Examining the Acute Effects of Weighted Vest Post-Activation Potentiation in Division II Track and Field Athletes for Competitive Application

By

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Abstract

Recent studies have shown potential for acutely improving athletic performance utilizing post-activation potentiation (PAP) activities. When sets, repetitions, recovery, and intensity are specified, PAP may result in more successful force production by affecting the contractile history of the active muscle fibers. Though research has been performed testing these mechanisms, few protocols have paired practical warm-ups with a competitive simulation. The purpose of the current study was to examine the effects of warm-up strides (relaxed sprints), with and without a weighted vest, on 15 meter dash performance in Division II Track and Field Athletes. Though the results were not significant, there was a trend towards the non-weighted vest protocol eliciting a quicker sprint time. It is possible that the repetitions performed with the vest could have led to fatigue instead of potentiation. However, rest time and intensity (amount of weight/effort given) could also have caused the results to differ from previous PAP studies. The physiological difference of individual athletes should also be considered with the understanding that one certain warm-up procedure may not benefit all. Further research should be conducted altering the different variables that affect PAP in order to identify a protocol that supports optimal performance.

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Statement of Purpose

The purpose of this honors project was to investigate the effects of post-activation potentiation (PAP) on sprinters and jumpers in the track and field program. This study was designed to reveal how particular acute warm-up protocols may affect the performance of a forceful skill (15 m dash) in athletes that are trained for speed and power.

Introduction

Coaches and athletes are constantly adapting their warm-up protocols to fit the newest research for performance benefits. Warm-ups function to raise body temperature, increase nerve conduction velocity, increase muscle enzymatic activity, and open the blood vessels to allow for increased oxygen transport (Pojskić et al., 2015). All of these mechanisms operate to improve readiness for exercise. From static stretching to dynamic stretching, athletes share the common goal of wanting to prepare their bodies for the maximum performance. There has been recent interest in exploring a new form of warm-up, post-activation potentiation (PAP). Post-activation potentiation relies on the contractile history of the muscle fibers to facilitate the development of force and power in movements. This preliminary stimulation of the central nervous system aids in motor unit recruitment, and thus force production (Sygulla & Foutaine, 2014). Though PAP can be applied in different contexts with different techniques, it can more generally be defined as a method of preconditioning the muscles through loaded exercises in order to allow temporary improvements in performance of often power-related events (i.e. sprinting, running, weightlifting, jumping, etc.) (Barnes, Hopkins, McGuigan, & Kilding, 2015).

At a physiological level, it is hypothesized that PAP is the result of short-term adaptations that happen at the actin-myosin binding site. There is an increased sensitivity to calcium that allows the binding of the myosin head and actin filaments in the muscle fiber to occur more rapidly, thus increasing the rate at which force can be developed in the performance activity. The twitch contraction-relaxation time decreases significantly

with effective use of PAP, thus causing an increased frequency of motor unit firing and resultant force. In addition to this physiological adaptation, PAP also allows for increased synchronization of the motor units due to the muscle preparation through the simulation of the target activity (Matthews, Matthews, & Snook, 2004).

However, not just any form of exercise will elicit the PAP effects and there are variables that need to be taken into account when determining the characteristics of a PAP warm-up. For example, the number of sets or repetitions that are performed, the rest time that is allocated between exercises, the intensity of the PAP exercise, the type of PAP exercise, individual traits of the athlete, and the type of activity the athlete is trying to potentiate are important considerations when outlining a study of PAP or PAP warm-up protocol (Tillin & Bishop, 2009). Ways to test the success of PAP include weight-vest warm-ups, back squats, use of resistance bands, loaded jump squats, and dynamic warm-ups (high knees, sprints, power skips, etc.).

Through the performance of PAP warm-ups, there could be three possible outcomes: no increase in performance, increase in performance due to the successful PAP mechanism, or a decrease in performance due to fatigue. A major consideration when utilizing PAP in training is the awareness of fatigue that could occur and how to avoid it. Fatigue and PAP are related in the aspect that in order for muscular performance to increase through PAP, it must prevail over fatigue (Batista et al., 2007). The interval of time that is dedicated to rest between the PAP exercise and the target exercise is key to whether or not fatigue will be present. The rest period needs to be long enough to avoid fatigue, but short enough to utilize the benefits of PAP before they dissipate (Weber,

Brown, Coburn, & Zinder, 2008).

There have been numerous studies performed that examine the success of PAP through force produced, decreased time in performance, or other objective measures of athletic success. Studies have also investigated the effects of different lengths of rest in the attempt to find the optimal time interval of PAP, rest, and ultimate performance. However, there have been few studies that specifically apply to a competitive sport situation. Though past research has led researchers to believe that PAP could benefit athletic performances, it has rarely been transferred to a practical athletic competition situation.

One study performed by Weber et al. (2008) examined the acute effects of a heavy-loaded squat on consecutive squat jump performance in Division I male track and field athletes. They completed a control, characterized by a set of jumps followed by unloaded squats and then another set of jumps, and an experimental trial, which required five repetitions of back squat at 85% of their max between the two sets of jumps. The peak and mean heights of the vertical jumps were recorded, as well as peak and mean ground reaction forces. The results of the study declared that the experimental trial utilized PAP to a greater extent than the control, thus improving the performance of the vertical jump. Though this protocol of PAP was successful within this population, it must be considered that improvement could have been due to the numerous amounts of fast twitch fibers present in the muscles of the athletes, which allows for proliferation of PAP (Weber, Brown, Coburn, & Zinder, 2008). Coaches and athletes must be aware that the success of PAP is dependent on the population and the characteristics of the process

that is being followed. They must also consider the idea that though track and field athletes may perform types of jumps, a purely vertical jump is not characteristic of any events, thus there should be speculation in studies that are more applicable to real-life competitive situations.

Faigenbaum, McFarland, Schwerdtman, Ratames, Jie, and Hoffman (2006) came closer to developing a protocol of PAP that could be transferred to a pre-competition warm-up situation. Though the sport was not specified, the population for the study was characterized by high school female athletes. They studied the effects of four warm-up protocols with and without a weighted vest and how they affected long jump, vertical jump, seated medicine ball toss and a 10-m sprint. They found that the dynamic warm-up with the weighted vest with two percent of body mass added improved long jump performance in comparison to six percent of added mass. Vertical jump also experienced similar benefits from two percent of body weight being added. Though there were not any significant differences with the sprints, the current study serves to explore this finding deeper with a more clearly pertinent population. As stated before, the success of different PAP protocols is dependent on the specific training of the subject base, as well as how well it lines up with the experience of the participants.

A study designed by Kümmel et al. (2016) was performed to test PAP, but not so much in a practical sense. Though the study did not directly mimic a competitive setting, it was able to elicit positive effects of PAP with the chosen population of track and field athletes. The researchers decided to test ten maximal repetitive hops, with a ten second rest, as a way to mimic the performance drop jump, yet not cause fatigue. They argued

that other types of conditioning plyometrics may produce too much ground reaction force, thus stating that reactive jumps are the most favorable form of PAP activity for this type of performance. They found that the conditioning stimulus had significant potentiating effects, and thus caused an increase in performance of the drop jump that was performed subsequently. The researchers stated that this sort of stimulus was allotted to provide ground reaction forces that would prepare the legs to produce a stretch-reflex during the countermovement. However, despite these significant findings, coaches and athletes may be skeptical due to the lack of direct correlation to their sport. No event in track and field involves the specific skill of a drop jump, which leads performers to question what warm-up is best for them. Regardless of the moderate impracticality of these findings, this study continues to support the ability to obtain PAP results within the population of power athletes, such as elite sprinters (Kümmel et al., 2016).

