

AN EXAMINATION OF PRE-ACTIVITY AND POST-ACTIVITY STRETCHING
PRACTICES OF NCAA DIVISION I, NCAA DIVISION II, AND NCAA
DIVISION III
TRACK AND FIELD THROWS PROGRAMS

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ERIN LEA GILREATH

ADVISER – DR. LAWRENCE JUDGE

SCHOOL OF PHYSICAL EDUCATION, SPORT, & EXERCISE SCIENCE
COORDINATOR, ONLINE COACHING PROGRAM

BALL STATE UNIVERSITY

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ABSTRACT

PAPER TITLE: An Examination of Pre-Activity and Post-Activity Flexibility Practices of Collegiate Division I Division II and Division III Track and Field Throws Coaches

STUDENT: Erin Lea Gilreath

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The purpose of this study is to determine the pre and post-activity stretching practices of Division I, II, and III track and field throws programs. A 33-item survey instrument was developed to collect data regarding the warm-up and flexibility practices at the NCAA division I (n=320), division II (n=175), and division III (n=275) universities. A total of 135 surveys were completed for a 17.5% return rate. Descriptive statistics included frequency counts, means, and standard deviations were calculated for the demographic and educational background variables as appropriate. Significant differences were found for the level of USATF certification and the use of static stretching between throws ($\chi^2 = 6.333$, $p = 0.048$). Significance was also found for the USATF certification level and requesting the athletic trainer (AT) perform static stretching ($\chi^2 = 13.598$, $p = 0.01$). Significant differences were also found for the NCAA division level and the use of soft tissue work ($\chi^2 = 5.913$, $p = 0.026$). Although research supports dynamic warm-up/stretching over other forms of pre-activity protocols (Little & Williams, 2006; Stone et al., 2006), it appears that some track and field throws coaches are reluctant to completely discontinue traditional methods, such as pre-activity static stretching. The results of this study suggest it is necessary for

track and field throws coaches to re-evaluate their own practices, perhaps cross-checking them with the existing research.

INTRODUCTION

The competitive performance of a thrower in track and field is a very aggressive display of strength, power, and technique. All of the throwing events (shot put, discus, hammer and javelin) use technical patterns that attempt to create a summation of forces by creating torques between different parts of the body via a stretch reflex. The shot put and discus throwing events utilize this power position by having the athlete attempt to create torque between the hips and shoulders by keeping the shoulders closed to the throwing sector while the hips are more open to the sector. The hammer and the javelin also utilize positions that attempt to increase torque between the upper body/implement and the lower body as a means of applying force into the implement. All of these torque-creating positions are performed in hundredths of a second. For this reason, it is essential that the body be finely tuned to optimally perform these techniques. A delicate balance needs to be attained and maintained between flexibility and strength/power in the throws. In the throwing events, which require explosive strength, training protocols that influence the mechanical performance of subsequent muscle contractions should be addressed (Chiu et al., 2003). A variety of approaches to stretching have been investigated by the coaching, scientific, and physiotherapy communities.

Types of Stretching

There are essentially two categories of stretching employed on a regular basis among athletes as part of a complete flexibility procedure: pre-activity stretching

