THE EFFECT OF WEARING THE ENERGY NECKLACE
ON CYCLING PERFORMANCE

A Manuscript Style Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science, Clinical Exercise Physiology

Joseph Mark Kaisersatt

College of Science and Health
Clinical Exercise Physiology

August, 2013
THE EFFECT OF WEARING THE ENERGY NECKLACE ON CYCLING PERFORMANCE

By Joseph Mark Kaisersatt

We recommend acceptance of this thesis in partial fulfillment of the candidate's requirements for the degree of Master of Science, Clinical Exercise Physiology

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ABSTRACT

Kaisersatt, J.M. The effect of wearing the energy necklace on cycling performance. MS in Clinical Exercise Physiology, August 2013, 40pp. (C. Foster)

The purpose of this study was to determine if wearing the Energy Necklace can affect steady-state exercise responses, competitive exercise performance, or enhance recovery from exercise in competitive cyclists. Sixteen subjects (13 male, 3 female) performed a VO2max test and two habituation sessions. Subjects then completed two randomized, double-blinded 10 km time trials on a cycle ergometer, one with the Energy Necklace, and one with the placebo necklace. Heart Rate (HR), Rating of Perceived Exertion (RPE), and lactate ([HLa]) responses were measured during warm-up, time trials, and cool-down. Time to complete each time trial was recorded. There were no statistically significant differences in HR, RPE, [HLa], or time to completion between the Energy Necklace and the placebo during warm-up, time trials, or cool-down. The result of this study demonstrates that the Energy Necklace does not enhance athletic performance as claimed by the manufacturer.
ACKNOWLEDGEMENT

I would like to express my gratitude to Dr. Carl Foster, my committee chair, for all of his time and effort he contributed towards my master’s thesis. Without his guidance and support this study would not have been possible.

I would also like to thank my committee members, Dr. John Porcari and Dr. Clayton Camic, for their continued support and willingness to help through the learning process of this thesis.

Furthermore I would like to thank Chris Dodge for keeping the lab running, and all of the participants who took time out of their busy lives to help me in the completion of my master’s degree. Thank you to the manufacturers of the Energy Necklace for their financial support.

Last but not least, I would like to thank my parents, Mark and Debbie Kaisersatt, for their love and endless support in all of my endeavors.
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INTRODUCTION

For as long as humans have been able to compete in sports, they have always strived for advantage over their opponents. In the ancient Olympic games, athletes tried many herbs and experimented with their diet in hopes of increasing athletic performance (Yesalis & Bahrke, 2002). Today, human competitive nature is no different than it has always been. A recent study examined whether consuming large quantities of beetroot juice, rich in dietary NO3−, could enhance the performance of well-trained cyclists and found that acute dietary NO3− supplementation did not significantly alter time trial performance in well-trained cyclists. But, the slight improvement shown (0.8%) could be meaningful in competition (Wilkerson, Hayward, Bailey, Vanhatalo, Blackwell, & Jones, 2012). Modern technology and advancement continues to open new avenues for athletic enhancement to explore.

Performance wear as an ergogenic aid is a relatively new phenomenon. The first collaboration of an athlete with a sneaker company was that of Bob Cousy, Boston Celtics star, with PF Flyers (New Balance, Boston, MA) in the 1950’s. Since then many products have entered the market boasting athletic claims. Performance jewelry is one more category of athletic products on the market, claiming to improve balance and flexibility.

Unfortunately, companies producing performance jewelry have very little scientific evidence to support their claims, and those that do frequently have poor test
design. One such product, the Power Balance bracelet (Power Balance Technologies Inc., Lake Forest, CA), was recently third party tested with the finding of no significant differences in flexibility, balance, strength, or vertical jump height between the Power Balance bracelet and a placebo (Porcari, 2011).

