THE EFFECT OF MAGNETIC AND HOLOGRAM BRACELETS ON BALANCE

A THESIS

Submitted to the Faculty of the School of Graduate Studies
and Research
of
California University of Pennsylvania in partial
fulfillment of the requirements for the degree of

Master of Science

by
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California, Pennsylvania
2013

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CALIFORNIA UNIVERSITY of PENNSYLVANIA
CALIFORNIA, PA

THESIS APPROVAL

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ACKNOWLEDGEMENTS

First and foremost, I would like to thank God, for all of the many blessing and opportunities he has placed upon me in life. Secondly, I would like to thank all of my professors at California University of Pennsylvania, especially Dr. Thomas F. West. Without their guidance and patience the process of this thesis would have been a much more grueling process. I would also like to thank them all for the education and learning opportunities, and simply the possibility of attending California University of Pennsylvania to obtain my Masters Degree in Athletic Training.

I would also like to thank my family for raising me in an environment that has allowed me to grow as an individual and a professional. I want to give a special thanks to my mother, for instilling my morals and beliefs, which has allowed me to become a successful individual in my eyes. I want to also thank my girlfriend and close friends for all of the support and motivation at times of need during this past year away.

I would also like to thank my undergraduate school as a whole; Cumberland University for the education needed in order to chase my dreams. I would like to give a special thanks to a select few from Cumberland University; Danny

Rogers, James Meadows, Katie Arnold, and La Keisha Fair for helping me grow as a professional and individual throughout my undergraduate career. Without these four individuals motivation, I would have never became the Athletic Trainer I am today, nor would I have ever had the possibilities for all of the great opportunities I have been able to experience.

Lastly, I want to thank my fellow graduate classmates for all of the memories and great times. You all made the process of leaving home and graduate school much easier for me, and the relationships that I have gained with a select few will always be strong. I hope success for you all and look forward to seeing the direction everyone goes. Good luck to everyone and again, thank you for all of the support and help.

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INTRODUCTION

Alternative medicine, is defined as all healing modalities that are not part of mainstream medicine;[1] the use of alternative medicine has dramatically increased in the past five years, introducing many new ideas for people looking for treatment, other than going directly to a doctor. With today's economy, people all over the world are looking for inexpensive alternative methods for treatment, with treatments like magnetic and hologram therapy at the top of the list. Many magnetic and hologram therapy product companies make claims of improved flexibility, strength, balance, and over all well-being while having little, if any, evidence to support their claims. The purpose of this study is to examine whether magnetic or hologram therapy truly has a positive effect upon an individual's balance when being worn versus when the product is not being worn.

Although magnetic and hologram therapy in the form of bracelets has been a growing form of alternative medicine, there has been minimal research performed on either, especially hologram therapy. There are many claims by subjects who have used magnetic therapy as a secondary medicine and experienced amazing, if not miraculous results by using this form of medicine. Magnets are more commonly

used to treat pain and have been promoted for the following: headaches, carpal tunnel syndrome, soft tissue sprains, joint pain, phantom limb pain, fibromyalgia, and chronic pelvic pain.[2] These individuals received various types of treatment with magnetic therapy in order to treat their allotted illness or condition, and many of the subjects experienced positive effects that reduced pain, increased range of motion, and allowed them to participate again in their everyday life.[3-7] However, other studies have been performed in the past that do not support the effects of magnetic therapy.[9] These studies specifically show that magnetic therapy had very minimal effects, if any at all on different conditions and illnesses.

Hologram therapy is an alternative therapy that has not been researched as heavily as magnetic. The evidence to support the effects of hologram therapy is very limited, however the small amount of research that has been performed has unsupportive comments and results related to the efficacy of hologram therapy.[9,10] These articles mainly look at the effects of hologram therapy upon balance, flexibility, and strength and their results state that the effects were not significant, however they state more testing needs to be performed. Even with the articles demonstrating no effect with hologram therapy, the

popularity of the bracelets has sky rocketed with the general public, as well as with professional athletes of all sports.

With the popularity of this new found technology that has been placed in bracelets, necklaces and other devices, research needs to be performed in order to show evidence that either supports or rejects the claims that are made by the companies producing this merchandise; as well as the numerous claims made from professional athletes, and the general public. The research for both forms of therapy is limited, while these companies are making claims that these bracelets can improve a persons overall performance, including their strength, flexibility, and balance.[11] With these claims many athletes of all ages are purchasing these devices in order to get an edge on the field and to perform at their highest level possible. With all these claims arise many questions, however people are still buying these bracelets no matter the lack of supportive evidence available.

Today's athletes are trying harder then ever to improve their performance by any means necessary. With the athletic world becoming more and more competitive, and athletes becoming bigger, stronger, and faster everyday, athletes are willing to take, or wear anything in order to

gain an edge. Magnetic and hologram bracelets have exploded on the athletic scene for the believed increases in performance they possess, and many professional athletes of today are being seen wearing and endorsing these bracelets. With the popularity of magnetic and hologram bracelets, and the allotted claims that are being made about these devices many people are wondering if they truly have a positive effect upon the human body. The purpose of this study is to examine the effects that magnetic and/or hologram bracelets have upon human balance.

METHODS

The primary purpose of this study was to examine the effect that Magnetic and/or Hologram bracelets have upon balance. The following section includes the following subsections: research design, subjects, instruments, procedures, hypotheses, and data analysis.