(Behm, Button, & Butt, 2001; Fry, McLellan, Weiss, & Rosato, 2003; Nelson, Kokkonen, & Arnall, 2005) and post activity stretching (Hunter & Marshall, 1992; Kerrigan, Xenopoulos-Oddson, Sullivan, Lelas, & Riley, 2003). Static stretching, ballistic stretching, proprioceptive neuromuscular facilitation stretching (PNF), and dynamic stretching are the specific types of stretching predominantly used by athletes, coaches, and athletic trainers in pre- or post-activity. Static stretching, the most commonly used method among athletes and coaches, requires the holding of a stretch position with little or no movement for a length of time (Mann & Whedon, 2001), usually 30 seconds. Static stretching encompasses the relaxation and simultaneous lengthening of the muscle being stretched. A classic example of a static stretch would be a seated or standing toe touch, which is intended to stretch the hamstring muscle group. Due to the nature of static stretching, a stretch reflex is not utilized, and therefore it is considered to be relatively safe compared to the next type of stretching: ballistic stretching. Ballistic stretching involves an active muscular effort and uses a bouncing-type movement in which the end position of the stretch is not held (Baechle & Earle, 2008). This type of stretching is more commonly used as part of a pre-activity warm-up. As mentioned earlier, this type of stretching does utilize a stretch reflex, thus preventing the muscle from fully relaxing, and should be used cautiously, especially in athletes with a prior injury history. A basic ballistic stretch would be a standing or seated toe touch that is performed in a ballistic (bouncing) manner; ideally the end position of the stretch should be deeper than the preceding repetition. Proprioceptive neuromuscular facilitation stretching (PNF) combines static stretching with isometric contractions of either the stretched muscle or the muscle's agonist to increase the range of motion (ROM) attainable during the stretch. PNF stretching techniques are commonly used in the athletic and clinical environments to enhance

both active and passive range of motion. PNF is considered the most effective stretching technique when the aim is to increase the range of motion (Sharman & Cresswell, 2006). Typically, PNF stretching is performed with the assistance of a partner such as an athletic trainer. There are actually three PNF stretching techniques: hold-relax, contract-relax, and hold-relax with agonist contraction. An example of a hold-relax with agonist contraction PNF stretch would be a unilateral hamstring stretch in which the athlete will lie supine, extend one leg at the knee while the partner guides the leg toward the athlete's head to a "comfortable" distance. This stretch is then held for a short duration, after which time the athlete is then instructed to resist the stretch by using the quadriceps and gluteals to push against the partner for a few seconds. Then the athlete will be instructed to relax their resistance to the stretch and generally a deeper stretch is achieved. Dynamic stretching allows for flexibility activity during a sport-specific movement. It can be argued that the pre-activity routine should contain exercises that address the concept of movement pattern specificity to most effectively prepare strength or power athletes for a specific sport activity. Although similar to ballistic stretching, dynamic stretching avoids bouncing and can include movement specific to a sport or movement pattern (Baechle & Earle, 2008). Dynamic stretching is most commonly found in the sport of track and field, but is also found in other sports like soccer, volleyball, baseball and even swimming. Michael Phelps, who swam in the 2008 Beijing Olympics, utilized dynamic stretching when he leaned forward and dynamically crossing his arms in front and behind his back a few times before a race. Specificity, targeting key areas of the body in the manner in which they are utilized in a given sport, is the key component of dynamic stretching. Circling arms backward, rotating at the shoulder, would be an example of a good dynamic stretch for a softball pitcher.

Current Stretching Research

The hypothetical objective of the pre-activity warm-up and stretching is to optimize performance and diminish the incidence of injury through augmented muscle temperature, muscle compliance, and efficiency of physiological responses (Hedrick, 1992). A properly planned pre-activity protocol will bring about a range of physiological changes that will improve performance during training activity or competition. The flexibility literature suggests that athletes should perform a “general” warm-up routine prior to activity (Cè, Margonato, Casasco, & Veisteinas, 2008; Hedrick, 1992; LaRoche, Lussier, & Roy, 2008; Mann & Jones, 1999; Ninos, 1995; Torres et al., 2008; Yamaguchi & Ishii, 2005), stretching routine prior to activity (Fredrick & Szymanski, 2001; LaRoche et al., 2008; Mann & Jones, 1999), and a stretching routine post-activity (Stone, Ramsey, O’Bryant, Ayers, & Sands, 2006).