Another recent study performed by Seitz et al. (2016) supports that idea that PAP will be provoked more effectively in individuals with significant muscle size, muscle volume, and percentage of type II myosin heavy chain isoforms. The study suggests that training methods that promote a higher myosin heavy chain concentration may allow increased magnitudes of PAP to be attained (Seitz et al., 2016). Due to the fact that the chosen population for the current study will be athletes that participate in both power and strength building routines (sprinting and weightlifting), it can be concluded that the researchers of the current study may have success in stimulating resultant PAP with a structured and researched protocol.

In addition to the types of exercises being performed, the rest interval is important to allow potentiation, rather than fatigue, to occur. Once again, the recovery time will be dependent on the subject base and the intensity of the potentiating exercise. In the analysis of Division II female athletes (basketball, volleyball, and softball), they were allowed a five minute rest between each part of the study; however, they did not find significant differences all-around, only certain individual cases (Sygulla & Fountaine, 2014). In the study of jump, sprint, and agility performance of collegiate level soccer players, a two minute rest was allowed following warm-up interventions, with a minute between each performance test. The study found that a prolonged intermittent low-intensity isometric exercise using 30% of body weight positively affected speed and agility with the given rest intervals (Pojskić et al., 2015). Kilduff et al. (2008) focused more specifically on varying rest times. They sought to find the optimal recovery time between a heavy resistance squat protocol and a countermovement jump for professional rugby players. Their study included rest times of 4, 8, 12, 16, 20, and 24 minutes, with the optimal recovery time that produced the best results being 8 minutes (Kilduff et al., 2008).

Weber, Brown, Coburn, and Zinder (2008) found that among Division I male track athletes, three minutes rest between the initial jumps, the performance of the heavy-load squats, and performance jump allowed for improvement in acute jump height and force. Though the current study will be analyzing sprint performance as opposed to vertical jump height, the population in the study performed by Weber, Brown, Coburn, and Zinder most closely matches the population of the current study, thus the three

minute rest time will be utilized in the current study.

The results in the meta-analysis performed by Seitz and Haff (2015) aligned with the previously discussed studies by reinforcing that the degree of potentiation relies on the strength characteristics of the individual as well as the components of the potentiation protocol. One relevant discussion in the study was that though back squat was not able to potentiate a greater response in a timed short-distance sprint, a sled resistance sprint was able to elicit positive effects. The study also stated that though stronger individuals are able to gain larger benefits from PAP, even weaker individuals may find some success. Though the current subject base should have experience in weight lifting and resistance exercises, the ability for weaker individuals to have improved results should still promote some success in the research findings. Also, even moderately weaker athletes will have had some experience with resisted training, based on observation of practices. The study also points out that plyometric style conditioning activities (jumping and short sprinting) may be more successful than traditional activities (heavy lifting) due to the assumption that type II muscle fibers are recruited more effectively with a lesser amount of resultant fatigue. This decreased amount of fatigue also allows the participant to follow with their performance activity with less of a rest interval. The study suggests that with plyometric style PAP, the individual may see effects as soon as 0.3-4 min preceding the activity; whereas, with heavy traditional warmups, the individual may have to wait more than five minutes; however, a range of 3-7 min was noted across several studies as successful (Seitz & Haff, 2015). The findings in regards to warmup style and rest interval length are consistent with the needs of a sprinter or jumper in track and field. These individuals

may not have access to a squat rack a few minutes before their race, and it would be more difficult to time this warmup correctly to elicit the effects when the gun is fired. It is important to analyze information that may be applicable to an athlete when it matters most, on the runway or at the start line. Information gained from this meta-analysis can help develop a proposed protocol for athletes preparing to compete.

Thus, taking the past research into consideration, the current study serves to build on past knowledge but with a focus targeted on benefitting a specific population for a practical, competitive setting. Through this study, the research will examine if PAP deserves a place in the pre-competition warm-up rituals of collegiate track and field athletes, and what procedures should characterize the potentiating warm-up. Based on successes of previous research, it is hypothesized that the weighted vest/post-activation potentiation protocol will prepare the participant for the sprint trial to a greater extent, thus resulting in a faster completion time.

Method/Procedure

Participants

The participants for this study included 10 Division II Collegiate Track and Field athletes from the University of Indianapolis, particularly long jumpers (n = 2), high jumpers (n = 1), pole vaulters (n = 2), hurdlers (n = 1), and heptathletes (n = 4). The athletic population was chosen due to the possibility of greater muscular potentiation and less fatigue (Chiu *et al*., 2003). The age of the participants ranged from 19 to 21 years. Other participant information is summarized in Table 1.

Table 1. Population Demographics.

Number of Participants	Age (years)	Track Experience (years)	Weight (lbs)
10	20.3±1.06	8.4±3.34	157.7±24.92

Participants were asked not to engage in strenuous strength or endurance training, abstain from caffeine and alcohol consumption at least 24 hours before each test, and there were at least five days separating the two warm-up protocols (Barnes, Hopkins, McGuigan, & Kilding, 2015). Testing took place during competition season, thus replicating the fitness level of the athletes if the protocol were to be transferred to a meet setting. The participants completed testing at approximately the same time to avoid time-of-day effects. Though the testing occurred at the same time of day, the protocols were counterbalanced to avoid order effects. Due to the limited subject base, both genders were included (Male: 6; Female: 4); however, differences due to gender were considered

in the analysis, despite that this was not the overall goal of the study. All participants were required to fill out an informed consent document to ensure that they were aware of the procedures and time commitment (two days of testing).

General Warm-up

Each athlete was familiar with the equipment used during testing. Prior to each test all participants completed a 400m run at about 60% effort to mimic a typical running warmup for this population. They were led through a short series of dynamic stretches to complete the pre-test general warm-up, taking approximately five additional minutes (Sygulla & Fountaine, 2014). The stretches included 30m spans of skipping forward/backward with backward/forward swimming arm circles, knee to chest pulls, foot to gluteal runs, and forward leaning scoops (a hamstring stretch). For the purpose of this study, the general warm-up served to get the body ready for exercise and prevent injuries, was not intended to directly enhance athletic performance.

Non-Weighted Vest Potentiation Warm-Up

Participants performed six repetitions of a ten-second stride pattern, defined as a submaximal sprint with elongated strides (Barnes et al., 2015). Barnes et al. (2015) found success using a PAP protocol in which participants performed six 10-second strides with a weighted vest. Thus, the current researchers selected six repetitions of strides in an attempt to produce potentiating effects. Recovery time consisted of the time it took to walk back to the start of the stride (around 60s). Barnes et al. (2015) requested

that the runners perform the strides at a 1500m race pace. For the current study, in order to provide an appropriate speed for sprinters and jumpers, participants performed the strides at around 70% of a 200m race pace. There was five minutes of recovery before the first 15 m sprint trial was performed.