Research Design

This research was a quasi-experimental, within subjects, repeated measures design. The independent variable will be bracelet condition. The condition will have four levels, Hologram bracelet, Magnetic bracelet, Placebo bracelet, and no bracelet. The dependent variable will be time to stabilization measured by the force platform. Time to stabilization was the point when the subjects weight was within 5% above or below their starting weight, which was then held for at least .5 seconds. The force platform assesses balance by measuring the pressure that was distributed across the subject's foot after they completed the task, such as jumping from a box onto the force platform. By using the force platform the researcher was able to see how quickly a person can recover from a

dynamic movement and regain their balance. This instrumentation potentially allowed the researcher to see the effects of each bracelet by collecting data and evaluating the amount of movement the individual made in order to regain their balance, as well as the time it took them to do so.

Subjects

The subjects that were used for this study will be 25-30 able volunteers, male and female, from California University of Pennsylvania. Subjects will be volunteer students enrolled in health-science courses, which will allow the clinician to reach these students via in class announcement. All subjects verified if they have any known allergies to any of the materials that will be used during the research, such as silicone, cotton, and any metals by completing the demographic questionnaire prior to testing, as well as an informed consent form stating they were aware of the risks involved and were able to complete the testing exercise. Only eligible subjects were able to participate in the study, a qualifying individual was one who is physically fit and able to perform the desired exercise or task. Exclusions that withheld any individual from

participation in the study was an individual who has suffered from a concussion in the past six months, was suffering from any lower or upper extremity injury at the time of testing that could possibly affect the results of the test, anyone who suffered from chronic instability in any lower extremity joint, and anyone who suffered from any visual, vestibular and/or balance issues. All subjects were required to complete a demographic sheet prior to testing to determine their eligibility.

Each subject was required to participate in one 45-minute testing session. All subjects in the study signed an Informed Consent Form prior to participation in the study. The Institutional Review Board at California University of PA approved the study prior to any data collection. Each participant's identity remained confidential and was not be included in the study.

Preliminary Research

There was a pilot study conducted with this research project. Volunteers who met the appropriate guidelines, with no aforementioned allergies, were used to review the protocol. The subjects performed all of the testing procedures. The researcher was looking for the subject's

ability to understand directions, the ability of the subject to perform the allotted testing task, and the effort that the subject put fourth during each trail in order to assure consistent performances. Data was collected on the data collection sheet (Appendix C2).

Instruments

In this research there were three different bracelets used in order to evaluate the effectiveness of each; there was one hologram bracelet (Power Balance), one magnetic bracelet, one placebo bracelet, and there was a trial with no bracelet. The test subjects were all required to wear their own tennis shoes in order to test, and was not allowed to test if they were not wearing acceptable footwear that would be worn during normal physical activity. Along with the bracelets, a black cotton compression band was used in order to cover each bracelet to keep the condition unknown to the test subject. The bracelets were hidden from sight by placing them inside of the compression band, while it still allowed the clinician to easily slide the bracelet and compression band upon the wrist during testing. In addition to the bracelets, the force platform was used, along with its software that

assessed balance by measuring the pressure that it distributed across the subjects foot after they completed a task, such as jumping from one foot to the other onto the force platform.

The Force Platform (Advanced Mechanical Technology, Inc., 176 Waltham St. Watertown, MA, 02472-4800, AMTI Serial #- 5386 Model Number- OR6-7-2000, Type- High Frequency) was used as a landing point for each trial of the bound test. AMTINetForce (Copyright 1999 Advanced Mechanical Technology, Inc., 176 Waltham St. Watertown, MA 02472-4800) was a software application that ran the system for the force platform. Calibration, platform zeroing and the testing trials were run through this software. It allowed correction for body weight, start and stop each trial, and rerun trials if necessary. The Biosoft(Copyright 2004 Advanced Mechanical Technology, Inc., 176 Waltham St. Watertown, MA 02472-4800) software program was used in conjunction with the force platform and AMTINetForce. After running each trial through AMTINetForce, data was reconfigured and accessed through Biosoft. Biosoft provided raw data, graphical analysis and charted comparison between trials. In conjunction with Biosoft, Excel was also used in order to see when each subject reestablished balance, by highlighting the collected data that was within 5% above

and below the subjects weight. This range had to be highlighted for a minimum of a half of second in order to assume balance had been reestablished. SPSS version 18.0 was then used to find the mean balance score for each condition.

Once each individual, with all three bracelets, had completed all the test trails, the data was then compared to see if any, if not all the bracelets had an effect upon human balance.

Procedures

Each subject was screened for any disqualifying factors and only qualifying individuals were able to move forward in the testing process. After screening, test subjects were brought in, one at a time, and they began the experiment. Each participant was shown the desired action, a single leg bound onto the force platform, by jumping from one foot (non-dominate foot) to the opposite foot (dominate foot) of a distance of 90cm(3ft); trying to reestablish balance as quickly as possible once they had made contact with the force plate. The dominance of the subjects' foot was decided upon testing, by asking each subject which foot they would kick a soccer ball with. The subject then

performed the task, as many times as necessary until they decided they were comfortable with the task, which also reduced any learning effect and familiarized the individual with the task. Once the subject felt comfortable with the desired action, testing then began. Each testing condition was performed three times, and the average was taken to decide the final score for each condition.

Each subject was tested under a randomized order of each condition, no bracelet, hologram bracelet, magnetic bracelet, placebo bracelet. After all scores had been averaged, and the final score was obtained, the researcher then compared the data scores to see if there was any significant effect upon balance under any of the tested conditions.

Hypothesis

The following hypothesis was based on previous research and the researcher's intuition based on a review of the literature:

> There will be an effect upon balance with each of the bracelet conditions (placebo bracelet, no bracelet, magnet bracelet, hologram bracelet).

