructor who puts out some great information on pitching and training tips, used overload – underload training during his time with the Chicago Cubs to increase his fastball from 90 mph to 96 mph! There are numerous success stories out there but I think the point has been made that baseball players of virtually any level could stand to gain benefits from overload underload training.

Ref: Jon Davis http://www.sbcoachescollege.com/articles/OverloadUnderloadBaseball.html

**STUDIES/SCIENTIFIC RESEARCH**

Over the years there have been numerous studies performed to determine the effects of overload underload training. The majority of overload underload training research focused on throwing baseballs. The research has all come back with stellar results. Not only did the players participating in the program make significant gains in velocity, they also stayed healthy for the following season: a difficult accomplishment considering the stress that throwing a baseball puts on the muscles, tendons, and ligaments of an arm. The two most notable studies on the use of overload underload training for bat speed improvement and throwing velocity improvement come from Coop DeRenne, one of the world’s premier research leaders in terms of overload underload training for baseball. DeRenne and colleagues came to the same conclusion as many of the world’s top sports scientists: overload underload training is one of the simplest and most effective ways to make significant performance improvements in a short amount of time.

**References**


Others to check out


Ammo Bat Co. Experiment

Participants and Pre-testing

This study utilized 13 high school baseball players ages of 15 through 18. These players skill levels ranged from average to elite. In no particular manner were they picked by weight, height, or ability. Player bat and ball exit speeds were individually pre-tested to gather a baseline for the experiment. Bat speed was tested using the Sport Sensor Swing Speed Radar. Radar was placed approximately 6 inches from a stationary tee in the opposing batter’s box. The radar was placed evenly with the height of the baseball. Each player took live swings: striking the baseball from the tee during testing. This gave us a live bat speed read and eliminated factors such as timing and hand eye coordination involved with a moving baseball. Each hitter took 5 swings with either the end-loaded “Slug” or hand-loaded “black powder” bats ---depending on the hitter--- (see bottom of page to determine which overload bat is used) while recording all 5 swings and taking the average of these swings to give them their average bat speed for the overload bats (20% over game bat weight). Players then took 10 swings using the underload bat (20% lighter than their game bat- Bullet) and recorded the average bat speed of the underload bat. Players then took 10 swings with their normal game bat while recording all 10 swings and taking the average to give them their bat speed using their game bat. The game bat results are the main focus of our experiment. We recorded each players bat speed when utilizing the overload and underload bats in order correct comparisons of progress throughout the experiment for research and development purposes. Each player was allowed 3 minutes of rest between tests of the different bats. Initial testing showed bat speeds ranging from 60.4 mph to 84.5 mph with game bats. Players were able to swing the underload bat an average of 8-12 mph faster than their game bat: and 8-12 mph slower than their game bat with the overload bats.

Which overload Bat to use:

**Slug (End Loaded)**-meaning the added weight is in the barrel. The slug is designed for a hitter with a developed swing and solid hitting mechanics. If a hitter with poor mechanics and little strength swings the slug he/she may alter their mechanics in order to compensate for the weight change. If this is the case, the hitter should utilize the hand loaded-black powder. If the hitter can handle the slug without casting or developing a long swing, then the hitter should utilize the slug.

**Black Powder**- hand-loaded meaning the added weight is above and below the handle of the bat. This gives the hitter complete control of the bat head and allows them to stay connected throughout the swing until contact. The Black Powder allows a hitter to develop the strength and power from overload training, while giving the feel of a game bat.
Training program implemented

After warming up with the Black powder, each player were instructed through a series of drills and repetitions utilizing the Ammo Bat Speed System. Players were re-tested every two weeks to see how immediate and consist gains would or would not be. Testing was given and recorded through the same procedures as the pre-test. Players were instructed to use the same bats and the same baseballs that were used in the pretest to cancel out any possible variables.

