

A double blind placebo controlled study of the LifeWave technology as it relates to the improvement of strength endurance in high performance college athletics

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Abstract

The LifeWave technology is a new supplement and method for the improvement of athletic performance. LifeWave is a means by which an individual may substantially increase their net strength endurance within as quickly as the first use of the product. To evaluate this statement in an unbiased manner, a double blind placebo controlled study was implemented at Troy State University in Troy, Alabama. The principal investigator of this study was Coach Richard Shaughnessy, strength and conditioning coach for the Troy State department of athletics. A standardized test was selected to measure net gains in strength endurance, and in this case the exercise that was performed by all athletes was a 225 lb. flat Bench Press. The baseline data for this test was collected on Thursday June 26, 2003. The comparative data was collected on the following Wednesday July 2, 2003. Athletes were divided into three groups: Control, Placebo and Test. The Control group was tested "as is" on both of these testing days. The Placebo group was given a set of patches filled with water; this group was unaware as to whether or not the patches were real or water filled. The Test group was given a set of patches with the LifeWave technology; again, this group was unaware as to the contents of the patches. It will be emphasized that the athletes using the LifeWave technology used the product only once; the test was performed within 10 minutes of first applying the patches to the athletes.

Metabolism and ATP production

It is well known that in humans in order for locomotion to occur ATP must be available to the muscle as well as all other cells. The biochemistry of metabolism is centered in the synthesis of carbohydrates, fats, proteins and nucleic acids. For the purpose of this discussion we shall concern ourselves primarily with the metabolism, utilization and transport of fats as they pertain to the production of ATP.

In carbohydrate metabolism that involves the glycolysis of glucose molecules to pyruvic acid for the purpose of feeding the Krebs Cycle with high-energy molecules, a process called chemiosmosis is used to pump protons across a membrane and provide the energy for ATP synthesis. The electron carrying coenzyme molecules from the Krebs Cycle enter the chemiosmosis process, the electrons are lost from the coenzymes, the energy is used to pump protons across the mitochondrial membrane, and as the protons flow to the outer compartment of the mitochondrion the energy from the electron flow is used to synthesize ATP molecules.

In contrast, in the metabolism of fats – precipitated by these molecules being first broken down into fatty acids and glycerol molecules during digestion – the glycerol is converted within the cell to DHAP, an intermediary compound. This is important in that the DHAP may continue along a metabolic pathway to pyruvic acid, or the DHAP may reverse and follow another pathway towards becoming glucose.

Of concern in this discussion is the use of fatty acids as a metabolic reactant in the mitochondria of the cell. In a process known as beta-oxidation (the fatty acid spiral) the fatty acids are converted into 2-carbon units of acetyl-CoA. A single fatty acid molecule containing 16 carbon atoms will yield 8 molecules of acetyl-CoA. As each acetyl-CoA molecule enters the Krebs cycle it is metabolized to release its energy. The ultimate formation of ATP after beta-oxidation and the Krebs Cycle is the same as described above. The difference in the sources of energy – carbohydrates or fats – is in that the energy yield from a 16-carbon fatty acid molecule is considerable. With respect to an athlete, it would be highly desirable to be able to utilize fatty acids as an energy source in ATP production in that this could potentially have a desirable effect on stamina and/or strength endurance.

LifeWave principal of operation

The LifeWave technology is a passive non-invasive device composed of water, Oxygen and organic compounds that is worn by the user much in the same fashion as a band aid. This product is not a transdermal patch and it has been demonstrated by the manufacturer that none of the patch active materials diffuses into or comes in contact with the user.

The obvious question that arises is how is it possible for such a device to function other than a placebo effect? It is postulated by the manufacturer that the LifeWave patch passively modulates the oscillating low energy magnetic field that exists just above the surface of the human epidermal layer. This passive frequency modulation creates a condition in which the transport of long chain fatty acids across the mitochondrial membrane for subsequent beta-oxidation and energy production is triggered or improved, thereby providing the user with increased energy via an increase in ATP production as described above.