Data Analysis

SPSS version 18.0 was utilized to analyze the data and perform hypothesis testing. A one-way repeated measure ANOVA was calculated to examine differences in score averages due to bracelet condition. An alpha level of $\alpha \leq .05$ will be utilized for hypothesis testing.

RESULTS

The purpose of this study was to examine the effects of magnetic and hologram bracelets on balance. The following section contains the data that was collected during this study.

Demographic Information

Twenty-three active, able volunteers, male and female, from California University of Pennsylvania volunteered to participate in the study. The volunteers were made up of 9 males and 14 females that had no disqualifying factors. All 23 subjects completed the testing successfully. The age ranges for the participants were from 18 years of age, up to 26 years of age. During analysis, any trials where the subject did not return to a balanced state were discarded. If the subject had two or more trials discarded under the same condition then their data was not used in the final analysis. The data from four subjects was disqualified from further examination for this reason, leaving a total of 18 subjects. Therefore, only 18 subjects qualified to have their data analyzed further.

Hypothesis Testing

The following hypothesis was tested for this study. The hypothesis was tested at the .05 alpha level.

1. There will be an effect upon balance with each of the bracelet conditions (placebo bracelet, no bracelet, magnet bracelet, hologram bracelet).

A one-way repeated-measures analysis of variance (ANOVA) was performed comparing the effect of the independent variables, Power Balance bracelet, magnetic bracelet, placebo bracelet, and no bracelet on the time to stabilization.

The mean time to stabilization scores can be found in Table 1. No significant difference was found ($F(3,51)=0.434$, $p>.05$). No significant difference exists among bracelet conditions, Power Balance bracelet ($m=0.566$, $sd=0.2014$), Magnetic-Copper bracelet ($m=0.622$, $sd=0.3031$), placebo bracelet ($m=0.608$, $sd=0.1996$), and no bracelet ($m=0.617$, $sd=0.2093$) means. The recording of these findings report that magnetic and holograms bracelets have no significant effect on balance, resulting in no negative or positive benefits of the application of these bracelets.

Table 1: Means of Time to Stabilization for Bracelet Conditions

Group	Time to Stabilization Mean (s)	Standard Deviation
Power Balance	.566	.2014
Magnetic Bracelet	.622	.3031
Placebo Bracelet	.608	.1996
No Bracelet	.617	.2093

DISCUSSION

This study examined the effect of several different therapeutic bracelets on a balance task. This section will discuss the results of the study in light of the research in this area. The following section is divided into three subsections: Discussion of results, conclusions, and recommendations for further research.

Discussion of Results

Magnetic and hologram therapy in the form of bracelets has been a tremendously growing form of alternative medicine in the recent years, even though minimal research has been performed on either modality, especially hologram therapy. There are many claims by subjects who have used magnetic therapy as a secondary medicine and experienced amazing, if not miraculous results by using this form of medicine.

It was hypothesized that there would be an effect upon balance with each of the bracelet conditions (control, no bracelet, magnet bracelet, hologram bracelet) using the force platform and AMTI NetForce® software application to

run the force platform. Calibration, platform zeroing and the testing trials were run through this software. It allowed correction for body weight, start and stop of each trial, and the ability to rerun trials if necessary. The Biosoft® software program was also used in conjunction with the force platform and AMTI NetForce. After running each trial through AMTI NetForce, data was reconfigured and accessed through Biosoft. Biosoft provided raw data, graphical analysis and charted comparison between trials.

Magnets are commonly used to treat pain and have been promoted for the following: headaches, carpal tunnel syndrome, soft tissue sprains, joint pain, phantom limb pain, fibromyalgia, and chronic pelvic pain.[2] These individuals received various types of treatment with Magnetic therapy in order to treat their allotted illness or condition, and many of the subjects experienced positive effects that reduced pain, increased range of motion, and allowed them to participate again in their everyday life.[3-7]

Hologram therapy is an alternative therapy that has not been researched as heavily as magnetic. There is little evidence to support the effects of hologram therapy on balance, however the small amount of research that has been performed has unsupportive comments and results about hologram bracelets effects on balance.[9,10] These articles

primarily examine the effects of hologram therapy upon balance, flexibility, and strength and their results state that the effects were not significant, however they state more testing needs to be performed. Even with the articles demonstrating no effect with hologram therapy, the popularity of the bracelets has sky rocketed with the general public, as well as with professional athletes of all sports.

The results of this study showed no significant change in performance among the 4 bracelet conditions (Power Balance, Magnetic, Placebo, and No bracelet). The lack of any significant effect supports the few articles that looked at Power Balance bracelets (hologram bracelets) effect upon balance. There was no previous research found on the effect of balance due to magnetic bracelets.

Pothier et al[16] and Verdan et al[17] both have examined the potential effects of the Power Balance bracelet. Pothier et al[16] studied the effect of the Power balance bracelet upon the normal population's balance. A prospective, single blind, randomized, triple placebo-controlled crossover study was conducted. Recruits underwent measurement and gave subjective feedback for each of four band conditions: no band, a standard silicone wristband band, a deactivated Power Balance Bracelet, and

the Power Balance Bracelet. The participants where illegible males or females age over 18, naive to the use of any balance augmentation devices, and having normal vestibular function as assessed by the history and a full neurologic examination. The modified Clinical Test of Sensory Interaction on Balance (mCTSIB) was used to obtain objective data on stability using a force-plate to measure the PL and root mean square (RMS) measurements of sway. The Wii Balance Board in conjunction with BalanceWorkshop software was used to calculate these variables from raw force-plate data. This study suggests that the Power Balance Silicone Wristband has no effect on balance in the healthy population. Although this study seems suitably powered, further work is needed to confirm these results.