Weighted Vest Potentiation Warm-Up

Participants were asked to perform six repetitions of a ten-second stride pattern, but for the final three repetitions, participants wore a weight vest with 20% of their body weight (Barnes et al., 2015). Though the researchers of the previous study utilized six weighted vest strides, the population for the current study did not have the same inherent endurance capabilities, thus the number of strides that were weighted was reduced. There was a five minute of recovery before the first 15 m sprint trial was performed.

Sprint Testing

The participants underwent the sprint testing under two conditions: one following the control warm-up without the weighted vest, and the other to assess sprint performance after the weighted-vest potentiation protocol. Participants received 5 minutes of recovery after the warm-ups before completing each sprint. Sprint distances of 10-20m have been studied, but the pre-activation techniques did not mimic the act of sprinting or use weighted vests to add a load (Maloney, Turner, & Fletcher, 2014). Thus, a sprint distance of 15m was selected with a more specific potentiating stimulus. The Brower TC-Timing System with Touchpad (TC, Brower Timing Systems, Draper, Utah, USA)

was utilized for data collection. Participants started with one hand on the touchpad (pressure sensor), in either a three- or four-point stance. After lifting the hand off the touchpad, the timer was automatically started as the individual initiated the maximum speed sprint. As the participants ran through the TC-PhotoGate (infrared light beam) at the end of the 15 meters, the completion time was recorded on the TC-Timer. The Brower TC-Timing System was selected in order to determine the effectiveness of the particular pre-sprint warm-up without the influence of reaction-time on the part of the participant and a person timing the sprint. Participants completed two sprint trials with three minutes of recovery between trials. The averages of the two trials were analyzed for significant differences.

Results

A repeated measures ANOVA (SPSS 24.0, Chicago, IL) determined there were not significant differences ($p > 0.05$) between the effects of the warm-up protocols on sprint times, $F(1,9) = 3.24$, $p = 0.105$. However, there was a trend for the length of sprint time to be shorter in the case of the non-weighted vest protocol compared to the weighted vest protocol (2.70±0.13 sec.; 2.73±0.10 sec., respectively).

Analysis/Conclusion

The aim of the study was to discover if a previously used potentiation protocol would be successful if adapted for the use of power athletes, as opposed to endurance athletes. A successful protocol would elicit beneficial potentiation and allow the athletes to perform the 15m dash with a faster time, as compared to the control trial. The study conducted by Barnes et al. (2015) examined runners used to running further distances in a race setting (1500m compared to 200m). The protocol for the endurance athletes was able to increase leg stiffness and thus elastic energy usage, which are mechanisms functioning alongside PAP. Due to the nature of chronic adaptations for power athletes, compared to endurance athletes, it is possible that there was not as much room for improvement when it comes to leg stiffness and short sprint running economy for the population. Other researchers have examined PAP protocol relationships with the power athletes of track and field; however, as far as it is known, none have examined a protocol that could be used in preparation for competitive events. Through examination of past studies, it was determined that potentiation protocols have allowed athletes to attain more successful power production than non-weighted scenarios (Faigenbaum et al., 2006; Kümmel et al., 2016; Weber, Brown, Coburn, & Zinder, 2008). The performance of Type II, fast-twitch muscle fibers benefit from pre-loading the muscles due to a primed contractile history, which was the basis of the hypothesis for the current study (Seitz et al., 2016). However, determining the perfect balance between maximizing potentiation and minimizing fatigue (Batista et al., 2007) proved to be a challenge due to the fact that there has not been a study performed with this specific population with these specific

performance measures. It is possible that the potentiation protocol proved to be too much for the athletes to handle, thus they approached the sprint testing in a less than optimal condition. Negative overloading could have occurred through too much intensity or volume. Intensity could be varied through decreasing the percentage of weight added to the vest or decreasing the percentage of effort that is placed into the warm-up activity (Seitz & Haff, 2015). However, some individuals still found success with the current protocol, so it is important to investigate why different variables may lead to beneficial potentiation in some cases and not others.

Though not statistically analyzed, there was a trend for a few of the individuals who were high/long jumpers and weighed relatively less than the other athletes to have more success in the weighted vest trial (Table 2 and Table 3). Though the weighted vest addition was based on a percentage of the athletes' total mass, there is room for speculation that the athletes that weighed less were at the same level of fitness as the other athletes, but had more lean/functional mass. This could mean that athletes who weighed less had a better force-to-body mass relationship allowing them to more successfully handle the potentiation protocol.

Table 2. Athlete Weight Sprint Time Comparison		
Weight Categories (lbs)	Protocol Time (sec)	
	Non-Weighted	Weighted
125-148	2.83±0.06	2.82±0.02
149-171	2.68±0.15	2.72±0.12
172-194	2.60±0.03	2.64±0.03

Table 3. Athletic Event Sprint Time Comparison					
	Long Jump	**High Jump**	**Pole Vault**	**Heptathlete**	**Hurdler**
Non-Weighted	2.813±0.074	2.865	2.695±0.247	2.633±0.06	2.575
Weighted	2.808±0.025	2.830	2.735±0.198	2.671±0.047	2.650

Further research into this speculation would be necessary; however, with more conclusive data, the use of body composition measurements to determine levels of potentiation loading could be beneficial. However, the technique behind high/long jumping could also be analyzed as a reason for success in this subgroup. For example, high/long jumpers are required to convert horizontal momentum to vertical momentum (high jumpers more so than long jumpers), and thus may be particularly impacted by added mass. The completion of the high jump is dependent on the force impulse that is the

result in the change of momentum directed upward. In one particular study, researchers observed that the horizontal component of the take-off must be at a maximum, but also with the ability to deliver a high vertical reaction force and quick ground contact time (Čon, 2010). The fact that the forces that the body feels are several times that of the actual mass, unnecessary mass has the potential to complicate these two variables, and thus affects the success of the jump. Long jump is similar in nature, but with more horizontal velocity and less vertical velocity, and may be subject to the same variables affecting success. The other events do not involve quite the same application of force, and thus may not be as prepared to handle the potentiation protocol (i.e. pole vault uses an assistive device to gain the vertical change in direction, hurdling discourages vertical movement, etc.) However, within the constraints of the current study, it is difficult to deduce an exact relationship between weight of the athlete, specific athletic event, and potentiation success. Further research should be performed to separate these components and examine more accurate causation.

Balancing the variables behind PAP can be a challenge due to the need to consider the goals of the athlete. Decreasing the potentiation protocol effort percentage could lead to a straying from the power output optimization for some. During competition season, the athletes of the population experience a “tapering effect” that focuses on decreasing the volume, but increasing the intensity. Thus, it may be more effective to rewrite a protocol with fewer repetitions of the stride patterns, as opposed to decreasing the effort or weight. Conversely, with this decrease in volume, there may be a need to increase the speed of the strides (intensity) to better simulate the speed of

acceleration in a race or runway approach. The protocol utilized by Barnes et al. (2015) that was considered in the development of this study involved distance runners, who rarely reach the speeds of power athletes. Thus, it may be more relevant to structure the intensity based on studies that examined more similar populations, such as in the case of Weber, Brown, Coburn, and Zinder (2008) who utilized 85% max effort of the task they were analyzing.