With any product, the power of persuasion (e.g. the placebo effect) can be extremely important. A review that addressed 12 studies testing the placebo effect reported that, in all but one, statistically significant placebo effects were evident (Beedie & Foad, 2009). The studies showed the wide scope a placebo effect can potentially influence, from strength performance to pain tolerance. Subjects have also been intentionally misinformed, giving support to the ability of a placebo agent to effect change (Wright, Porcari, Foster, Felker, Kosholek, Otto, Sorenson, & Udermann, 2009). Simply believing in these claims increased performance, justifying the need for control groups in exercise studies.

A new product that is not yet on the market is of interest and will be referred to as the Energy Necklace. The manufacturer of the Energy Necklace currently produces lines of performance bracelets and claims to utilize a proprietary chip that is programmed to resonate with your cells’ natural frequencies and causes your blood cells to separate and un-clump. Purportedly, this would improve endurance performance.

The purpose of this experiment was to determine if wearing the Energy Necklace can affect steady-state exercise responses, competitive exercise performance, or enhance recovery from exercise in competitive cyclists.
METHODS

Participants

Participants for the study were 16 apparently healthy adults between the ages of 21 and 44 years of age. The 13 male subjects were on average (±SD) 32.7±8.04 years of age, their height was 179.4±7.42 cm, and their weight was 74.5±8.48 kg. The 3 female subject were on average (±SD) 32.7±1.53 years of age, their height was 164.6±1.86 cm, and their weight was 58.5±4.76 kg. The men’s maximal heart rate (HRmax) was 189±8.8 bpm, and their maximal oxygen consumption (VO2max) was 63.2±6.38 ml/kg/min as determined during an incremental cycle ergometer test. The women’s HRmax was 177±3.2 bpm, and their VO2max was 45.8±1.10 ml/kg/min (Table 1). All participants were trained cyclists accustomed to at least recreational racing. The protocol was approved by the University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects. All participants provided written informed consent prior to testing.

Table 1. Group Demographics

<table>
<thead>
<tr>
<th></th>
<th>Male (n=13)</th>
<th>Female (n=3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>32.7±8.04</td>
<td>32.7±1.53</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>179.4±7.42</td>
<td>164.6±1.86</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>74.5±8.48</td>
<td>58.5±4.76</td>
</tr>
<tr>
<td>HRmax (bpm)</td>
<td>189±8.8</td>
<td>177±3.2</td>
</tr>
<tr>
<td>VO2max (ml/kg/min)</td>
<td>63.2±6.38</td>
<td>45.8±1.10</td>
</tr>
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</table>
Procedures

Subjects underwent an initial incremental cycle ergometer test to determine HRmax and VO₂max. A minimum of seven days after the maximal exercise test participants completed two 10 km habituation time trials (TT) on the Velotron cycle ergometer (Racer Mate, Seattle, Washington), with a minimum of three days between habituation trials. These trials were designed to attain the feel of the bike, determine a pacing strategy, etc.

Testing consisted of two 10 km TT’s, one with the Energy necklace, one with the placebo necklace. Testing was controlled, randomized, and double-blinded to eliminate biased or skewed results. Necklaces were distributed to participants immediately following their second habituation trial and were worn for a minimum of seven days prior to and during the first testing TT. After the first TT, the other necklace was given to the subject and worn for a minimum of seven days prior to and during the second testing TT.

The testing protocol began with a 15-min warm-up that consisted of 5-min at 100 Watts, 5-min at 50% of peak power output (PPO) from the incremental test, 3-min at 75% PPO, 2-min at 100 Watts, and a 3-min transitional period at rest. Heart rate (HR) was measured using radio-telemetry (Polar, Lake Success, New York). Blood lactate ([HLa]) was measured at the end of each stage of the warm-up with a finger prick blood sample using dry chemistry (Lactate Plus, Waltham, Massachusetts). The Rating of Perceived Exertion (RPE) was measured using the Borg category-ratio scale, 6-20 (Borg, 1970). Participants then completed a 10 km TT, aiming to finish as fast as possible. Heart rate and RPE were measured every 1 km. [HLa] was measured every 2 km. The testing
protocol ended with a 10-min cool-down at 100 Watts. HR was measured every 2 min and [HLa] was measured post cool-down.