Verdan et al[17] also performed a study testing the Power Balance Bracelet and it effects upon strength, flexibility, and balance. The subjects' strength and flexibility were measured using the MicroFit system; Strength was measured via a bicep curl and flexibility via the sit-and-reach method. Balance was measured by the BIODEX system. The test subjects where tested with 4 different conditions for the balance test: eyes open on a firm surface, eyes closed on a firm surface, eyes open on a foam surface, and eyes closed on a foam surface. There were 24 test subjects total, 10

men and 14 women, that were tested in a counterbalanced, double-blind, placebo, controlled test. Each subject performed each test 3 times, once with the Power Balance Bracelet, then the placebo, and then no band. The results of this study showed no significant difference in strength, flexibility, or balance with regard to the treatments used.

Based on the findings of these studies, and the results of this study, the belief that Power Balance bracelets can have an effect upon balance cannot be supported by scientific research. All three studies were performed in a similar manner, and the results for all of these studies showed there was no significant difference in balance while wearing the Power Balance bracelet.

As stated previously, there has been no research found exploring the effects of magnetic bracelets upon balance. With the results found in this study, there is no evidence to support the hypothesis that there would be an effect upon balance due to magnetic bracelets.

Conclusion

The results of this study showed no significant difference upon balance when wearing and of the bracelet conditions. With the results of this study, one could not recommend hologram or magnetic bracelets for any athlete, or general person, to enhance or improve their balance. If an athlete were to ask an athletic trainer, or any other type of clinician about the effects of hologram or magnetic bracelets, one could use this study to show that the bracelets have no performance enhancement abilities concerning bracelets.

Recommendations

The following recommendation should be considered to expand upon this research:

Recommendations for this study would to possibly perform the same research on the Biodex Balance System in place of the Force Platform. This would take out human error from the participants and would allow the researcher to have a more controlled study, with less factors affecting the results, such as making sure the participant jumps the same height and way each time. The Biodex Balance

System would allow a controlled platform for the athlete to stand on, and would limit the possibility of human testing error due to differing levels of effort from the subjects.

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APPENDICES

APPENDIX A

Review of Literature

REVIEW OF LITERATURE

Alternative Medicine, is defined as all healing modalities that are not part of mainstream medicine[28], and these forms of medicine has dramatically increased in the past five years, introducing many new ideas for people looking for treatment other than going directly to a doctor. With today's economy, people all over the world are looking for cheap alternative ways for treatment, with Magnetic and Hologram Therapy being at the top of the list. However, many magnetic and hologram therapy products make claims of improved flexibility, strength, balance, and over all well being without having any evidence to support their claims. The purpose of this study is to examine whether magnetic or hologram therapy truly has a positive effect upon an individual's balance when being worn versus when the product is not being worn.

Magnetic and Hologram Therapy

Definition

A growing trend in today's health care is the use of alternative or secondary therapies by individuals suffering

from a wide range of injuries and disorders. Alternative therapies have been used for centuries, yet only recently has the use of these therapies significantly increased in Western Cultures.[1] Magnet therapy is one such alternative therapy gaining increasing recognition in the United States today that has rapidly grown over the past few years. The therapeutic use of magnets dates to ancient times, when the Greeks, Egyptians, and Chinese all recorded healing powers associated with the earth's magnetic field.[8] Patients today use magnetic therapy by placing various types and forms of magnets along their body in order to treat their illness or injury. Magnets have been shown to relieve stress, combat infections, prevent seizures, reduce pain, and accelerate the healing time of bone fractures and post-surgical wounds.[2]

In order for magnetic therapy to have an effect upon the body there is an interaction that occurs with the magnetic field. Magnetic fields are composed of the areas of energy produced by the permanent magnet and are created by the motion of elections in the atom of the magnet material, such as iron or nickel.[3] These fields remain still and constant and are not pulsating in nature, such as with electromagnetism, which combines constantly moving, or pulsating electric currents with magnetism.[1] The direction

in which the electrons are spinning in the atom determines the polarity, or charge of the magnet and are referred to as "positive" or "negative" and "north" or "south."[3] When electrons spin to the right, a northern polarity and negative charge are created, and to the left, a southern polarity and positive charge.[4]

All magnets consist of two poles in which similar poles repel on another, while opposing poles attract.[2] These poles are thought to have differing effects on the human body.[5] The northern pole is considered negative magnetic energy and is believed to normalize and calm the body. Some of the many proposed actions of the northern polarity include reducing fluid retention, increasing cellular oxygen, reducing inflammation, and normalizing acid base balance. The southern pole is made up of positive magnetic energy and is credited for causing an overstimulation response. Effects of southern polarity, such as increasing intracellular edema, decreasing cellular oxygen, increasing inflammation, and causing more acidity in pH levels.[1]

Hologram therapy has caught its popularity in the recent years and with this comes a very small amount of research to back it theory and effects. Research to explain what hologram therapy truly is, and the effects that it carries along with it is very limited, basically non-

existent. The leading manufacture of hologram bracelets, Power Balance, states that the thin polyester film hologram is programmed through a proprietary process, which is designed to mimic Eastern philosophies that have been around for hundreds of years.[18] Power Balance does not state any other information among their website stating what is actually done to the holograms or bracelets, or even the effects that the bracelets will have upon a person.[18] However, Rein suggests that duplicating the natural dynamic frequency patterns within an externally applied electromagnetic field carrier could be used to treat the body of various illnesses and conditions.[19] With Reins' statements, one can believe that by placing a electromagnetic field carrier, such as a Power Balance bracelet, could have an affect upon the body. Although the effects of holograms is a controversial topic, and research is limited to support the claims by many of the hologram bracelet producing companies, the popularity of these bracelets has drastically grown since their introduction to the public. Professional Athletes have been the most vital promoter of these bracelets and could be the reason for their popularity, even without any research available to support the claims by the companies.