Research reporting the usage of pre-activity warm-up and stretching and post-activity stretching, has shown stretching methods recommended a few decades ago, such as ballistic stretching (1960’s), were replaced with a static and/or PNF stretching (1980’s) and then by dynamic stretching (present). The current accepted practice is that dynamic flexibility stretching (not static, PNF, or ballistic-type stretches) should be used prior to activity (Behm et al., 2001; Cè et al., 2008; Egan, Cramer, Massey, & Marek, 2006; Fredrick, & Szymanski, 2001; LaRoche et al., 2008; Mann & Jones, 1999; Siatras, Mittas, Maneletzi, & Vamvakoudis, 2008; Torres et al., 2008; Unick, Kieffer, Cheesman, & Feeney, 2005; Winchester, Nelson, Landin, Young, & Schexnayder, 2008; Yamaguchi & Ishii, 2005, Young & Elliott, 2001). Current research suggests that athletes should perform static-style stretching following

exercise (Egan et al., 2006; Nelson & Bandy, 2008; Stone et al., 2006; Swanson, 2008).

Stretching is commonly thought to be beneficial to athletic performance, but there is a body of research that suggests acute static muscle stretching is detrimental to maximal force production or peak torque. Some authors have suggested that acute static stretching negatively impacts the torque producing ability of a muscle (Evetovich, Nauman, Conley, & Tood, 2003; Stone et al., 2006). Voluntary maximum contractions were decreased up to an hour after acute static stretching (Fowles, Sale, & MacDougall, 2000). Peak leg extension power output following a 20-minute static stretching treatment was found to be significantly lower than non-stretching treatment (Yamaguchi, Ishii, Yamanaka, & Yasuda, 2006). In research by Cramer et al. (2004) peak torque was significantly decreased after active and passive static stretching. Siatras et al. (2003) observed the mean speed of young gymnasts during the run of the vault was significantly lower after acute static stretching. While stretching has been found to increase the range of motion of a joint, researchers have indicated that acute static stretching can be deleterious to peak athletic performance.

Several studies exist that document the injurious effects of stretching on jump performance. A significant decrease in both static jumps and countermovement jumps following an acute bout of passive muscle stretching has been noted (Cornwell, Nelson, Heise, & Sidaway, 2001). Young and Elliot (2001) also concluded that static stretching produced a significant decrease in drop jump performance and a no significant decrease in concentric maximum rate of force development. A study by Robbins and Scheuermann (2008) supports the conclusion that 90 seconds of stretching per muscle group is sufficient to cause significantly lower vertical jump

scores. Significant decreases in vertical jump performance following a bout of static stretching were also reported by Hough, Ross, and Howatson (2009).

Weight room 1 repetition maximums (1RM) have been shown to be related to performance in the throwing events in track and field (Judge, Bellar, McAtee, & Judge, 2010; Reis & Ferreira, 2003). The most recent scientific evidence has indicated that the execution of a dynamic warm-up routine prior to an exercise requiring maximal force and power output may enhance an athlete's performance (Bacurau, Monteiro, Ugrinowitsch, Tricoli, & Cabral, 2008; Stone et al., 2006). Dynamic warm-up exercises emphasize progressive, whole-body, continuous movement. These exercises are typically performed in running drills that include forward, lateral, and change of direction movement (McMillian, Moore, Hatler, & Taylor, 2006). The type of warm-up utilized should be specific to the task demands.

Active warm-up, passive warm-up, and stretching are frequent procedures performed by athletes prior to engaging in physical activity. The theoretical goal of active warm-up is to optimize performance and reduce the incidence of injury through increased muscle temperature, muscle compliance, and efficiency of physiological responses. A well-designed pre-activity protocol will bring about various physiological changes that enhance the training activity or competition. Although the need of a pre-activity warm-up and stretching routines prior to throwing might be clear, the specific elements that should be included in the warm-up may be less obvious (Judge, Craig, Baudendistal, & Bodey, 2009).

Coaches Certification

National sport governing bodies (NGBs) have taken significant steps to educate coaches by conducting face to face training sessions, organizing seminars, preparing resource material, and other coaching education endeavors. The 2006

NASPE National Standards for Sport Coaches (NSSC) were designed to ensure that coaches and coaching education programs meet the core requirements for creating sport environments that function in the best interest of the athletes' personal and sport development. Collegiate coaches in the United States are often certified through the United States Track and Field (USATF) coach's education program. Established in 1984, the USATF coaches education program is a three level program designed to certify individuals as track and field coaches. Certified coaches will possess the knowledge and skills to design and implement safe and effective training programs (USATF, 2010). The USATF coach's education program utilizes many of the NASPE standards as an educational cornerstone to provide an introduction to the skills and knowledge trained coaches should have, but the program is not currently National Council for the Accreditation of Coaching Education (NCACE) accredited.