Following the first testing protocol, the subjects removed the first necklace and received the second necklace. The second necklace was worn for a minimum of seven days prior to and during the second testing TT. Subjects repeated the entire testing protocol for the second TT. As they would in competition, subjects had access to information regarding momentary velocity, power output (PO), and distance completed during the TT.

**Statistical Analysis**

Statistical analysis of the data was performed using repeated measures ANOVA ($\alpha=0.050$) and compared HR, RPE and [HLa] responses during the steady-state warm-up, during the two TT, and during the cool-down. A paired-samples, two-tailed T-test ($\alpha=0.050$) was performed to compare the total time to complete the TT’s under placebo and intervention conditions. This was to determine whether the Energy Necklace technology could affect steady-state exercise responses, competitive exercise performance, or enhance recovery from exercise.
RESULTS

Warm-up

Warm-up HR data followed the expected HR curve pattern with a direct relationship between HR and PO (Figure 1). Tests of Within-Subjects Effects (α=0.050) determined there was no significant difference (p=0.496) in HR between necklace groups (Table 2). This can be seen by comparing the means of the placebo condition (142±20.9 bpm) and the intervention condition (142±21.1 bpm). Tests of Within-Subjects Effects also determined that there was a statistically significant difference in HR between warm-up stages (p=0.000) as expected with PO change, and there were no statistically significant interaction effects between necklace groups and warm-up stage (p=0.933). Tests of Between-Subjects Effects determined there were statistically significant differences between subjects HR’s (p=0.000) as expected.
Warm-up RPE data followed the expected RPE curve pattern with a direct relationship between RPE and PO (Figure 2). Tests of Within-Subjects Effects ($\alpha=0.050$) determined there was no significant difference ($p=0.772$) in RPE between necklace groups (Table 2). This can be seen by comparing the means of the placebo condition (10.2±2.57) and the intervention condition (10.3±2.29). Tests of Within-Subjects Effects also determined there was a statistically significant difference in RPE between warm-up stages ($p=0.000$) as expected with PO change, and there were no statistically significant interaction effects between necklace groups and warm-up stage ($p=0.124$). Tests of Between-Subjects Effects determined there were statistically significant differences between subjects RPE’s ($p=0.000$) as expected.
Warm-up [HLa] data followed the expected [HLa] curve pattern with an increase in [HLa] as PO increased (Figure 3). Tests of Within-Subjects Effects ($\alpha=0.050$) determined there was no significant difference ($p=0.983$) in [HLa] between necklace groups (Table 2). This can be seen by comparing the means of the placebo condition (3.6±1.78 mg/dL) and the intervention condition (3.6±1.79 mg/dL). Tests of Within-Subjects Effects also determined there was a statistically significant difference in [HLa] between warm-up stages ($p=0.000$) as expected with fatigue, and there were no statistically significant interaction effects between necklace groups and warm-up stage ($p=0.642$). Tests of Between-Subjects Effects determined there were statistically significant differences between subjects [HLa] ($p=0.000$) as expected.
Figure 3. Blood Lactate Concentration During Warm-up

Table 2. Warm-up Data

<table>
<thead>
<tr>
<th></th>
<th>Placebo</th>
<th>Energy Necklace</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR_{average} (bpm)</td>
<td>142±20.9</td>
<td>142±21.1</td>
</tr>
<tr>
<td>RPE_{average} (Borg)</td>
<td>10.2±2.57</td>
<td>10.3±2.29</td>
</tr>
<tr>
<td>[HLa]_{average} (mg/dL)</td>
<td>3.6±1.78</td>
<td>3.6±1.79</td>
</tr>
</tbody>
</table>

**Time Trials**

There was no significant difference (p=0.510) in the total time required to complete the 10 km TT between treatment groups (Table 3). Neither the placebo condition (1003.78±91.243 sec) nor the Energy Necklace condition (1000.84±85.571 sec) was significantly (p<0.050) faster than the other. Out of the 16 participants, 8 rode slightly faster with the Energy Necklace, and 8 rode slightly faster with the placebo (see Figure 4 for individual subject times).
Figure 4. Time Trial Comparison