The other side of fatigue is the amount of recovery between warm-up repetitions, the warm-up and the sprints, and between sprints. It is possible that the individuals did not receive a long enough recovery time; however, this aspect is more difficult to analyze because too much of a recovery could result in dissipation of the potentiation effects (Weber et al., 2008). Fitness level and muscular composition of the athletes are determinants of optimum recovery time and will be variables for consideration in individual cases.

Another potential cause for deviation from the past findings could be due to the difference in the athletes analyzed. Each athlete is accustomed to performing some measure of running and power exercise; however, some of the individual events involve less running, and thus may lead to variance in the results. Past research has emphasized that the individual physiological characteristics of the athletes is an important consideration for potentiation protocols (Tillin & Bishop, 2009). Thus, future success may be found by tailoring the protocol for each athlete, through adjusting added weight and rest time. Instead of adopting one protocol from a synthesis of past literature and applying it towards multiple athletes, determining the best method of priming the

neuromuscular system may need to be established over multiple trials for each individual, using the guidelines of what has and has not worked for other researchers. There was also the presence of uncontrollable variables that occurred throughout the research activities. For example, there could have been a learning curve for the starting position of the sprints for some of the athletes. Though all of the athletes had experience starting a sprint from a three- or four-point position, those that are primarily jumpers may not encounter this starting position as frequently. The weighted vests may also have proved to be cumbersome to the athletes. Though they are familiar with activities that involve moving extra weight, there were reports that the vests were mildly constricting and awkward while running. This discomfort could have led to the athletes developing atypical running gaits, which could have led to a decrease in running economy, and thus increased, unnecessary effort. Expending energy in this manner would lead to not properly priming the muscles, and potentially skewing the results. A difference in the weekly structure for each individual was also an uncontrollable variable. For instance, because many of the athletes were on different workout schedules, it was possible that some were fatigued from previous workouts, and did not report it. Though the athletes were informed of the guidelines and procedures, it is difficult to control the activities the athlete had participated within the same day or during the week preceding the testing sessions.

An area of further investigation could be examine the speed of the sprint following only the general warm-up, without the strides. Though this would be a slight risk for the athlete if their muscles were not warmed up enough, it could determine if

both the weighted and non-weighted protocols had an effect, even if one was not more significant than the other. The stride patterns themselves were of higher intensity than the general warm-up, thus there could be the possibility that they had a potentiating effect, regardless of the presence of extra weight. Competition setting recovery time could also be more individualized for the athletes; however, many researchers have found differing "optimal recovery times", thus it may be up to each athlete to deduce what rest period is ideal for them. There is also the potential for recovery time to be based on heart rate; however, with the variables of adrenaline or uncontrollability of the precise start time of the race, this measure could be unpractical and less relevant to sprint performers.

Coaches are constantly trying to determine what workouts and warmups will best prepare their athletes for competition day. However, due to individual physiological differences, uniformly priming athletes may not be possible. Though research is critical to produce guidelines for building successful training programs, there cannot be a single approach towards securing athletic performance. It is important to analyze the fitness of the athlete and build a successful warm-up protocol from experience by varying the intensity, volume, and rest that is incorporated. Further research or individual experimentation should be performed with a protocol similar to the current study in order to identify the ideal levels for each variable in order to make an application to a practical competition setting. Athletes in different events may have different musculature and anthropometric measurements rendering individual consideration. For example, high jumpers are generally taller because of the elevated center of mass advantage; pole vaulters balance height and muscle mass to have enough power to successfully convert

energy into the pole, yet proceed in an upward pattern; heptathletes participate in multiple, varied events, and thus need to have an overall sound fitness, but may excel in some areas more than others (i.e. the 1000m run versus 60m hurdles). There is also the consideration of fatigue between different events. For example, heptathletes often have multiple events back-to-back; long jumpers have the opportunity to continue on to finals and gain more attempts; high jumpers and pole vaulters theoretically have unlimited attempts as long as they keep clearing bars. On the other hand, it is also important to recognize that some athletes may not have the "ideal" form when it comes to each event. For example, some short high jumpers and pole vaulters are able to overcome their vertical disadvantage with better power and technique, which could mean that these athletes may need a different potentiation protocol than their taller counterparts. In order to differentiate between specific athletes within the single sport of track and field, future studies could focus on measuring biomechanical and neuromuscular variables (i.e. stride length/rate and leg stiffness, respectively). The use of PAP as an acute warm-up technique and the research to back the concept is still relatively new and further examination needs to be performed so all athletes can benefit. Though past research has found success in various potentiation protocols, it is important to remember the context and the ultimate goal to improve athletic performance when it matters the most.

Reflection

Research has always been a passion of mine, particularly in areas that are relatable. Being an exercise science student has given me multiple opportunities to look into the research that is currently being performed around the world, but to also experiment with my own research ideas.

Until this research project, I have not been involved in the process of getting a research protocol approved by the IRB. This process proved to be extensive with plenty of details that I would have overlooked without guidance. Though I recognize the importance to keeping the participants safe and confidential, I never realized the extent of which a researcher has to document all of the "why's" and "how's". This experience has greatly developed my appreciation for larger scale research and the process that those involved went through to get the procedure from proposal to actual data. Another difficult element to the research process is through recruiting attempts. If I did not have a connection with the University of Indianapolis Track and Field team, I do not think I would have been able to gather the participants that I needed. Though the athletes were willing to participate in the beginning, many forgot or had schedules that became increasingly busy. I would have liked to include more participants in my study; however, logistically it proved to be very difficult. Through this process, I have also acknowledged the importance of a pilot study, in some cases. Because there were many articles in this field of study, but none that incorporated all of the elements that I was looking for, I was forced to synthesize different elements of each research study and at times, make knowledgeable assumptions. This lack of resources in the specific area that I wanted to

examine proved that there was a need for research to be performed, yet made the process more challenging. A pilot study can serve to determine if the methods are on the right track or if there are certain variables to be accounted. Ideally, I would have liked to have had the chance to perform a pilot study so I could have a base of research to tweak and adjust for a new round of testing. I would have hoped for this opportunity so I could potentially find significant results the second time around; however, this is just another realization of the amount of time and commitment that goes behind developing significant data. It was also challenging to rely on the resources of others when attempting my research protocols. This experience again opened my eyes to cost that can go behind extracting significant data. Whether that be through actually paying the participants, allocating technology, or funding other resources, it is clear why there is a necessity for organizations dedicated to providing grants for researchers.

The whole process of developing an Honors Project was more challenging than I anticipated in general. Due to extenuating circumstances, I had the opportunity to work with several advisers and see the perspectives of each professor and how they approach research. Though at first this was a slight obstacle, it ended up being an opportunity for me to work with different people and experience different styles of approaching the process. This experience also taught me to be flexible, as I know in the "real world" I will often be a part of situations that I cannot control, and I need to know how to handle them and find success as a result.