Chronic Pain

One of the leading uses for magnetic and hologram therapy is for the reduction of pain in individuals who suffer from acute pain, as well as chronic. Magnets are more commonly used to treat pain and have been promoted for the following: headaches, carpal tunnel syndrome, soft tissue sprains, joint pain, phantom limb pain, fibromyalgia, and chronic pelvic pain.[1]

One particular study evaluated the effectiveness of magnet therapy for treatment of wrist pain attributed to Carpal Tunnel Syndrome. They conducted a double-blind placebo-controlled randomized clinical trial in which 30 patients with pain, due to carpal tunnel syndrome had either a 1000 gauss magnet or a placebo metal disk applied to the carpal tunnel area using a Velcro wrap for a period of 45 minutes. Pain was measured on a visual analogue scale using 0 and 10 as anchors.[6] The results of this specific study reported that out of the 160 patients who were contacted by mail, 45 replied. 38 qualified for participation, and 30 patients completed the 45-minute treatment protocol: 15 with a magnetic device and 15 with a placebo. The age of each participate did not vary greatly, nor did the presenting symptoms including numbness, tingling, burning, and pain. There were no men in the

magnet group and only 4 in the placebo group.[6] The delivery of a unipolar static magnetic field through a magnetized device that was directly applied to the point of greatest wrist pain resulted in no significant difference in relief of pain when compared with an identical placebo device. However, both magnet and placebo produced a significant decrease in pain during the 45-minute application that was still detectable at the 2-week follow-up. The decrease in pain observed in both experimental and control groups could be attributed to a variety of causes. Most likely, this is a placebo effect due to the patients' belief in the efficacy of the device. Also it is possible that pressure over the pain, due to application of the bracelet, somehow reduces the amount of pain experienced.[6] Although the researchers of this study state that magnets were not effective in treatment of pain due to carpal tunnel syndrome, they did have evidence that pain was reduced greatly during the application time of the magnets, as well as the placebo.

Weintraub et al[12] also looked into the effects that magnetic therapy had upon carpal tunnel syndrome. The researchers wanted to look into whether or not the combination of simultaneous static and time-varying dynamic magnetic field stimulation to the wrist for four hours a

day, for two months, could reduce the pain patients with carpal tunnel syndrome suffer from. Thirty-six random volunteers who suffered from CTS were included in the study. The results demonstrated that the treatment performed provided a significant short- and long- term pain reduction and mild improvement in objective neuronal functions.

Another set of researchers performed a study upon the effect of static magnets on chronic knee pain and if they could improve physical function in a specific group.[7] Forty-seven subjects with chronic knee pain in one or both knee joints were recruited from various patient clinics at an academic health science center and from the local community. No specific radiological or laboratory data were used to diagnose the subjects underlying pathology; however, all subjects reported a physician had told them that their knee pain was degenerative in nature due to previous trauma or osteoarthritis. Subjects where then assigned either to a magnet group or a placebo group, where the magnet group then wore a pad over their knee that contained four unipolar magnets, with the negative side against the patients skin, while the placebo group wore the same device without the magnets implanted. They were instructed to wear these devices for 2 weeks and were

instructed to keep log of how long they wore the device each day. The results suggest that subjects who applied static magnets around their painful knee joints experienced enough pain relief to enable them to perform functional activities with less difficulty. However, most of the subjects in the placebo group experienced little to no change in their pain and function over the two-week period. This case suggests that the use of magnets for chronic knee pain and physical dysfunction is a beneficial alternative treatment for suffering individuals.

Magnetic therapy has also been shown to have positive effects upon individuals who suffer from osteoarthritis in their hips in knees. Harlow et al[9] were interested in if magnetic bracelets reduce pain in patients with osteoarthritis of the hip and knee. They chose to perform a randomized controlled trial with 194 patients between the ages of 45-80 with osteoarthritis of the hip or knee. 66 patients were given strong magnet bracelets to wear, 64 were given weak bracelets, and another 64 patients were given a placebo bracelet. The outcomes showed that the patients who wore the magnets experienced less limb pain, less stiffness and more functioning, showing that magnetic bracelets lower pain in patients with osteoarthritis in the knee or hip.[9]

Harlow et al[10] also performed a study that was a randomized controlled trial set in England. They gathered results from 193 participants by randomly giving 65 a standard magnet, 64 a weak magnet, and 64 received a dummy non-magnetic steel washer. The results showed no significant differences in the baseline characteristics between the three groups. However, there was also a manufacturing error that caused the weak magnets to be to strong during the study and only 28 out of the 64 qualified.

Richmond et al[11] also had a goal to find out the effectiveness of a typical magnetic wrist strap for reducing pain and stiffness, and for improving physical functioning in patients with osteoarthritis. They performed a randomized double blind, placebo-controlled crossover trial where each patient wore four devices over a 16-week period. Forty-five patients where chosen and where given a commercially available magnetic wrist strap, a weak magnetic wrist strap, a demagnetized wrist strap, and a copper bracelet and monitored. The results that were gathered from the test showed no obvious results that any bracelet affected the level of pain that the patients' felt.