TT PO data followed the expected pattern with a slight decrease in PO as work continues and ending with a large increase in PO for the finish (Figure 5). Tests of Within-Subjects Effects ($\alpha=0.050$) determined there was no significant difference ($p=0.662$) in PO between necklace groups. Tests of Within-Subjects Effects also determined there was a statistically significant difference in PO as distance increased ($p=0.000$) as expected and seen in Figure 5, and there were no statistically significant interaction effects between necklace groups and distance ($p=0.971$). Tests of Between-Subjects Effects determined there were statistically significant differences between subjects PO’s ($p=0.000$) as expected.
HR data followed the expected HR curve pattern with an initial rise in HR followed by a progressive rise though the finish (Figure 6). Tests of Within-Subjects Effects ($\alpha=0.050$) determined there was no significant difference ($p=0.536$) in HR between necklace groups (Table 3). This can be seen by comparing the means of the placebo condition ($175\pm9.8$ bpm) and the Energy Necklace condition ($177\pm10.3$ bpm), and the mean maximal HR of the placebo ($190\pm10.8$ bpm) and Energy Necklace ($192\pm11.4$ bpm) conditions. Tests of Within-Subjects Effects determined there was a statistically significant difference in HR as distance increased ($p=0.000$) as expected, and there were no statistically significant interaction effects between necklace groups and distance ($p=0.769$). Tests of Between-Subjects Effects determined there were statistically significant differences between subjects HR’s ($p=0.000$) as expected.
RPE data followed the expected pattern with an increase in RPE as work continued (Figure 7). Tests of Within-Subjects Effects ($\alpha=0.050$) determined there was no significant difference ($p=0.200$) in RPE between necklace groups (Table 3). This can be seen by comparing the means of the placebo condition (15.5±3.75) and the Energy Necklace condition (15.8±3.84) and the maximal RPE in the placebo (19.8±0.50) and Energy Necklace (20.0±0.00) conditions. Tests of Within-Subjects Effects also determined there was a statistically significant difference in RPE and distance ($p=0.000$) as expected with fatigue, and there were no statistically significant interaction effects between necklace groups and distance traveled ($p=0.602$). Tests of Between-Subjects Effects determined there were statistically significant differences between subjects RPE’s ($p=0.000$) as expected.
Figure 7. Rating Of Perceived Exertion Vs. Distance During Time Trial

[HLa] data follows an expected pattern with an increase in [HLa] as work continues (Figure 8). Tests of Within-Subjects Effects (α=0.050) determined there was no significant difference (p=0.790) in [HLa] between necklace groups (Table 3). This can be seen by comparing the means of the placebo condition (13.0±3.73 mg/dL) and the Energy Necklace condition (12.8±2.81 mg/dL). Tests of Within-Subjects Effects also determined there was a statistically significant difference in [HLa] and distance (p=0.000) as expected with fatigue, and there were no statistically significant interaction effects between necklace groups and distance (p=0.846). Tests of Between-Subjects Effects determined there were statistically significant differences between subjects [HLa] (p=0.000) as expected.
Table 3. Time Trial Data

<table>
<thead>
<tr>
<th>Time (sec)</th>
<th>Placebo</th>
<th>Energy Necklace</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR\textsubscript{average} (bpm)</td>
<td>175±9.8</td>
<td>177±10.3</td>
</tr>
<tr>
<td>RPE\textsubscript{average} (Borg)</td>
<td>15.5±3.75</td>
<td>15.8±3.84</td>
</tr>
<tr>
<td>[HLa]\textsubscript{10km} (mg/dL)</td>
<td>13.0±3.73</td>
<td>12.8±2.81</td>
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</table>

Cool-down

Cool-down HR data followed the expected pattern with HR decreasing throughout the cool-down (Figure 9). Tests of Within-Subjects Effects ($\alpha=0.050$) determined there was no significant difference ($p=0.659$) in HR between necklace groups (Table 4). This can be seen by comparing the means of the placebo condition (148±21.0 bpm) and the Energy Necklace condition (149±21.7 bpm). Tests of Within-Subjects Effects also determined there was a statistically significant difference in HR and time in cool-down
(p=0.000) as expected after exercise, and there were no statistically significant interaction effects between necklace groups and time in cool-down (p=0.882). Tests of Between-Subjects Effects determined there were statistically significant differences between subjects HR’s (p=0.000) as expected.