As I continue on to Physical Therapy graduate school and pursue more research interests, I will have a deep appreciation for the work in which I will be involved. Even

if I end up joining the professor after the research is underway, I will have personal experience with handling the start-up process, which will increase my engagement. This experience with the research process will also be an advantage as I compete for the few positions of research involvement offered to my large cohort of students. I will be a knowledgeable resource, familiar with the process and accompanied with the determination to provide new and interesting research to the medical community. Also, looking back, I have to remind myself that all research is important, even if the hypothesis is not proven correct or the data is not significant. All research builds on one another, and it is necessary to develop each building block in order to know where to proceed from there. Research studies contain literature reviews for a reason, as proof that the investigators looked into every aspect of the subject before developing a new or improved path of study.

I have greatly enjoyed my studies and learning from the fantastic faculty here at UIndy and the opportunities that I have been offered to apply my knowledge in a practical setting. Learning through lectures and classroom settings has developed the knowledge base that I need to continue to build on my education through applied research. It is important for students to recognize the value in taking ownership of their education and to do personal research to see what is new in their field of study. This research process has taught me how to take information that I have read from other sources, synthesize it, find areas of improvement, and then develop my own ideas and test them in a similar manner. This research process will indirectly help me as a therapist as I encounter new patient scenarios and seek new information to apply to each patient

and problem solve to make each encounter more successful.

Through improving my skills of analyzing past research, I was able to take my education to the next level and contribute to the body of research. More specifically, I was able to examine an important aspect of my life, track and field, and investigate a potential route for the performance improvement for my teammates and myself. Though I was not able to find significant relationships, I was able to report past information and more insight for athletes to structure their competitive approach. Through this Honors Project, I have continued to build my belief in the value of current research and developing our fields of interest.

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Appendices

Appendix A: Style Guidelines

Page setup
Use letter size (8-1/2 by 11 inch). Margin must be 1.5 inches on the top and 1.5 inches on the left. One inch on the right, and one inch on the bottom. When using the MS template, be sure to delete EVERYTHING that is typed in RED. Except for the title page, everything should be double-spaced. Exceptions would be: Table of Contents, footnotes and end notes, captions/explanatory notes on charts, graphs, and/or tables, appendices, and references (single-spaced within a reference and double spaced between entries). Please consult your discipline-specific style manual, such as MLA or APA.

Style
In APA style, quotations over three lines long should be in block quotation, single-spaced, and double indented (one inch) on the left and right. Do not use quotation marks in the block quote except when indicating quotations within the block quotation.

In MLA style, quotations four or more lines should be in block quotation (three or more lines for poetry), double-spaced, and double-indented (one inch) on the left side only. Do not use quotation marks in the block quotation except when indicating quotations within the block quotation.

Please follow the guideline within your discipline.

Font, etc.
An Honors thesis is not the place to experiment with funky fonts—they do not enhance your work. They only distract your readers. Unless there is an artistic reason for using a non-standard font or multiple styles, please use a single 12 point standard font style, such as Times New Roman. Appendices that include documents prepared by others, copies of invoices, recruitment flyers, or other promotional materials are exceptions to this rule.

Title/title page
Type the title in all bold letter and in font size 16 on the first page of the manuscript. Be sure to center the title. By line and your name should also be centered. Use the MS template. This page should NOT have the page number. The following statement must be centered also:

An Honors Project submitted to the University of Indianapolis Honors College in partial fulfillment of the requirements for a Baccalaureate degree “with distinction.” Written under the direction of your advisor’s name here.

Date
It is very likely that you will be asked to revise and resubmit your honors project. Every time you submit your project, be sure to change the date and type in the ACTUAL date of submission.

Signatures
BEFORE you submit your manuscript to the Honors College Committee, be sure to have your advisor sign your manuscript. This means that you must complete your manuscript and give it to your advisor at least two weeks in advance so that your advisor will have ample time to read your manuscript. You may submit your manuscript ONLY AFTER your advisor signs the title page, indicating that your advisor have read and approved the project and that your manuscript is ready to be read by the HCC.

The Director of Honors College will sign AFTER your manuscript has been approved by the HCC.

Abstract
The second page of your manuscript should be the abstract page. Type the heading, Abstract, in the font size 12 and on the first line in the center. Your abstract should be somewhere between 150 words to 200 words, and from this portion on, your thesis must be double-spaced.

Acknowledgment (optional)
The third page of your manuscript should be the acknowledgment page. However, if you received a grant for this project, you should acknowledge that here. This page should be typed in double-space.

List of Table
If you decide not to have an acknowledgment page, AND if you have tables in your manuscript, then this page should be the third page. If you did not use any tables, then skip this page and move on. The title should be centered while the list of tables should use both right and left justifications. Do not leave extra line between the “List of Tables” and “Table 1.” Include a brief title of table after “Table 1:” with all major words capitalized. The brief title of table must match the way it is presented in the body of the text. Make sure the page numbers line up straight on the right side. In the body of the manuscript, you must place the table titles ABOVE the tables.

List of Figures
If you used any figures in your manuscript, this page comes next. The title, “List of Figures” should be centered, whereas the list itself should use both right and left justifications. Do not leave out a line between “List of Figures” and “Figure 1”.) “Figure 1:” etc. should be followed by a brief figure caption. Figure captions must be placed

BELOW the figure in the body of the manuscript, capitalizing only the first word and any proper noun or adjective. Keep the figure captions brief, and make sure that the figure captions in the body of the manuscript matches how they appear in the list of figures.

Table of Contents
Unlike list of tables and figures, which may be included in your manuscript ONLY IF you do have tables and figures in your manuscript, you MUST have the table of contents. The title, "Table of Contents," should be centered, where as the rest should use both left and right justification so that the page number will line up strainght on the right.

List of Appendices
Again, the title should be centered, whereas the list itself should use both left and right justification in order to align the page numbers on the right. Copy of your CITI training should be in the Appendices. If you have a project that was research with human participants, your IRB submission and the approval letter from IRB is REQUIRED. If you applied for external funding, a copy of the grant application should be included. If you had a budget, a complete budget comparing projected with actual costs should be included in the Appendices, too. Appendices are organized in the order they are discussed in the manuscript; therefore, the first appendix mentioned in the manuscript would be Appendix A.

Statement of Purpose
Arabic numeral starts from this page on. Use Header (click on View, select Header/Footer) and make sure this is Section 3; otherwise, Header, etc. will appear on the cover page. This running head should be on one line and aligned to the right. Type your first initial (because sometimes there are several Honors students with the same last name), and last name, one space. Then, click on "format page number" to select 1, 2, 3…. And click "insert page number." This page should be page 1.

The title, "Statement of Purpose," should be centered. The text itself should use the left alignment. Be sure to revisit your statement of purpose from your project proposal. Be sure to use the past tense now that your project is done. This should reflect what you actually investigated or did, especially IF the project changed substantially from what was originally proposed.

Body of Manuscript
Follow the guideline within your discipline. Keep in mind that all components that publishable article within your discipline have must be included in your Honors Manuscript. Subheadings should be typed in the center in font size 12.