To understand how this phenomenon could be possible, let us re-examine the metabolic process involving fatty acid energy sources within the human body. Fatty acids, a hydrocarbon in which one of the hydrogen atoms has been replaced by a carboxyl group, are also described as a monobasic aliphatic acid made up of an alkyl radical attached to a carboxyl group. The metabolic role of fatty acids may be described in part in that fatty acids are one of the primary sources of energy for humans, and through Beta-Oxidation, are broken down into basic units of energy. Of interest here is that in order for this process to work, fatty acids need to enter the mitochondria for Beta-Oxidation, and they are unable to penetrate the inner mitochondrial membrane by themselves.

In addition to lipid metabolism, the mitochondria is involved with protein synthesis, and by using either phase-contrast microscopy or electron microscopy, the mitochondrial filaments or rods are seen to be 0.5 micrometers in diameter. This information is significant in that it is reported by the manufacturer that in the LifeWave technology, materials and structures must be selected based upon the resonant and sympathetic frequencies of the mitochondria during lipid metabolism. In the human body, to overcome the problem of the inability of fatty acids to transport from the cytosol (soluble portion of the cell) across the mitochondrial membrane, it has been determined by several researchers that various nutrients are essential to transport long chain fatty acids from the cytosol across the mitochondrial membrane for fatty acid oxidation/metabolism and energy production.

To obtain the desirable effect of improving cell metabolism passively (specifically, increasing the rate of fatty acid Beta-Oxidation by allowing fatty acids to transport across the mitochondrial membrane) the manufacturer constructed a device consisting of orthomolecular organic structures designed to passively interact with the human magnetic field for the purpose of creating a system of frequency modulation, much in the same way that radio waves are modulated to communicate audio information.

Context:

At the time prior to the beginning of this study the relationship between the LifeWave technology and increases in stamina or strength endurance was known by LifeWave Products, LLC but not known by the athletes participating in this study.

Objective:

To quantitatively assess the effectiveness of the LifeWave technology in improving the bench press performance of college football athletes during team training.

Methods:

Using a double blind randomized placebo controlled study, a total of 25 subjects, ages 18 to 22 years, volunteered to participate for this test study. Subjects' baseline bench press data was collected after a brief warm up period. Subjects were asked to bench press a fixed 225 lb. weight until failure. In the next session, subjects were randomized into three groups using a numbering system that labeled participants as test group, placebo group or control group members with 25 completing this two session study. The test group was provided with non-

transdermal patches that contained the LifeWave technology. The Placebo group was provided with non-transdermal patches that contained water. A collection team independent of the players collected and monitored data throughout the study process.

Main Outcome Measures:

The LifeWave technology is a non-invasive patch that demonstrated the ability to improve strength endurance in the majority of athletes that utilized it during a strenuous weight lifting activity.

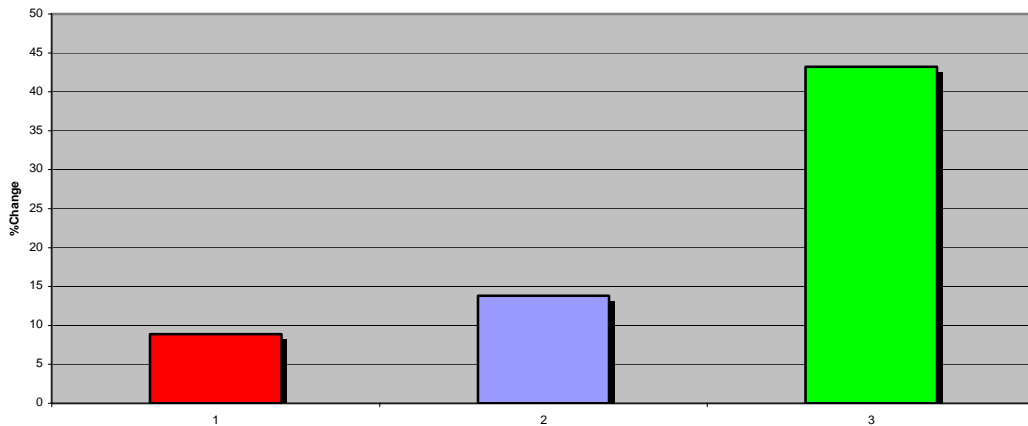
Results:

Raw data collected from the two-day study was as follows; all numbers listed are repetitions performed:

CONTROL				PLACEBO				TEST			
Baseline	Comparative	^Reps	^Percent	Baseline	Comparative	^Reps	^Percent	Baseline	Comparative	^Reps	^Percent
10	10	0	0	23	23	0	0	3	8	+5	+166.7%
4	6	+2	+50%	10	10	0	0	16	15	-1	-6.2%
12	14	+2	+16.7%	7	12	+5	+71.4%	8	9	+1	+12.5%
9	10	+1	+11.1%	21	24	+3	+14.3%	16	18	+2	+12.5%
10	13	+3	+30%	14	8	-6	-42.8%	7	15	+8	+114.3%
5	6	+1	+20%	10	11	+1	+10%	5	8	+3	+60%
20	21	+1	+4.7%	26	27	+1	+3.8%	12	14	+2	+16.7%
18	19	+1	+5.5%	11	17	+6	+54.5%				
6	5	-1	-16.7%								
18	11	-7	-38.9%								

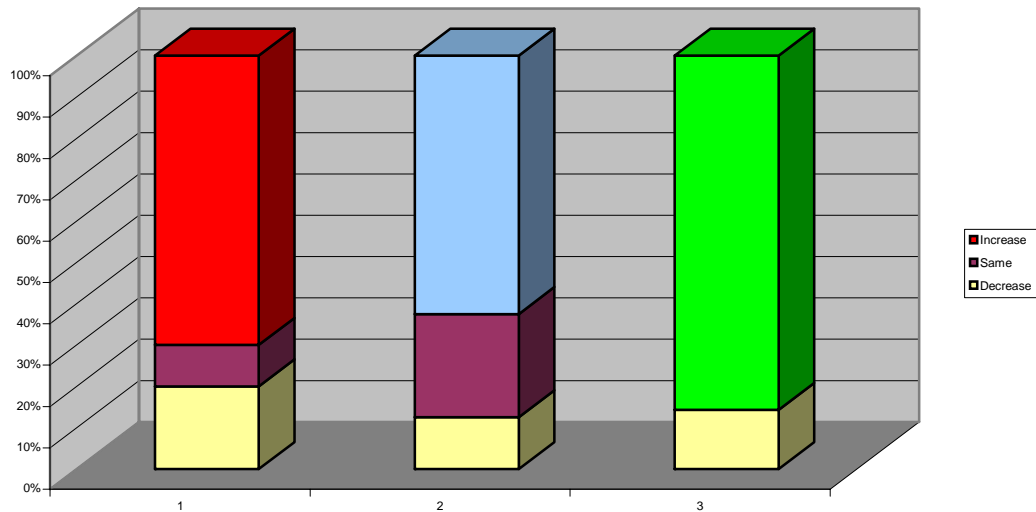
From the raw data collected in the above table, and by removing the highest and lowest scores from each group, it was determined that (1) The average percentage change in strength endurance in the Control group was an increase in performance of 8.9% from the baseline tests to the comparative tests (average 0.875 rep improvement); (2) The average percentage change in strength endurance in the Placebo group was an increase in performance of 13.8% from the baseline tests to the comparative tests (average 1.67 rep improvement); (3) The average percentage change in strength endurance in the Test group was an increase in performance of 43.2% from the baseline tests to the comparative tests (average 2.6 rep improvement).

Average Percent Change In Strength Endurance



In addition, the data shows the following:

CONTROL GROUP			PLACEBO GROUP			TEST GROUP		
Decrease	Same	Increase	Decrease	Same	Increase	Decrease	Same	Increase
2	1	7	1	2	5	1	0	6



The above table gives us the breakdown of athletes in each group as it pertains to showing whether or not an athlete showed a decrease in performance from baseline to comparative test, remained the same in performance from baseline to comparative test, or showed an increase in performance from baseline to comparative test.

In the Control group we see that 20% of the participants showed a decrease in performance during the two-day study, 10% of the participants maintained the same level of performance during the two-day study, and 70% of the participants showed an increase in performance during the two-day study. In the Placebo group we see that 12.5% of the participants showed a decrease in performance during the two-day study, 25% of the participants maintained the same level of performance during the two-day study, and 62.5% of the participants showed an increase in performance during the two-day study. In the Test group we see that 14.3% of the participants showed a decrease in performance during the two-day study, 0% of the participants maintained the same level of performance during the two-day study, and 85.7% of the participants showed an increase in performance during the two-day study.