Figure 9. Heart Rate During Cool-down

Cool-down [HLa] data followed the expected pattern with [HLa] decreasing throughout the cool-down (Figure 10). Tests of Within-Subjects Effects (α=0.050) determined there was no significant difference (p=0.571) in [HLa] between necklace groups (Table 4). This can be seen by comparing the means of [HLa] reabsorption the placebo condition (4.9±2.28 mg/dL) and the Energy Necklace condition (5.3±2.23 mg/dL). Tests of Within-Subjects Effects also determined there was a statistically significant difference in [HLa] and time in cool-down (p=0.000) as expected after
exercise, and there were no statistically significant interaction effects between necklace
groups and time in cool-down (p=0.472). Tests of Between-Subjects Effects determined
there were statistically significant differences between subjects [HLa] (p=0.000) as
expected.

![Figure 10. Blood Lactate Concentration During Cool-down](image)

### Table 4. Cool-down Data

<table>
<thead>
<tr>
<th></th>
<th>Placebo</th>
<th>Energy Necklace</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR$_{\text{average}}$ (bpm)</td>
<td>148±21.0</td>
<td>149±21.7</td>
</tr>
<tr>
<td>RPE$_{\text{session}}$ (Borg)</td>
<td>17.1±1.39</td>
<td>17.4±1.86</td>
</tr>
<tr>
<td>[HLa]$_{\text{average decrease}}$ (mg/dL)</td>
<td>4.9±2.28</td>
<td>5.3±2.23</td>
</tr>
</tbody>
</table>
DISCUSSION

The purpose of this study was to determine if wearing the Energy Necklace could affect steady-state exercise responses, competitive exercise performance, or enhance recovery from exercise in competitive cyclists. The result of this study demonstrates that the Energy Necklace does not enhance athletic performance as claimed by the manufacturer.

With exercise products the placebo effect can strongly influence the results of the study and therefore must be accounted for by testing in a randomized, double blind, placebo fashion as this study was. Although this study investigated one specific product, it is presumed that investigating other performance enhancing jewelry would have similar results under similar testing conditions. The placebo effect is not a new discovery. An older study reviewed over 1000 patients in 15 studies covering many areas including wound pain, angina pectoris, headache, nausea, cough, mood changes, anxiety, and even the common cold (Beecher, 1955). This review found that placebos have a high degree of both therapeutic effectiveness as well as toxic effects. The placebo effect was effective in over one third (35.2±2.2%) of cases. The wide variety of physiologic areas that have the potential to be affected along with the relative consistency of responses justifies the need for a control group in exercise studies to rule out bias. Due to the results of this study, any benefits seen or perceived using the Energy Necklace or other performance jewelry is likely attributable to the placebo effect.
Future testing procedures should also mimic actual competition as closely as possible and warm-up is an important aspect of many competitors’ regimens. One study found there was a significant difference in the total time required to complete a 3 km time trial depending on the warm-up condition (Hajoglou, Foster, De Koning, Lucia, Kernozek, & Porcari, 2005). Both hard and easy warm-up time trials were significantly faster than the no warm-up trial. Therefore, including a warm-up session in cycle ergometer testing protocol is important to valid time trial testing in comparing to real competition.

With any product, the power of persuasion can be extremely influential. Simply believing in the claims of a product can increase performance, justifying the need to continue conducting well designed and controlled studies in the future.
REFERENCES


APPENDIX A

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE (PAR-Q)
Physical Activity Readiness Questionnaire (PAR-Q)

Name:_________________________ Age:_________ Date:_______________

Phone #:____________________ Email:__________________________

• Please read the following questions carefully and check (X) the appropriate answer. Answer all questions honestly and to the best of your ability.