> **Introduction**
> You probably read some more books, articles, etc. as you worked on your project. Be sure to revise your literature review from your proposal and include works

you've read while working on your project.

Method/Procedure

Write out the description of actual project procedure. Be sure to revisit your proposal and feedback from the committee to see if there were works that needed to be included in the project. Now that your project is done, write in the past tense.

Product Produced

This section can be in appendix.

Results

This section is only for empirical studies. This is where you present data from your study.

Analysis/Conclusion

Analysis section is important for creative Honors project also (for empirical studies, this is where you analyze the data). To demonstrate your learning and understanding of your art in creative Honors project, you need to analyze your own work based on the historical/critical knowledge you gained, and this is where you do NOT place your work in historical/critical context but actually analyze your own work's merit. Conclusion is where you can address what needs to be done in the future, so it is more future-looking.

Reflection

Reflection is to record the student learning and making connections between text/literature and the activity, so it is more past-looking and more personal piece.

References

Follow the format of your discipline. This could be Bibliography, Works Cited, Works Consulted, etc.

The table titles in the body of the manuscript must be placed ABOVE the tables, and the titles must match how they are presented in the list of tables.

Figure captions in the body of the manuscript must be placed BELOW the figures, and the titles must match how they are presented in the list of figures. Be sure to include citations in the body of the manuscript (but not in the list of figures) if figure is reproduced from another source. Figures must be sharp, high resolution. Full color is allowed.

Appendices

This comes at the end. Copy of your CITI training should be in the Appendices. If you have a project that was research with human participants, your IRB submission and the approval letter from IRB is REQUIRED. If you applied for external funding, a copy of the grant application should be included. If you had a budget, a complete budget comparing projected with actual costs should be included in the Appendices, too. Appendices are organized according to the order they are discussed in the manuscript (The first appendix mentioned in the manuscript would be Appendix A, for example).

Margins on all Appendices must be 1.5 inch on the top and the left, one inch on the right and the bottom. Appendices must be paginated and consistent with the body of the manuscript.

Submission of Manuscript for Review to Honors College Committee
Three copies signed by advisor(s)

Submission of Camera-Ready Manuscript
After the project is approved by Honors College Committee, submit one hard copy with advisor's signature, one electronic copy, and a clean copy of the cover page. All macros must be removed from the electronic copy, and manuscript must be in a single file. The extension on the electronic copy must be either doc. or docx.

Appendix B: CITI Training

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK REQUIREMENTS REPORT*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Chelsea Wieland (ID: 4437078)
- **Email:** wielandc@uindy.edu
- **Institution Affiliation:** University of Indianapolis (ID: 473)
- **Institution Unit:** Kinesiology
- **Phone:** 8123754993

- **Curriculum Group:** Human Research
- **Course Learner Group:** Group 1.Biomedical Research Investigators and Key Personnel (INACTIVE)
- **Stage:** Stage 1 - Basic Course
- **Description:** The biomedical track is applicable when the majority of your human research studies involve therapeutic or diagnostic agents.

- **Report ID:** 14205536
- **Completion Date:** 10/14/2014
- **Expiration Date:** 10/14/2016
- **Minimum Passing:** 75
- **Reported Score*:** 93

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED
Introduction (ID: 757)	10/14/14
Students in Research (ID: 1321)	10/14/14
History and Ethics of Human Subjects Research (ID: 498)	10/14/14
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	10/14/14
Informed Consent (ID: 3)	10/14/14
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	10/14/14
Records-Based Research (ID: 5)	10/14/14
Research With Protected Populations - Vulnerable Subjects: An Overview (ID: 7)	10/14/14
Research and HIPAA Privacy Protections (ID: 14)	10/14/14
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	10/14/14

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

CITI Collaborative Institutional Training Initiative at the University of Miami

Appendix B: CITI Training (Continued)

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK TRANSCRIPT REPORT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Chelsea Wieland (ID: 4437078)
- **Email:** wielandc@uindy.edu
- **Institution Affiliation:** University of Indianapolis (ID: 473)
- **Institution Unit:** Kinesiology
- **Phone:** 8123754993

- **Curriculum Group:** Human Research
- **Course Learner Group:** Group 1.Biomedical Research Investigators and Key Personnel (INACTIVE)
- **Stage:** Stage 1 - Basic Course
- **Description:** The biomedical track is applicable when the majority of your human research studies involve therapeutic or diagnostic agents.

- **Report ID:** 14205536
- **Report Date:** 10/08/2015
- **Current Score**:** 93

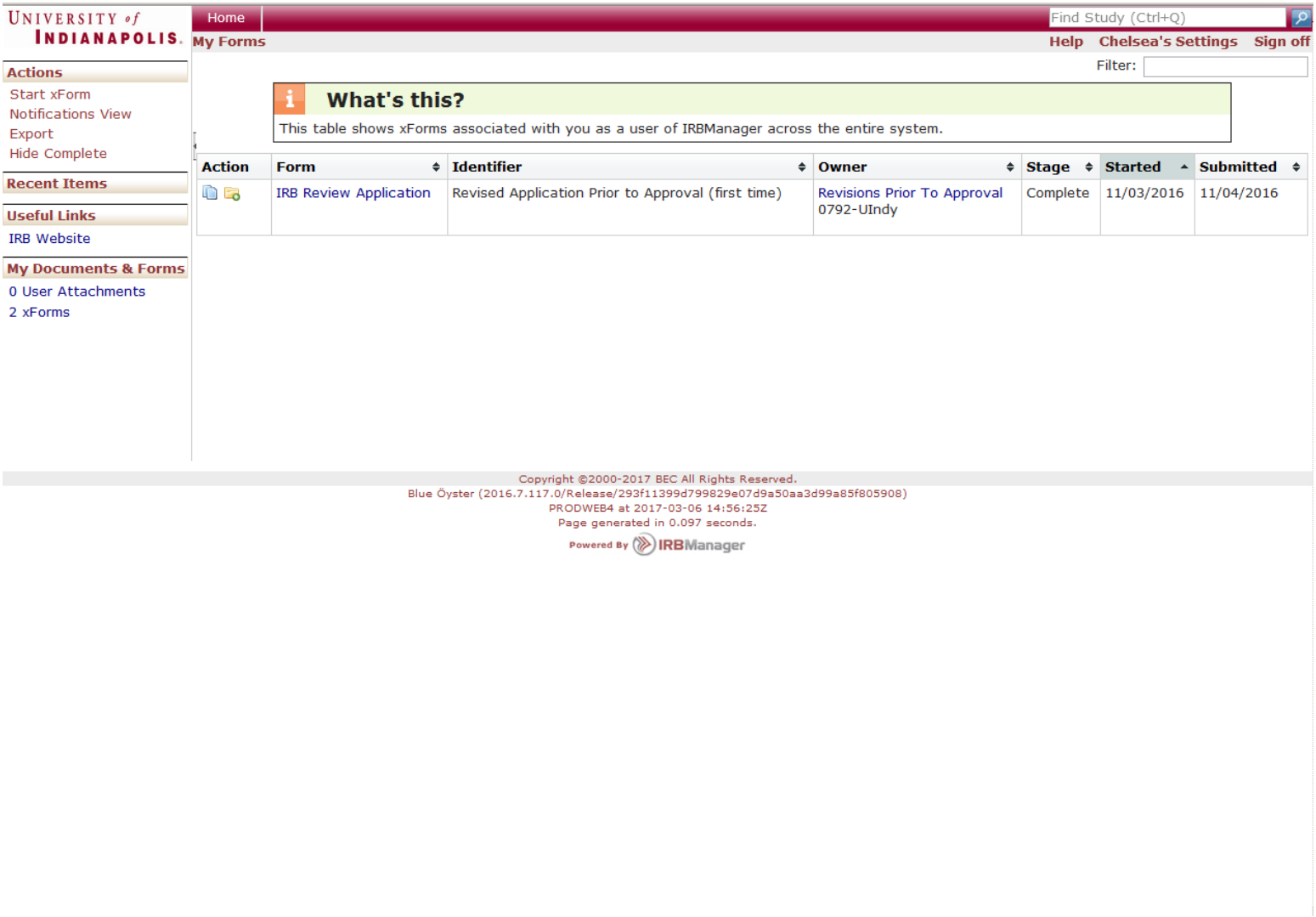
REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT
History and Ethics of Human Subjects Research (ID: 498)	10/14/14
Introduction (ID: 757)	10/14/14
Students in Research (ID: 1321)	10/14/14
Informed Consent (ID: 3)	10/14/14
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	10/14/14
Records-Based Research (ID: 5)	10/14/14
Research and HIPAA Privacy Protections (ID: 14)	10/14/14
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	10/14/14
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	10/14/14
Research With Protected Populations - Vulnerable Subjects: An Overview (ID: 7)	10/14/14