<table>
<thead>
<tr>
<th>Weeks 1 and 2</th>
<th>Swings</th>
<th>Sets</th>
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<tbody>
<tr>
<td>Warm up series- No Lower 1/2</td>
<td>15-20 Handle loaded bat</td>
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<tr>
<td>Momentum Drill- Shuffle Shuffle</td>
<td>4 overload, 8 underload, 8 game bat</td>
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<tr>
<td>Tee Drill</td>
<td>4 overload, 8 underload, 8 game bat</td>
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<tr>
<td>Front Toss</td>
<td>4 overload, 8 underload, 8 game bat</td>
<td>2</td>
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<tr>
<td>Cage BP-40ft</td>
<td>4 overload, 8 underload, 8 game bat</td>
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Drills were performed 3 days a week for 2 weeks with at least one day of rest in between training days. Total swings per day were 175-180 consisting of 32 overload, 64 underload, 64 game bat, and 15-20 with the handle loaded bat during warm up series. Players retested after the week 2 training.
Description of Results after two weeks-
After 2 weeks of training we saw gains in all three areas with the following averages:
Overload Bat - +4.2 (ranging from +1 to +9)
Underload Bat - +5.5 (ranging from +3 to +14)
Game Bat - +5.3 (ranging from +1 to +15)

Weeks 3 and 4

<table>
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<tbody>
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Drills were performed 3 days a week for 2 weeks with at least one day of rest between training days. Total swings per day were 175-180 consisting of 32 overload, 64 underload, 64 game bat, and 15-20 with the handle loaded bat during warm up series. Players were retested after the week 4 training.
**4 week Testing Results in MPH**

![Graph showing MPH results for different types of bats over weeks 1 to 13.]

**Description of Results after four weeks**
After 4 weeks of training we saw gains in all three areas from week 2 with the following averages:
- Overload Bat: +1.5 (ranging from 0 to +5)
- Underload Bat: +3.85 (ranging from 0 to +8)
- Game Bat: +2.1 (ranging from 0 to +7)

**Total Average Gains of Bat Speed after 4 weeks**
- Overload Bat: +5.7 MPH
- Underload Bat: +9.05 MPH
- Game Bat: +7.1 MPH

**Weeks 5 and 6**

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<td>Momentum Drill-Happy Gilmore</td>
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Drills were performed 3 days a week for 2 weeks with one day of rest in between training days. Total swings per day were 175-180 consisting of 32 overload, 64 underload, 64 game bat, and 15-20 with the handle loaded bat during warm up series. Players were retested after the week 6 training.
Description of Results after six weeks of training

After 6 weeks of training we saw gains in all three areas from week 4 with the following averages:

Overload Bat: +3.4 (ranging from +1 to +9)
Underload Bat: +3.7 (ranging from 0 to +8)
Game Bat: +3.4 (ranging from 0 to +7)

Total Average Gains of Bat Speed after 6 weeks

Overload Bat: +9.1 MPH
Underload Bat: +12.75 MPH
Game Bat: +10.5 MPH

Results

After 6 weeks of training using the Ammo Bat Speed System’s overload underload principles we were able to prove that overload underload training drastically increases bat speed. Increased bat speed with the player’s game bat ranging from +4 mph to +16 mph during a 6 week program. All 13 players showed gains in bat speed while 0 players showed no gains or negative gains. The average increase in bat speed among these 13 participants was 10.5 mph with their game bat. And also showed gains in the overload bat of +9.1 mph and gains with the underload bat of +12.75 mph.
Overall Bat Speed Gains with Players Game Bat

Overall Bat speed Gains with Overload Bat
Conclusion

Utilizing overload underload training principals proved to drastically increase bat speed without altering the mechanics of a hitter’s swing. The overall average of the 6 week Ammo bat Speed system program was +10 MPH. There are many ways to implement overload underload principals however the drills and repetitions utilized throughout this case study have proven the best results we have seen. Utilizing the overload bats to increase strength and power, and the underload bat to generate speed resulted in a well-rounded hitter with an optimized swing. The increase in bat speed allows a hitter to start his swing later in the pitch giving him more time to calculate the location of the baseball as it crosses into the zone.

Training apparatus and equipment

Ammo Bat Seed System

- **Underload bat**- Bullet made by Ammo Bat co.
- **Overload bat**- Slug made by Ammo Bat co.
- **Hand loaded bat**- Blackpowder made by Ammo Bat Co.

**Game bat**- players used their aluminum bat of choice

**Bat speed Radar**- made by Sport Sensor

**Ball Exit Speed Radar**- Pro Stalker II

**Training Program**- Ammo Bat Speed Program