Some NCAA Division I track and field programs may also have the added benefit of working with strength and conditioning coaches. Most strength coaches and some throws coaches are certified through the National Strength and Conditioning Association (NSCA). The NSCA Certified Strength and Conditioning Specialist (CSCS) program was created in 1985 to certify individuals as those who possess the knowledge and skills to design and implement safe and effective strength and conditioning programs (NSCA, 2009). In order to pass the certification exam individuals must possess knowledge in the scientific foundations of warm-up, stretching, cool down, periodization, nutrition, and strength and conditioning, and demonstrate the skills to apply that knowledge.

NCAA Division I university athletic departments typically operate with larger budgets and a larger, more specialized staff (e.g., assistant coaches, athletic trainers, strength & conditioning coaches, etc.) compared to the NCAA Division II and NCAA

Division III athletic departments (Fulks, 2005). NCAA Division I track and field programs often have a throws coach with a strength and conditioning background and the certification to design and sometimes conduct warm-up and flexibility routines prior to practices and competitions. In contrast, most NCAA Division II and III track and field programs do not have the budgetary resources to hire a throws coach. It is unknown if the difference in budget and ultimately staffing at NCAA Division I and NCAA Division II and NCAA Division III track and field programs has an impact on warm-up and flexibility routines. Even with the proliferation of coaches' education and certification programs, and a greater emphasis on research in this area, it is uncertain if certification is actually impacting the training of athletes.

Purpose of the Study

The purpose of this study is to determine the pre- and post- activity stretching practices of men's Division I, II, and III track and field throws programs and to explore whether Division I, II, and III track and field throws programs utilize a pre and post-activity protocols that reflect the current best practices espoused by literature and whether or not their choices are affected by coaching certifications or NCAA division. These would include the use of dynamic stretches during the pre-activity warm-up and static flexibility exercises during the post-activity cool down.

METHOD

Sampling Procedure

The purpose of this study was to ascertain stretching practices conducted in men's Division I, II, and III track and field throws programs. To avoid redundancy, only one coach per program (the throws coach) was contacted about the study. The assumption was that the throws coach would complete the survey instrument, or direct the staff member responsible for stretching activities to complete the survey

instrument. Current email addresses for all Division I, II, and III men's track and field throws coaches were obtained from the 2009-2010 NCAA Coaches Directory. An introductory email explained the purpose of the study and provided a hyperlink to the institutional review board approved, web based informed consent and survey instrument. Data was collected during a four week period in Oct/Nov 2010. Early off-season was determined to be the best timeframe to maximize coaches' recall of stretching practices used during the previous season and coaches' participation in the study. A reminder email was sent to non-respondents two weeks and four weeks after the initial email in an effort to increase the overall response rate.

Instrumentation

The authors designed an institutional review board approved survey instrument to gather demographic and educational background information as well as specific pre- and post- activity practices. The survey instrument consisted of 33 questions. The first part of the questionnaire (9 questions) focused on the participant's personal and educational background information whereas the second half (24 questions) pertained to the pre and post-activity stretching practices used with the track and field throws athletes. Content validity was established in two ways. The survey was reviewed by experts for clarity and for the construction of questions, and only minor editing was required to improve the clarity of the questions. Wording of the questions was designed to include descriptive information to counteract against misunderstanding of key terminology. For example, ambiguous terms such as "warm-up" and "stretching" were defined for the respondent. Responses were similarly worded to maximize participant comprehension based on previous research using similar questions did not reveal any difficulty with participant comprehension. The survey has demonstrated construct validity (Judge et al., 2010; Judge et al., 2009).

Principle component analysis was used to compare similarity in response. Cronbach's Alpha for the entire survey (0.722) suggested the instrument had adequate construct validity.