YES NO

_   _ 1. Has your doctor ever said that you have a heart condition (had a stroke, heart attack, or heart surgery) and/or that you should only do physical activity recommended by a doctor?

_   _ 2. Do you feel pain in your chest when you do physical activity?

_   _ 3. In the past month, have you had chest pain when you were not doing physical activity?

_   _ 4. Do you lose your balance because of dizziness or do you ever lose consciousness?

_   _ 5. Have you ever been told by a doctor that you have bone, joint, or muscle problems that could be made worse by physical activity?

_   _ 6. Do you have a diagnosed illness that could be made worse by physical activity?

_   _ 7. Is your doctor currently prescribing medication for your blood pressure or heart condition?

_   _ 8. Are you pregnant?

_   _ 9. Do you know of any other reason why you should not do physical activity?

Fitness Participation Agreement

I have voluntarily chosen to participate in fitness activities offered by the University of Wisconsin-La Crosse. I have answered the questions above to the best of my ability and affirm that my physical condition is good and I have no known conditions that would prevent me from participation. I acknowledge that participation is at my own pace and comfort level and that I may discontinue my participation at any time. Furthermore, I agree to self-determine my exertion through good judgment and to discontinue any activity that exceeds my personal limitations. I understand that by signing this agreement that I hereby waive and release the University of Wisconsin-La Crosse, staff, and all relevant employees in any way from liabilities or demands as a result of injury, loss, or adverse health conditions as a result of my participation. I affirm that I have read and understand this document and I wish to participate in fitness activities.

_________________________  __________________________
Signature of Participant Date
UNIVERSITY OF WISCONSIN-LA CROSSE  
Graduate Studies  
THE EFFECT OF WEARING THE SHUZI ENERGY NECKLACE  
ON CYCLING PERFORMANCE  

Preliminary Questionnaire  

Name: ____________________________ Date: ____________ 

Age: __________ Sex: Male / Female (circle one) Phone #: ____________________________  

(To be filled out by researcher)  
Height (cm) __________ Weight (kg) __________ BMI __________ BP __________  

Do you smoke? Yes/No (circle one)  
If Yes, how many packs per day? __________  
If No, have you ever smoked? Yes/No  
If Yes, when did you quit? __________  

Do you participate in at least 30 min of moderate intensity physical activity on at least three days of the week? Yes/No  

Do you take any antihypertensive medication (high blood pressure) or have you been diagnosed with hypertension? Yes/No  

Is there a history of Heart Attack or Sudden Death with your father (before the age of 55) or your mother (before the age of 65)? Yes/No  

Do you have a total cholesterol ≥200 mg·dL⁻¹ or are you on lipid-lowering medication? Yes/No  

Do you have Diabetes or are you Prediabetic? Yes/No  

Are you a trained cyclist accustomed to at least recreational racing? Yes/No  

I HEARBY DECLARE THAT THE ABOVE STATEMENTS ARE TRUE TO THE BEST OF MY KNOWLEDGE  

Participant’s Signature ___________________________________________________
APPENDIX C
INFORMED CONSENT
INFORMED CONSENT FOR “The Effect of Wearing the Shuzi Energy Necklace on Cycling Performance”

I, ____________________________, give my informed consent to participate in this study designed to evaluate the effect of a new ergogenic (performance enhancing) aid, the Shuzi performance necklace, on cycling performance. I have been informed that the study is under the direction of Carl Foster, Ph.D. who is a Professor in the Department of Exercise and Sport Science at the University of Wisconsin-La Crosse. I consent to the presentation, publication and other release of summary data from the study, which is not identifiable with myself.

I have been informed that there are five phases of the overall study. In phase 1, I will be required to perform an incremental exercise test on a cycle ergometer, while my breathing is monitored from a scuba type mouthpiece and my heart rate is monitored from a chest strap. Subsequently I will perform four 10km time trials (~20 min) on a specialized exercise bicycle. These trials (1 & 2) will be for practice, or (3 & 4) to test the effects of wearing the Shuzi performance necklace or a placebo necklace for a week. During each of the time trials I will be expected to complete the distance as rapidly as possible. During all trials in all phases of the study, I will have my blood sampled from a ginger stick puncture several times and will have my heart rate measured from a chest strap.