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

Collaborative Institutional Training Initiative at the University of Miami

Appendix C: IRB Submission



UNIVERSITY of INDIANAPOLIS

Home | Find Study (Ctrl+Q)

My Forms | Help | Chelsea's Settings | Sign off

Filter:

Actions
- Start xForm
- Notifications View
- Export
- Hide Complete

Recent Items

Useful Links
- IRB Website

My Documents & Forms
- 0 User Attachments
- 2 xForms

What's this?

This table shows xForms associated with you as a user of IRBManager across the entire system.

Action	Form	Identifier	Owner	Stage	Started	Submitted
	IRB Review Application	Revised Application Prior to Approval (first time)	Revisions Prior To Approval 0792-UIndy	Complete	11/03/2016	11/04/2016

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Blue Oyster (2016.7.117.0/Release/293f11399d799829e07d9a50aa3d99a85f805908)
PRODWEB4 at 2017-03-06 14:56:25Z
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Appendix D: IRB Letter of Approval

UNIVERSITY of INDIANAPOLIS.

Institutional Review Board
1400 East Hanna Avenue
Health Pavilion, Room 261
Indianapolis, IN 46227

800/232-8634 x5774
317/781-5774
http://irb.uindy.edu

Richard Robinson, Ph.D.
Department of Kinesiology
University of Indianapolis
1400 East Hanna Avenue
Indianapolis, IN 46227

November 4, 2016

UIndy Study# 0792
Study Title; ***Examining the Acute Effects of Weighted Vest Post-Activation Potentiation in Division II Track and Field Athletes for Competitive Application***

Dear Dr. Robinson,
Using expedited review procedures, the University of Indianapolis Institutional Review Board (IRB) has approved the current version of the study noted above. You may immediately begin research activities. This letter serves as official certification of IRB approval.

This initial approval period is valid for one year, and will expire on November 3, 2017. If this study will continue beyond the expiration date, then you must apply for annual update and renewal (continuing review) using the Project Update (Continuing Review) form. You should submit the form no less than 30 days prior to the expiration date in order to allow ample time for review and approval renewal, and avoid unnecessary interruptions in research activities. A summary of important dates follows:

IRB Approval Date: November 4, 2016
Study Update & Approval Renewal Application Due Date: September 5, 2017
IRB Approval Expiration Date: November 3, 2017
Approval Period: 12 months

IRB approval constitutes Version 1.0 of this study and informed consent documentation.

If appropriate, then the IRB Office will send through interoffice mail original copy(ies) of informed consent documentation bearing the IRB validation stamp with approval and expiration dates. You may also access the document(s) in the "Attachments" section of the study home page in IRBManager. **You must use the original copy with the IRB validation stamp as a "master" to make copies for participants.**

You must submit any modifications of the study methodology, protocol, recruitment materials and/or informed consent procedures to the University of Indianapolis IRB for review and approval prior to implementation.

Appendix D: IRB Letter of Approval (Continued)

You must promptly report adverse events (i.e., research related injury or illness) and/or unanticipated problems (e.g., loss of data, breach of data security) to the University of Indianapolis IRB.

Please contact the IRB Director, Dr. Greg E. Manship (manshipg@uindy.edu), with questions or concerns about this letter or other IRB matters.

Sincerely,

Elizabeth S. Moore

Elizabeth S. Moore, Ph.D.
Chair, Institutional Review Board (IRB)

gem

Cc: Chelsea Wieland

Appendix E: Informed Consent

University of Indianapolis
Institutional Review Board
Approval Date: November 4, 2016
Expiration Date: November 3, 2017

UIndy Study# 0792
Study Version: 1.0
Study Version Date: November 4, 2016
Informed Consent Document (ICD) Version: 1.0
ICD Version Date: November 4, 2016

UNIVERSITY of INDIANAPOLIS.

College of Health Sciences
UIndy Health Pavilion
(317) 788-3500

1400 East Hanna Avenue
Indianapolis, Indiana 46227-3697
www.uindy.edu/health-sciences

Principal Investigator: Dr. Richard Robinson
School/Department/Division: College of Health Sciences/Kinesiology
Telephone: (317) 788-8021
Email: robinsonrh@uindy.edu

Co-Investigator: Chelsea Wieland
Email: wielandc@uindy.edu

INFORMED CONSENT FOR PARTICIPATION IN RESEARCH ACTIVITIES

Examining the Acute Effects of Weighted Vest Post-Activation Potentiation in Division II Track and Field Athletes for Competitive Application

1. PURPOSE OF THIS RESEARCH STUDY

The purpose of this research study is to investigate the effects of a new warm-up technique called post-activation potentiation (PAP) on 15-meter sprint performance using sprinters and jumpers of a Division II Track and Field program. PAP is the theory that challenging the muscles through a relevant exercise before a muscular performance will elicit more successful muscular performance in the subsequent contraction. PAP warm-up techniques have been shown to be effective in athletes who participate in activities that require a high level of muscular power. This study will compare a PAP warm-up utilizing a weighted vest to a typical pre-competition warm-up by measuring the effects on 15-meter sprint time.

You have been invited to participate in this research study because I am a member of the aforementioned team and event group at the University of Indianapolis. I have been informed that I may NOT be eligible to participate if I have had a lower extremity injury in the last six months that required medical attention and caused me to stop training.

I have been informed that my participation in the study is expected to involve two sessions, each approximately 45 minutes in duration and that I will be one of at least 10 participants, but there may as many as 50.