Statistical Analysis

Descriptive statistics included frequency counts, means, and standard deviations were calculated for the demographic and educational background variables as appropriate. The two principle questions about pre-activity stretching practices were examined via chi-squared tests of expected distribution for alignment with current research supported best practices. Statistical significance was set a priori at $p < 0.05$.

RESULTS

A 33-item survey instrument was developed to collect data regarding the warm-up and flexibility practices at the NCAA division I ($n=320$), division II ($n=175$), and division III ($n=275$) colleges and universities throughout the United States that compete in track and field. From the 770 Division I, II, and III men's track and field throws programs, 135 coaches returned completed usable surveys. This represents 17.5% of a finite population. The distribution of responses by division included: 42.6% from Division I, 15.4% from Division II, and 41.2% from Division III. This distribution across the three NCAA divisions closely resembles the actual distribution of NCAA member schools with track and field programs with Division I at 320 for 41.6%, Division II at 175 for 22.7%, and Division III at 275 for 35.7% (NCAA, 2009). The low response rate may have resulted from the following factors: (a) spam control software may have sorted introductory and follow-up emails into a bulk mail folder, (b) coaches may not have been interested in the topic or may not have perceived a tangible benefit from study participation, and (c) coaches may not

have had sufficient time to complete the survey instrument due to the recruiting calendar (e.g., placed on “to do” list). While the response rate is relatively low by traditional standards, review of institution and conference affiliation data suggests the sample is representative of Division I, II, and III men’s track and field throws programs.

Demographic Information

The subjects ranged in age from 23 years to 62 years old (Table 1). The mean age of the participants was 38.6 (SD = 11.2) years. The participants reported 12.6 (SD = 9.3) years of coaching experience. The vast majority of participants were male (81.4%) (n=110). Females accounted for 18.6% (n=25) of the participants. More participants reported working at Division I institutions (42.6%) than Division III institutions (41.2%).

<Insert Table 1>

Current Pre-Activity Warm-up and Stretching

One hundred and thirty out of 135 respondents did some type of general warm-up prior to track and field throws practices and competitions. Twenty-five coaches reported the general warm-up lasted between five to 10 minutes, four coaches reported less than five minutes, 44 coaches reported between 10-15 minutes, and 61 coaches reported greater than 15 minutes in length.

One hundred and fourteen of 135 coaches performed some form of pre-activity stretching following the general warm-up. Fifteen coaches indicated using either static/ballistic, or /PNF stretching; 55 coaches used dynamic stretching, and 52 coaches reporting using a combination of static or dynamic stretching. Eight coaches reported that they did not utilize pre-activity stretching. Nine coaches used pre-

activity stretching that lasted between 5-10 minutes, 61 took greater than 10 minutes, and another six lasted less than five minutes.

Current Post-Activity Cool Down and Stretching

Of the respondents, 97 out of 135 indicated athletes completed a post-activity cool down. Eleven of the 97 respondents described post-activity cool down as low-intensity track and field throws activity, one respondent stated jogging, and four respondents specified “other” (e.g., light band movements and stance/slide movements). Fourteen coaches reported the cool-down lasted five to 10 minutes, one coach indicated less than five minutes, and one indicated between 10-15 minutes. Four of 16 coaches indicated that athletes almost always complete the full post-activity cool-down, six reported athletes almost always complete the full post-activity cool-down, five reported athletes sometimes complete the full post-activity cool-down, and one reported that athletes rarely complete the cool-down. Regarding post-activity stretching, 117 of 135 respondents reported including this aspect of training in their daily routines. Seventy-one coaches described post-activity stretching as static, six coaches reported PNF stretches, seven used dynamic stretching, 34 used a combination of static and dynamic stretching methods, and 18 coaches reported not using post-activity stretching.