I have been informed that during all of the studies I will become very fatigued, as I would if I competed in a cycling competition. The blood sampling form my fingers will cause minor soreness after the trials. The risk of medical complications during exercise testing in individuals thought to have heart disease is approximately 6/10,000 tests. In individuals, like myself, who are healthy and athletic, the risk of complications is less well documented, but is known to be less than 0.1/10,000 tests. There is no documented case of the transmission of blood borne infections from the blood sampling technique used in this study.

The primary benefit of this study is that a new, legal ergogenic aid for athletes may be available if the Shuzi performance necklace behaves as the investigators expect. From the first exercise test, I will have information about my maximal physiological response to exercise, which many athletes find helpful for designing their training programs.

I have been informed that there are no “disguised” procedures in the study. All procedures can be taken at face value. However, I have been informed that within each set of experiments I may be given either active agent (Shuzi performance necklace) or placebo, and that I am expected to wear this necklace for the entire week and during the time trials.

I have been informed that the investigators will answer questions regarding the procedures throughout the course of the study.

I have been informed that I am free to decline to participate or to withdraw from the study at any time without penalty.

Concerns about any aspects of this study may be referred to Dr. Foster (608 785 8687). Questions about the protection of human subjects may be addressed to Dr. Bart Vanvoorhis (608 785 6892), Chair of the UW-L Institutional Review Board for the protection of human subjects.

Investigator:______________________________ Subject Signature:______________________________
Date:______________________________

have observed the informed consent process for this subject and am writing my name below to signify that I believe the subject understands the nature of the study and the risks that they are being asked to assume.

Witness:______________________________
APPENDIX D

REVIEW OF THE LITERATURE
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The purpose of this experiment is to determine if wearing a Shuzi Energy Necklace can affect steady-state exercise responses, competitive exercise performance, or enhance recovery from exercise in competitive cyclists.

History

For as long as humans have been able to compete, we have always strived for advantage over our opponents. A study was conducted that discussed the attempts made at enhancing performance during our earliest history and the ancient games (Yesalis & Bahrke, 2002). It discusses how athletes during the ancient Olympic games tried many herbs, experimented with their diet, and many other unusual tactics in hopes of increasing their athletic performance. A more recent study looked at whether dietary NO$_3^-$ supplementation, via beetroot juice, might alter the physiological responses and performance of well-trained cyclists during a self-paced bout of long duration endurance exercise (Wilkerson, Hayward, Bailey, Vanhatalo, Blackwell, & Jones, 2012). The study found that acute dietary NO$_3^-$ supplementation did not significantly alter time trial performance in well-trained cyclists, but the slight improvement shown (0.8%) could be meaningful in competition. Performance enhancement is by no means a new phenomenon.

Performance Jewelry

Performance wear is a relatively new phenomenon. The first collaboration of an athlete with a sneaker company was that of Bob Cousy, Boston Celtics star, with PF Flyers (New Balance, Boston, MA) in the 1950’s. Since then endless products have
entered the market boasting athletic claims. Performance jewelry is one more category of athletic products to hit the market recently claiming to improve balance and flexibility.

Unfortunately these companies have very little scientific evidence to support their claims, and those that do frequently have poor test design. One such product, the Power Balance bracelet (Power Balance Technologies Inc., Lake Forest, CA), was recently third party tested. This study found that there were no significant performance benefits when wearing the Power Balance bracelet compared to the placebo bracelet (Porcari, Hazuga, Foster, Doberstein, Becker, Kline, Mickschl, & Dodge, 2011). Flexibility, balance, strength, and vertical jump height were tested. The subjects performed two trials each test one with the Power Balance bracelet, one with the placebo. Trial 2 scores were significantly greater than Trial 1 scores for all areas being tested. Since the order of bracelets was random and balanced, improvements were attributed to subjects either being warmed up, or habituated to the task.