Other Uses

Magnetic and hologram can also be used for other disorders, illnesses, and injuries other than chronic pain. Porcari et al.[13] performed a study specifically about the hologram bracelet, Power balance, to test the claims that the hologram bracelets could improve overall well-being.42 NCAA athletes completed four tests where they completed two trails of each test; trunk flexibility, balance, strength, and vertical jump. In one test the subjects wore a Power Balance bracelet, and in the second test they wore a placebo bracelet without knowing. The results of the data collected showed there was no significant difference in flexibility, balance, strength, or vertical jump height between the Power Balance and placebo conditions. The study finds that according to these tests there is no evidence that supports the claims that Power Balance makes.

Mikesky et al[14] performed a study that evaluated the effect of static magnetic therapy on the pain associated with delayed onset muscle soreness. The study performed was a double blind, placebo-controlled study that evaluated 10 males and 10 females, between the ages of 18-32, who were untrained but healthy. Subjects performed two sets of 25 maximal eccentric elbow flexion repetitions on an isokinetic dynamometer to induce muscular soreness. Once

they were done performing the exercise the individuals where then randomly assigned to magnetic or placebo treatment by wearing an armband for the next 7 days. The results showed no significant differences between magnetic and placebo control arms were noted for any of the outcome measures. Results indicate that static magnetic therapy had no effect on the pain associated with DOMS nor did it speed recovery when compared to a placebo control.

Kanai et al[15] wanted to examine the effectiveness of a neck-type magnetotherapy device on 62 patients. The patients were randomly assigned to receive treatment with the MT device or a non-MT device. All patients that where in the study received treatment for 7 days and the results showed that patients, who were treated with MT device, had significant pain relief after three hour of beginning the treatment. These results supports that MT can reduce neck pain and stiffness and is a successful treatment option for anyone experiencing neck pathologies.

Pothier et al[16] aimed a study to determine whether the Power Balance Bracelet (Hologram therapy) affected objective and subjective measures of balance in the normal population. A prospective, single blind, randomized, triple placebo- controlled crossover study was conducted. Recruits underwent measurement and gave subjective feedback for each

of four band conditions: no band, a standard silicone wristband band, a deactivated Power Balance Bracelet, and the Power Balance Bracelet. Participants acted as their own controls. The participants where normal males or females age over 18, naive to the use of any balance augmentation devices, and normal vestibular function as assessed by the history and a full neurologic examination. Exclusion criteria included the following: a serious, unstable medical illness or any concomitant major medical or neurologic illness; pregnant women; a history of external, middle, or inner ear pathology; signs of active ear disease; and latex or any rubber allergy. Patients were recruited from responses to advertisements in the Toronto General Hospital. Informed consent was taken from all participants. The study was given approval by the University Health Network Research Ethics Boards. The modified Clinical Test of Sensory Interaction on Balance (mCTSIB) was used to obtain objective data on stability using a force-plate to measure the PL and root mean square (RMS) measurements of sway. The Wii Balance Board in conjunction with BalanceWorkshop software was used to calculate these variables from raw force-plate data. This study suggests that the Power Balance Silicone Wristband has no effect on balance in the normal population. Although

this study seems suitably powered, further work is needed to confirm these results.

Verdan et al[17] also performed a study testing the Power Balance Bracelet and it effects upon ones strength, flexibility, and balance. The subjects' strength and flexibility were measured using the MicroFit system; Strength was measured via a bicep curl and flexibility via the sit-and-reach method. Balance was measured by the BIODEX system. The test subjects where tested with 4 different conditions for the balance test: eyes open on a firm surface, eyes closed on a firm surface, eyes open on a foam surface, and eyes closed on a foam surface. There were 24 test subjects total, 10 men and 14 women, that were tested in a counterbalanced, double-blind, placebo, controlled test. Each subject performed each test 3 times, once with the Power Balance Bracelet, then the placebo, and then no band. The results of this study showed no significant difference in strength, flexibility, or balance with regard to the treatments used.

This are just a few other uses that magnetic and hologram therapy have been used for, however there are many other illnesses or diseases that these forms of therapy could be used for. With more research, these alternative

medicines could be found to have positive affects on a wide variety of illnesses and diseases.

Balance

Balance can be defined as "the state of bodily equilibrium or the ability to maintain the center of body mass over the base of support."[20] Balance is a vital role for any person, whether they are an athlete, or just an employee for a law office. Without Balance individuals would be unable to perform simple everyday tasks such as, walking, bending over, or simply standing in place. For athletes, balance can be one of the most crucial and vital aspects of their athletic performance, because without good balance an athlete is very limited in their abilities.

Today's athletes are able to perform at a level that was unachievable in past years, and every athlete, whether they are a professional or a pee-wee league football player, want to be able to perform at their highest levels possible and are willing to do whatever it takes in order to achieve this, such as buying bracelets that possess technology that can increase their balance and many other abilities. Balance is a combination of center of balance, postural control, center of pressure and base of support.

Maintaining balance also includes both sensory and motor components.

Sensory Components of Balance

Postural stability is controlled through a combination of visual, vestibular, and proprioceptive neural input, which comes from the central nervous system.[21-22] Information is gathered from these three inputs and is processed to establish the motor controls to follow, which then result in a muscle action.