Divisional Comparisons

Some key noted data when comparing coaches by division shows that 40.4 % (23 of 57) of the division I coaches say that a combination of dynamic flexibility and static/ballistic/PNF stretching best describes their pre-activity stretching, whereas 42.9 % (9 of 21) stated the same at the division II level, and 38.5% (20 of 52) stated the same at the division III level. 40.4 % (23 of 57) respondents at the division I level stated dynamic flexibility best describes their pre-activity stretching, whereas 38.1 %

(8 of 21) respondents stated the same at the division II level and 46.2% (24 of 52) respondents stated the same at the division III level. 10.5% (6 of 57) respondents at the division I level stated static stretching best describes their pre-activity stretching, whereas 19.4% (4 of 21) stated the same at the division II level and 9.6% (5 of 52) stated the same at the division III level.

Some other divisional data illustrates that 75.0 % (42 of 56) of coaches at the division III level had obtained a graduate degree, whereas 57.1 % (12 of 21) had at the division II level and, 56.9 % (33 of 58) had at the division I level. 58.6 % (34 of 58) coaches at the NCAA division I level reported having the CSCS certification; whereas 47.6 % (10 of 21) stated the same at the division II level and 62.5% (35 of 56) stated the same at the division III level.

Results Compared to Current Research Conclusions

Survey items were designed to evaluate the respondents' knowledge of flexibility. The following were the questions/responses included in the survey:

- (1) How much do you think pre-activity flexibility prevents injuries: helps greatly 55.9% (n=76) helps somewhat 29.4% (n=40) doesn't help much 8.1% (n=11), doesn't help at all 3.7% (n=5), hinders 2.2% (n=3) no response 0.7% (n=1).
- (2) How much do you think post-activity flexibility prevents injuries: helps greatly 47.1% (n=64) helps somewhat 44.1% (n=60) doesn't help much 8.1% (n=11), no response 0.7% (n=1) (rest responses 0%, n=0).
- (3) How much do you think pre-activity flexibility helps performance: helps greatly 51.5% (n=70) helps somewhat 30.1% (n=41) doesn't help much 9.6% (n=13), doesn't help at all 3.7% (n=5), hinders 4.4% (n=6) no response 0.7% (n=1).
- (4) How much do you think post-activity flexibility helps performance: helps greatly 41.2% (n=56) helps somewhat 45.6% (n=62) doesn't help much 11.0% (n=15), doesn't help at all 1.5% (n=2), hinders 0% (n=0) no response 0.7% (n=1).
- (5) When should flexibility be emphasized: pre-activity 22.8% (n=31) post-activity 38.2% (n=52) both 35.3% (n=48) neither 2.9% (n=4) no response

0.7% (n=1).

Significant differences were found for the level of USATF certification and the use of static stretching between throws ($\chi^2= 6.333$, $p = 0.048$). Ten coaches not holding a USATF coaching certification reported performing static stretching between throws compared to 24 certified coaches that reported not utilizing static stretching between throws. Significance was also found for the level of USATF certification and requesting the athletic trainer (AT) to perform static stretching ($\chi^2= 13.598$, $p = 0.01$). Five coaches not holding a USATF coaching certification reported asking the athletic trainer to perform pre-activity static stretching compared to 25 certified coaches that reported not utilizing the athletic trainer to perform pre-activity static stretching. Significant differences were also found for the NCAA division level and the use of soft tissue work ($\chi^2= 5.913$, $p = 0.026$). Fifteen coaches NCAA division I coaches reported using soft tissue work, three NCAA division III coaches reported using soft tissue work, and five NCAA division III coaches reported using soft tissue work.

<Insert Figure 1>

<Insert Figure 2>

<Insert Figure 3>

DISCUSSION

A properly designed pre-activity warm-up and stretching routine is intended to prepare the athlete for their specific sport practices and competitions. The research suggests a warm-up (preferably sport-specific) should be performed prior to stretching (Bishop, 2003a; Bishop, 2003b; Cè et al., 2008; Hedrick, 1992; Mann & Jones, 1999; Ninos, 1995; Torres et al., 2008; Yamaguchi & Ishii, 2005), and a subsequent stretching routine (preferably dynamic) should be performed prior to practice and

competition (Faigenbaum & McFarland 2007; Fredrick & Szymanski 2001; LaRoche et al., 2008; Mann & Jones 1999; Shellock & Prentice 1985; Smith, 1994). Concurrent with the literature, 95.6% of track and field throws coaches reported completing a pre-activity warm-up. These findings are similar to Judge et al. (2009) which revealed 100% of the college football programs surveyed did a pre-activity warm-up and Judge et al. (2010) which revealed 100% of the women's college volleyball performed a pre-activity warm-up. The same survey instrument used in the current study was also used in both the football and volleyball studies.