A new product that has yet to hit the market is the Shuzi Energy Necklace (ShuziUSA, Millbrae, CA). Shuzi claims to utilize a proprietary chip programmed to resonate with your cells’ natural frequencies and cause your blood cells to separate and un-clump (ShuziQi, 2012). They claim they are able to do this by utilizing Albert Einstein’s e=mc\(^2\) and states since every atom has mass, and the speed of light is a constant, there must be energy in every atom. Through their programming process, the Shuzi chip emits specific sub-atomic energy frequencies powered by the same energy that is keeping an atom in constant state of motion. These energy frequencies stimulate the separation of blood cells in the body which helps increase blood cell circulation. They go on to state that even if you’re in top physical shape and you do not “feel” the benefits of
Shuzi, you can be sure that the benefits are still occurring in your blood cells. Shuzi conducted their own tests with a micro-circulation nail microscope, and a high-powered microscope at 500x magnification, to view the capillaries in a person’s fingertips, the results of which are accessible from their website. They state from their results that it is clear that wearing any ShuziQi product, the speed at which the blood cells travel through the capillaries can increase up to 200% than without Shuzi. All the test subjects reported noticeable beneficial changes in their well-being, including a more positive attitude, greater energy, balanced emotions, healthier physical appearance (as remarked upon by friends), and a lower stress level. After viewing their research, it is clear they did not conduct the test to account for the placebo effect, and much of their data is subjective.

**Placebo Effect**

With any product, the power of persuasion can be extremely influential. A review addressed 12 studies from sports literature testing the placebo effect (Beedie & Foad, 2009). In six studies the dependent variable was endurance performance, in four, strength performance, in one, anaerobic performance and in one, pain tolerance. All but one study reported either a statistically significant or clinically significant placebo effect. Showing the wide scope a placebo effect can potentially influence. Another study tested the placebo effect by intentionally misinforming the subjects of the benefits of a placebo agent (Wright, Porcari, Foster, Felker, Kosholek, Otto, Sorenson, & Udermann, 2009). The study found that the magnitude of the placebo effect could be different depending on the nature of the exercise task and the nature of the subjects performing the task. There was a larger effect in less accomplished runners as well as during exercise that may need to be sustained.
The placebo effect is not a new discovery. An older study reviewed over 1000 patients in 15 studies covering many areas including would pain, angina pectoris, headache, nausea, cough, mood changes, anxiety, and even the common cold (Beecher, 1955). This review found that placebos have a high degree of both therapeutic effectiveness as well as toxic effects. The placebo effect was produced in over one third (35.2±2.2%) of cases. The wide variety of physiologic areas that have the potential to be affected along with the relative consistency of responses justifies the need for a control group in exercise studies to rule out biases.

Protocol validity

Testing procedures should mimic actual competition as closely as possible and warm-up is an important aspect of many competitors’ regimens. A study found there was a significant difference in the total time required to complete a 3 km time trial depending on the warm-up condition (Hajoglou, Foster, De Koning, Lucia, Kernozek, & Porcari, 2005). Both hard and easy warm-up time trials were significantly faster than the no warm-up trial. Including a warm-up session in cycle ergometer testing protocol is therefore important to valid time trial testing in comparing to real competition.

Our bike should also be adequate for time trial testing. A study done on the Velotron ergometer (Racer Mate, Seattle, Washington) found that an indoor uphill time trial using the Velotron electronic bicycle ergometer with a computer-generated opponent is a reliable measure with respect to time to complete the trial, average watts, average heart rate, and average cadence (Noreen, Yamamoto, & Clair, 2010). This supports our use of the Velotron ergometer as a reliable device to perform time trial testing.

Summary
In conclusion, when testing the effects of wearing the Shuzi Energy Necklace on cycling performance, results must be valid in order to properly assess the claims of the product. With exercise products the placebo effect and strongly influence the results of the study and therefore must be accounted for. Testing procedures must also reflect real competition in order to be a reliable and valid illustration of the products benefits.
REFERENCES