Postural stability is dependent on the athlete's base of support, the larger the base of supports the better the balance. Base of support can be defined as the area of the body that is making contact with the ground or environment. In many sports athletes are rarely on two feet for long periods of time, making their base of support very small. Therefore the inputs from visual, vestibular, and proprioceptive sources must be interpreted and acted on quickly so that motor commands can maintain equilibrium in the body.[23]

Proprioception can be described as being able to detect changes in specific joint position and being able to adapt to that change.[24] It is a combination of input from

mechanoreceptors that are contained within the joint, ligaments, tendons and the skin which work together to give the sense of change in joint position.

Visual input is an important part of balance, because of the information that is gained through vision, which then goes to the brain to be analyzed and put into motor commands. Although visual input is important, it is not necessary in healthy individuals. In healthy individuals they are able to close their eyes and can still maintain balance with little change in movement.

The vestibular sensory component also plays an essential role in balance. It is a part of the hearing system and contributes to equilibrium and movement. Signals from the vestibular system send outputs to the eyes and to muscles. The signals to the muscles help keep correct posture to maintain balance.[23]

Types of Balance

There are two common types of balance, static balance and dynamic balance. Static balance is when an individual is standing in a fixed position with minimal movement. This form of balance is minimal in athletics, due to the fact that the majority of sports require the body to be in motion in order to perform.

Dynamic balance is the form of balance that is most critical in an athlete's performance because it is balance that occurs during plyometric movements such as jumping or running. This form of balance occurs while an athlete is in motion and many factors effect dynamic balance, such as the environment around the athlete and the sensory motor components of the body reacting to the surface and environment that the athlete is participating in.

Psychological Aspects

Placebo affect

The mental capability can be one of the best strengths of an athlete, or one of the greatest weaknesses. The effects that the brain can have upon the body are astonishing. There are reported cases that prove that just because a person believes a device or treatment should help them that it actually has positive effects upon them. However, in many cases, these magic cures or devices are just placebos that are used.

According to Brody, "A placebo is a treatment believed not to have a specific effect on the illness or condition to which it is being applied."[25] These placebos that are used can range from any treatment from a topical cream,

form of oral capsule, to electrical stimulation to the body. None of the treatments are scientifically proven to have positive or negative effects upon an illness or disability. Beedie and Foad,[26] researchers at Canterbury Christ Church University, did a study over the placebo effect in sports performance over 12 intervention studies. The studies they examined looked at the placebo effect on endurance performance, strength performance, and on anaerobic performance. In order to evaluate the effect of a placebo on sports performance the researchers supplied the individuals with an inert substance that the test subjects thought was an ergogenic aid. The findings suggest that psychological variables such as motivation, expectancy, conditioning, and the interaction of these variables with physiological variables, might be significant factors in driving both positive and negative outcomes.

Benson and Friedman looked into how the placebo effect can play a vital role into a person's recovery and health. The researchers tested several different individuals suffering from illnesses ranging from congestive heart failure to a group of asthmatic patients. While testing these patients, they would treat one group with their normal everyday treatment and treat the second group with the normal everyday treatment along with a placebo in order

to see how the placebo affected the patients' rate of healing and success. In the majority of the studies the patients who received the normal treatment along with the believed beneficial placebo often showed greater positive results versus the group that was just treated with the standard treatment.[27]

The research supporting the placebo effects are abundant because there are unexplained cases where people have had positive results from unexplainable treatments. The placebo effect also plays a vital role in sports that can give an athlete an edge over their component. An athlete has various ways of psyching themselves up for a game, whether it be by listening to music, reading a piece of literature, or simply by listening to their coach praise and back them. All of these affect the mental status of an athlete and can decide whether the athlete is going to perform or fail. Outside sources also give athletes mental edges over their competitors, such as wearing compression clothing that supposedly increases reaction time, strength, and power and other things such as magnetic and hologram bracelets. If the athlete believes in the claims that are made by the companies producing these devices then the placebo effect has an endless opportunity of having positive affects upon the athlete.

Summary

Magnetic and hologram therapy are both rather new forms of treatment for many individuals of the world today. The growth of these therapies in the form of bracelets have been rapid and are grossing thousands of dollars daily, to the point where these magnetic and hologram bracelets can be seen daily at any given location. With the amount of professional athletes that support these bracelets and endorse them, the popularity of the bracelets has gone beyond anyone's expectations.

Magnetic therapy, in its various forms, has been researched more heavily then hologram therapy, and there has been significant evidence found that supports the claims and uses of magnetic therapy. Evidence shows that the use of magnets can range from reducing chronic or acute pain, to help managing many forms of arthritis, and even help relieve pain associated with Dysmenorrhea in women.[29] The evidence to support hologram therapy however is very limited. It is the newer technology of the two and researchers have not had the desire to look into it as deeply as magnetic therapy. The findings on hologram therapy is very limited and there is minimal evidence that

supports it has positive effects on performance of individuals.

With the popularity of these two forms of therapy growing so quickly worldwide, research needs to be conducted in order to support the claims that many of the companies are making. Professional athletes, as well as everyday athletes are buying these bracelets that contain these forms of technology everyday in order to get an edge on the field. With the claims that many of the companies make about increased overall performance, from increase strength, flexibility, and even balance, these bracelets are appealing to anyone who wants to better him or herself overall. With these claims the question arises: “Do Magnetic and/or Hologram Bracelets have an effect upon human balance?”

APPENDIX B

The Problem

STATEMENT OF THE PROBLEM

Secondary Medicine has dramatically increased in the past five years, introducing many new ideas for people looking for treatment other then going directly to a doctor. With today's economy, people all over the world are looking for cheap alternative ways for treatment, with Magnetic and Hologram Therapy being at the top of the list for many people across the world. However, many magnetic and hologram therapy products, like bracelets, make claims of improved flexibility, strength, balance, and over all well being without having any evidence to support their claims. The purpose of this study is examined whether magnetic or hologram therapy truly has a positive effect upon an individuals balance when being worn versus when the product is not being worn.