Current research recommends dynamic stretching should be completed before track and field throws practices or competitions (Cè et al., 2008; Fredrick & Szymanski, 2001; Herda, Cramer, McHugh, & Stout, 2008; LaRoche et al., 2008; Mann & Jones, 1999; McMillian et al., 2006; Shellock & Prentice, 1985; Torres et al., 2008; Yamaguchi & Ishii, 2005) rather than static stretching (Church, Wiggins, Moode, & Crist, 2001; Evetovich et al., 2003; Fowles, Sale, & MacDougall, 2000; Janot, Dalleck, & Reymont, 2007; Kokkonen, Nelson, & Cornwell, 1998; Marek et al., 2005; Nelson et al., 2005; Young & Behm, 2002; Young & Elliott, 2001). Of 114 respondents reporting the use of pre-activity stretching, 55 coaches (40.4%) reported using dynamic stretching as their pre-activity method. This is consistent with the research recommended protocol. However, 38.2% of coaches reported using a combination of dynamic stretching and static/ballistic, and /PNF stretching and 2.2% use static stretching to describe their pre-activity stretching. Current literature does not support the use of static/ballistic, and PNF stretching prior to track and field throws practices and competitions (Bishop 2003a; Bishop, 2003b; Bradley, Olson, & Portas, 2007; Burkett, Phillips, & Ziuraitis, 2005; Faigenbaum & McFarland, 2007; Kovacs, 2006). Bradley et al. (2007) and Woolstenhulme, Griffiths, Woolstenhulme,

& Parcell (2006) recommended using ballistic stretching during pre-exercise; however, this form of stretching is frequently not supported by research (Bradley et al., 2007; LaRoche et al., 2008). PNF stretching after warm-up is associated with significant increases in range of motion (Sharmann & Cresswell, 2006; Wenos & Konin, 2004).

This combination stretching may be limiting the explosive capabilities of track and field throws athletes and may have little or no effect on injury prevention (Shrier, 1999; Stone et al., 2006). Most available data indicates pre-activity static stretching can cause acute performance reduction relating to decreased tissue stiffness or alterations in nervous system components of the stretch-shortening cycle, such as the myotatic reflex (Stone et al., 2006). These alterations can result in decreased maximum strength and explosiveness, as well as inferior performances in the throwing circle. However, the throws coaches in the present study appear to be hesitant to eliminate pre-activity static stretching.

These findings differ from the reported pre-activity stretching practices of volleyball coaches (Judge et al. 2010) and of football coaches (Judge et al., 2009). Forty-two percent of volleyball coaches reported utilizing pre-activity dynamic stretching (Judge et al., 2010). Twenty-six percent of football coaches indicated using only dynamic stretching prior to activity compared to 40.4 % of track and field throws coaches in the present study. In both studies, a high percentage of football coaches (90%) and volleyball coaches (86%) reported including dynamic stretching as part of the pre-activity protocol compared to (79%) track and field throws coaches in the present study. Yet, even though the coaches understood the value of dynamic stretching, many coaches failed to eliminate static stretching from the prescribed pre-activity routine. It may be that coaches are reluctant to remove static stretching

because of dogmatic adherence to coaching practices passed on from previous generations. Also, the ratio of athletes to throwing circles/surfaces may result in a significant amount of downtime for the athletes between throws. Many athletes will look to fill this downtime by doing something they feel might better prepare them for their next throwing opportunity. In a competition setting, it is hypothesized that much static stretching performed by athletes is an attempt to distract their mind from focusing on certain aspects of the competition that might hinder their performance. Ironically, they use performance-hindering static stretches to distract their minds from the possibility of poor performance. Both of these situations can be combated by the coach educating the athletes about the detrimental effects of static stretching and by developing routines for athletes to follow in these situations that do not involve static stretching.