2. WHAT WILL BE DONE / PROCEDURES

I have been informed that I will first be asked to give my informed voluntary consent by signing and dating this Informed Consent Document (ICD). I have been informed that I should NOT sign this ICD until I have all the information I need to make a fully informed decision. When I sign and date the ICD the investigators will enroll me in the study.

Appendix E: Informed Consent (Continued)

After enrollment I will complete a short demographic questionnaire with one of the researchers in a conference room in the Athletic and Recreation Center at the University of Indianapolis that will require about 15 minutes. The questionnaire will collect information about gender, age, specific athletic event/(s), years of experience, and body weight.

Due to the nature of the study, I have been informed that testing will take place at least 24 hours after this essential information is provided. In the 24 hours before the testing of each session, I have been asked to refrain from strenuous exercise as well as the consumption of alcohol and caffeine. I have been informed that testing sessions will require me to complete the following: (a) a 400 meter run at 60% of my maximal speed; (b) a series of dynamic stretches; (c) 3 x 10 second runs at 70% of my 200 meter pace without a weight vest (one testing session) OR the PAP warm-up wearing a weight vest with a load of 20% of my body weight (another testing session); and (d) 2 x 15-meter maximum sprints. Regardless of the assigned protocol for the session, I will be allocated 5 minutes of rest between the warmup and sprint performance, and 3 minutes between the two sprint performance trails. I have been informed that order in which I perform the two testing sessions will be randomly assigned. I have been informed that the two sessions will be separated by a span of five days, and that I must again refrain from strenuous exercise and alcohol/caffeine consumption 24 hours before the second session. I have also been informed that testing will occur in a public setting (the Athletics and Recreation Center), and that there may be people in the building that are not directly related to the study. I have been informed that the investigators will be monitoring my status during participation, noting any signs of fatigue or soreness; however, I have been asked to report any discomfort that occurs during the study.

3. POSSIBLE BENEFITS

I have been informed that I will not receive direct and immediate benefits from this research. However, if one of the warm-up protocols causes significant improvements in sprint performance, then the methodology could be utilized in future competitions.

4. POSSIBLE RISKS AND DISCOMFORTS

Because the research involves sprinting, a maximum effort physical activity, I have been informed that musculoskeletal injuries are possible. The following are potential musculoskeletal injuries: hamstring strain, quadriceps strain, gluteal strain, hip flexor strain, lower lumbar strain, ruptured Achilles, calf muscle tear, sprained ankle, muscle cramps, delayed onset muscle soreness, etc. If these issues should occur, I have been informed that I should report the injury to the investigators. In the event of a more serious injury (e.g., ruptured Achilles, complete muscle tear, severe ankle sprain, etc.), I have been informed to seek medical attention independent of the current study. Following a more minor injury (e.g., muscle strain, delayed onset muscle soreness, etc.), I have been informed to use my best judgment and seek treatment if necessary from team athletic trainers.

Appendix E: Informed Consent (Continued)

5. CONFIDENTIALITY OF RECORDS

I have been informed that any information learned from this study in which I might be identified will remain confidential. All records will be stored in a locked file cabinet in a locked room. All electronic data will be stored on password and/or encryption protected devices. Only the investigator and members of the research team will have access to these records. If information learned from this study is published, I will not be identified by name. By signing this form, however, I allow the research study investigator to make your research records available to the University of Indianapolis Institutional Review Board (IRB) Office and regulatory agencies as required by law.

6. OFFER TO ANSWER QUESTIONS AND RESEARCH INJURY NOTIFICATION

Dr. Richard Robinson and Ms. Chelsea Wieland (wielandc@uindy.edu), responsible for this research study, have answered questions regarding my participation in this research study. If I have any further questions, I can contact Dr. Richard Robinson at (317) 788-8021 (robinsonrh@uindy.edu). I will receive a copy of this informed consent document for my records.

I have been informed if I experience an injury that is related to your participation in this study I should contact Dr. Richard Robinson at (317) 788-8021.

I have been informed that a copy of the final research results will be made available to me at the conclusion of the study, upon request, by contacting Dr. Richard Robinson at (317) 788-8021 (robinsonrh@uindy.edu).

7. EXPLANATION OF TREATMENT AND COMPENSATION FOR INJURY

I have been informed that if I suffer from an injury as a direct result of my participation in this research, then I should obtain appropriate treatment from a team athletic trainer or medical provider. If my injury requires medical treatment, then providers will bill me and/or my insurance for treatment costs. I am responsible for knowing the details of my medical insurance coverage. I have been informed that there is no provision for financial payments or other forms of compensation (such as lost wages, medical cost reimbursement, lost time or discomfort) with respect to such injuries. I have been informed that I am not waiving any of my legal rights by signing this consent form.

Appendix E: Informed Consent (Continued)

8. VOLUNTARY PARTICIPATION WITH RIGHT OF REFUSAL

I have been informed that participation in this research study is voluntary and I am free to withdraw from this study at any time without penalty. If I choose to withdraw, I should contact Dr. Richard Robinson (317) 788-8021 (robinsonrh@uindy.edu). Upon withdrawal from the study, data that has already been collected will be deleted and not factored into the results of the study.

9. IRB REVIEW AND IMPARTIAL THIRD PARTY

I have been informed this study has been reviewed and approved by the University of Indianapolis Institutional Review Board (IRB). The IRB is responsible for protecting the rights and welfare of people who participate in research. Proof of IRB approval appears throughout this document as the UIndy IRB validation stamp, which includes the dates of approval and expiration of approval. If I have questions or concerns about my rights or welfare as a research subject, then I should call IRB Director, Dr. Greg E. Manship at (317) 781-5774 or (800) 232-8634 ext. 5774.

10. SIGNATURE FOR CONSENT

The above-named investigator has informed me of the risks and benefits of participating in this research project. I have seen the IRB validation stamp with proper dates of approval and expiration of approval throughout this document. I have asked questions and I have received answers that help me better understand the risks and benefits. I have thought about the risks and benefits, and I consent to be a research subject in this study.

Research Participant's Name	Research Participant's Signature	Date

Investigator's Name	Investigator's Signature	Date

Appendix F: Recruitment Email

Dear UIndy Track and Field Athlete,

I am a senior at UIndy pursuing a degree in Exercise Science, Pre-Physical Therapy with a concentration in the Honors College. For my Honors Project, I am wishing to conduct research with some of you as participants. The study would involve two days with a time commitment each day of approximately 45 minutes that can be scheduled at your convenience.

For my research, I am interested in investigating the effects of a new warm-up technique called Post-Activation Potentiation* (PAP) on power athletes (sprinters/jumpers). The two testing sessions will involve running strides with and without a weighted vest and then comparing the effects of the two types of warm-ups on the time of a short sprint (15m). If you choose to participate, more details of the research will be explained during a brief meeting before the first testing session. If you have questions about the details of the research feel free to contact me at wielandc@uindy.edu. You can also contact Dr. Richard Robinson, my research adviser, at robinsonrh@uindy.edu or (317) 788-8021 for other questions.

Thank you for your consideration and I hope that you choose to participate in this research!

Sincerely,

Chelsea Wieland

*A method of warming up the muscles through weighted exercises in an attempt to enhance the performance of power-related activities.