Definition of Terms

The following definitions of terms will be defined for this study:

1) Bracelet Condition – Hologram, Magnetic, Placebo, and no bracelet will be used in order to assess the effect that each has upon human balance

2) Balance- Evidence will be gathered to evaluate if there is any difference in human balance with each condition.

Basic Assumptions

The following are basic assumptions of this study:

1) The subjects will be honest when they complete their demographic sheets.
2) The subjects will perform to the best of their ability during testing sessions.

Limitations of the Study

The following are possible limitations of the study:

1) Participant effort could be inconsistent during testing.
2) Testing done in the lab is not sport specific tests.
3) There may be a learning effect while performing the bound exercise.
4) The subjects are volunteers and are limited to physically active subjects from California University of Pennsylvania and therefore it is not randomized.

Significance of the Study

The results of this study will evaluate the effects that magnetic and hologram bracelets have upon human balance, and will either justify the claims, and popular growth of these bracelets, or it could prove that these claims have no merit. This will allow athletic trainers to better advise their athletes and patients in regards to these alternative medicine options.

APPENDIX C

Additional Methods

APPENDIX C1

Institutional Review Board Approval

From: instreviewboard <instreviewboard@calu.edu>
Subject: IRB approval as ammended #12-049
Date: March 5, 2013 1:03:18 PM EST
To: "MOS8414 - MOSS, CHARLES R" <MOS8414@calu.edu>
Cc: "West, Thomas" <west_t@calu.edu>

Institutional Review Board
California University of Pennsylvania
Morgan Hall, Room 310
250 University Avenue
California, PA 15419
instreviewboard@calu.edu
Robert Skwarecki, Ph.D., CCC-SLP,Chair

Dear Mr. Moss:

Please consider this email as official notification that your proposal titled "The effect that magnetic and/or hologram bracelets have upon balance" (Proposal #12-049) has been approved by the California University of Pennsylvania Institutional Review Board as amended.

The effective date of the approval is 3-5-2013 and the expiration date is 3-4-2014. These dates must appear on the consent form.
Please note that Federal Policy requires that you notify the IRB promptly regarding any of the following:
(1) Any additions or changes in procedures you might wish for your study (additions or changes must be approved by the IRB before they are implemented)
(2) Any events that affect the safety or well being of subjects
(3) Any modifications of your study or other responses that are necessitated by any events reported in (2).
(4) To continue your research beyond the approval expiration date of 3-4-2014 you must file additional information to be considered for continuing review. Please contact instreviewboard@calu.edu

Please notify the Board when data collection is complete.
Regards,
Robert Skwarecki, Ph.D., CCC-SLP
Chair, Institutional Review Board

Appendix C2

Individual Data Collection Sheet

EFFECT OF HOLOGRAM AND MAGNETIC BRACELETS ON BALANCE

BY: RANDY MOSS

DATE:

MALE_____	FEMALE_____	SUBJECT #_____
POWER BALANCE		
MAGNETIC BRACELET		
CONTROL		
PLACEBO BRACELET		

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ABSTRACT

TITLE: The Effect of Magnetic and Hologram Bracelets on Balance

RESEARCHER: Randy Moss Jr., ATC/L, PES

ADVISOR: Dr. Thomas F. West

PURPOSE: The purpose of this study was to examine the effects of Magnetic and Hologram bracelets on balance.

METHODS: This research is a quasi-experimental, within subjects, repeated measures design. The independent variable will be bracelet condition. This condition will have four levels, Hologram bracelet, Magnetic bracelet, Placebo bracelet, and no bracelet. The dependent variable will be balance score based on the force platform and AMTINetForce software application, which will be used to run the force platform. Calibration, platform zeroing and the testing trials were run through this software. It allowed correction for body weight, start and stop each trial, and rerun trials if necessary. The Biosoft software program was also used in conjunction with the force platform and AMTINetForce. After running each trial through AMTINetForce, data was reconfigured and accessed through Biosoft. Biosoft provided raw data, graphical analysis and charted comparison between trials.

FINDINGS: Twenty-three active, able volunteers, male and female, from California University of Pennsylvania volunteered to participate in the following study. The volunteers were made up of 9 males, and 14 females. All 23 subjects completed the testing successfully, with no reported injuries. The age rang for the participants were from 18 years of age, up to 26 years of age. Four subjects collected data was disqualified from further examination due to error that occurred during the data collection process. The

	disqualification of their collected data was decided due to lack of evidence to support the four bracelet conditions. Therefore, only 18 subjects qualified to have their data analyzed further. A one-way repeated-measures analysis of variance (ANOVA) was performed comparing the effect of the independent variables, Power Balance bracelet, magnetic bracelet, placebo bracelet, and no bracelet on the dependent variable, each balance score based on the force platform. No significant difference was found ($f(3,51)=0.434$, $p>.05$). No significant difference exists among bracelet conditions, Power Balance bracelet ($m=0.566$, $sd=0.2014$), Magnetic-Copper bracelet ($m=0.622$, $sd=0.3031$), placebo bracelet ($m=0.608$, $sd=0.1996$), and no bracelet ($m=0.617$, $sd=0.2093$) means.
CONCLUSION:	The recording of these findings report that magnetic and holograms bracelets have no significant effect on balance, resulting in no negative or positive benefits of the application of these bracelets