If we remove the data for the individuals who both decreased in performance and maintained the same level of performance we find that (1) in the Control group, with respect to the 7 individuals who did show an improvement in performance from the baseline to the comparative test the average increase in strength endurance was 19.7%; (2) in the Placebo group, with respect to the 5 individuals who did show an improvement in performance from the baseline to the comparative test the average increase in strength endurance was 30.8%; (3) in the Test group, with respect to the 6 individuals who did show an improvement in performance from the baseline to the comparative test the average increase in strength endurance was 63.8%.

If we remove the data for the individuals who both increased in performance and maintained the same level of performance we find that (1) in the Control group, with respect to the 2 individuals who decreased in performance from the baseline to the comparative test the average decrease in strength endurance was 27.8%; (2) in the Placebo group, with respect to the 1 individual who decreased in performance from the baseline to the comparative test the decrease in strength endurance was 42.8%; (3) in the Experiment group, with respect to the 1 individual who decreased in performance from the baseline to the comparative test the decrease in strength endurance was 6.2%.

Discussion:

Based on the data collected it is evident that there are several distinct differences in athletic performance between the three groups. With respect to the simple averaging of performance numbers, it is not unusual that all three groups experienced an increase in strength endurance given the nature of the test (athletes were in a training session for the upcoming football season). With respect to the Placebo group, a case could be made that there was indeed a "Placebo Effect" that took place; athletes that wore the patch product thought that they had the real technology so hence they made more of an effort to perform. Given the data of the average group performance improvement of the Placebo group of 13.8% (as compared to 8.9% in the Control group) this would be a reasonable spread in terms of attainable improvements from the baseline day to the comparative day. With respect to the Test group, there was indeed a legitimate effect of the LifeWave technology on athletic performance; athletes that wore the patch product experienced an average improvement of 43.2% in strength performance. The spreads in average performance numbers between the three groups is significant and would tend to indicate that the LifeWave technology played an important role in improving strength endurance in the test group.

Another indicator that the LifeWave technology was having a legitimate effect on athletic stamina is evidenced in the chart on page 4. In all three groups we see that the majority of the athletes improved in performance; however, the Control group and Placebo group showed nearly identical percentages of athletes that improved, with 70% of the Control group and 62.5% of the Placebo group. By comparison in the test group we see that 85.7% of the participants experienced an improvement in performance. Given that the Test group had the highest percentage of members who recorded an improvement in performance, with 85.7% of the members demonstrating an improvement, and that the average improvement was significantly higher than the other two groups (43.2%) this would again indicate that the LifeWave technology was having a beneficial effect on athletic performance.

Another important indicator with respect to examining that the LifeWave technology was having a beneficial effect on athletic performance is found when looking at only those individuals who increased in performance or only those individuals who decreased in performance. In the Control group we find that of those individuals who did show an improvement the average gain was 19.7%. In the Placebo group we find that of those individuals who did show an improvement the average gain was close to the Control group at 30.8%. In the Test group we find that of those individuals who did show an improvement the average gain was more than triple the Control group and double the Placebo group at 63.8%. This information would indicate that the LifeWave technology was having a beneficial effect on strength endurance. This improvement is dramatic in that the individuals tested had only used the LifeWave technology for 10 minutes prior to the test.

Conclusion:

Based on the data collected and the results obtained it was demonstrated that the LifeWave technology is a method for the improvement of athletic performance, and more particularly a means by which an individual may increase their net stamina/strength endurance output. The model utilized to evaluate the technology was a double-blind placebo controlled study, with 25 college athletes from the Troy State University football team volunteering to participate in this study. In this evaluation of strength endurance involving competitive athletes both baseline and comparative tests were performed prior to any other type of physical activity. Being that the athletes had a very brief usage of the LifeWave technology, an additional study would prove to be of interest as a comparison to this test study to determine what effect the LifeWave technology has on athletes that incorporate LifeWave into their daily training regime.

It was demonstrated that the Test/LifeWave group using the LifeWave technology showed the highest percentage of improvement in strength endurance when averaging all members, the highest percentage of improvement in strength endurance when averaging only those members who showed an improvement, and the lowest percentage of decreased performance when averaging only those individuals who showed a decline in performance.