It is typically recommended that track and field throws athletes perform static stretching after exercise. Interestingly, 86.0% of track and field throws coaches in this study reported athletes did complete a post-activity stretching protocol. This is much higher than the 43.5% of football coaches who reported athletes do not complete any post-activity stretching protocol (Judge et al., 2009). Among those coaches who completed post-activity stretching, 52.2% of them reported static stretching as their primary method. This means that a little more than half of the coaches who implement post-activity stretching into their program are following research recommendations. But this number is much lower when compared to post-activity flexibility reported by volleyball coaches (71.4%) (Judge et al., 2010).

Ninety-seven of 135 coaches (71.3%) reported that athletes complete a post-activity cool down. It can only be speculated why the post-activity cool down and stretching are not completed on a more consistent basis. Perhaps, due to the NCAA

(2010) 20 hour of countable athletic activities rule, there is a lack of practice time to perform this cool-down and stretching, and coaches are unable to make it a mandatory conclusion to daily practice. Venue scheduling and availability may also affect post-activity work as track and field throws coaches may have a small window of time to use the court. Student-athletes have to balance class, practice, study, and competition and may not have time to complete a full daily cool-down on their own in the locker room, training room, or another venue.

One of the most interesting findings of the present study is that 25.7 % of throws coaches reported not being certified. The lack of Division I track and field throws coaches with certifications could be attributed to the fact that many institutions often hire a former thrower to fill this specialized position and certification is often completed subsequent to their initial hire.

Another interesting finding is the similarities between Division I, Division II, and Division III programs in terms of the pre-activity stretching routines. It is concluded that track and field throws coaches are implementing flexibility practices into their programs; however, there seems to be little compliance with the proper protocols recommended in the literature. Perhaps fewer support staff and fewer certified professionals at the NCAA Division II and Division III level impact the likelihood of scientific-based stretching practices being incorporated into track and field throws programs.

PRACTICAL APPLICATIONS

The results of this study suggest it is necessary for track and field throws coaches to re-evaluate their own practices, perhaps cross-checking them with the existing research. Although research supports dynamic warm-up/stretching over other forms of pre-activity protocols (Little & Williams, 2006; Stone et al., 2006), it

appears that some track and field throws coaches are reluctant to completely discontinue traditional methods, such as pre-activity static stretching. This study suggests track and field throws coaches need to implement more scientifically appropriate flexibility practices within the context of their respective teams.

Track and field throws coaches at all levels could benefit from participating in certification programs, like the system offered by the National Strength and Conditioning Association, to learn current practices. As the knowledge base for warm-up and stretching strategies continues to evolve, track and field throws coaches should adapt their practices to ensure athletes are being properly prepared for training and competition. This can be accomplished by obtaining a commitment from coaches to understand and keep up-to-date with current research and also by obtaining a commitment from coach's education programs to teach literature and follow-up with coaches receiving certifications.

Coaches should try to gain knowledge from as many professional sources as possible, which can include consultation with a certified strength and conditioning coach or athletic trainer, and participation in a coach's certification program. Utilizing well designed training programs that follow research recommended pre-activity stretching protocols that can have a positive impact on an athlete's preparedness which contributes to peak performance. Adhering to these recommendations would allow track and field throws programs to implement more appropriate flexibility (warm-up/cool-down, and stretching) routines for maximal benefits towards their respective team.

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Table 1

Subject Characteristics

Variable		Mean or Percent	<i>SD</i>
Age		38.6 yrs	11.2
Years of Coaching Experience		12.6 yrs	9.3
Gender	male	80.9% (n=110)	
	female	18.6% (n=25)	
NCAA Div	I	42.6% (n=58)	
	II	15.4% (n=21)	
	III	42.1% (n=56)	

Table 1: Participant characteristics given in means with standard deviations or in percent of total with count.

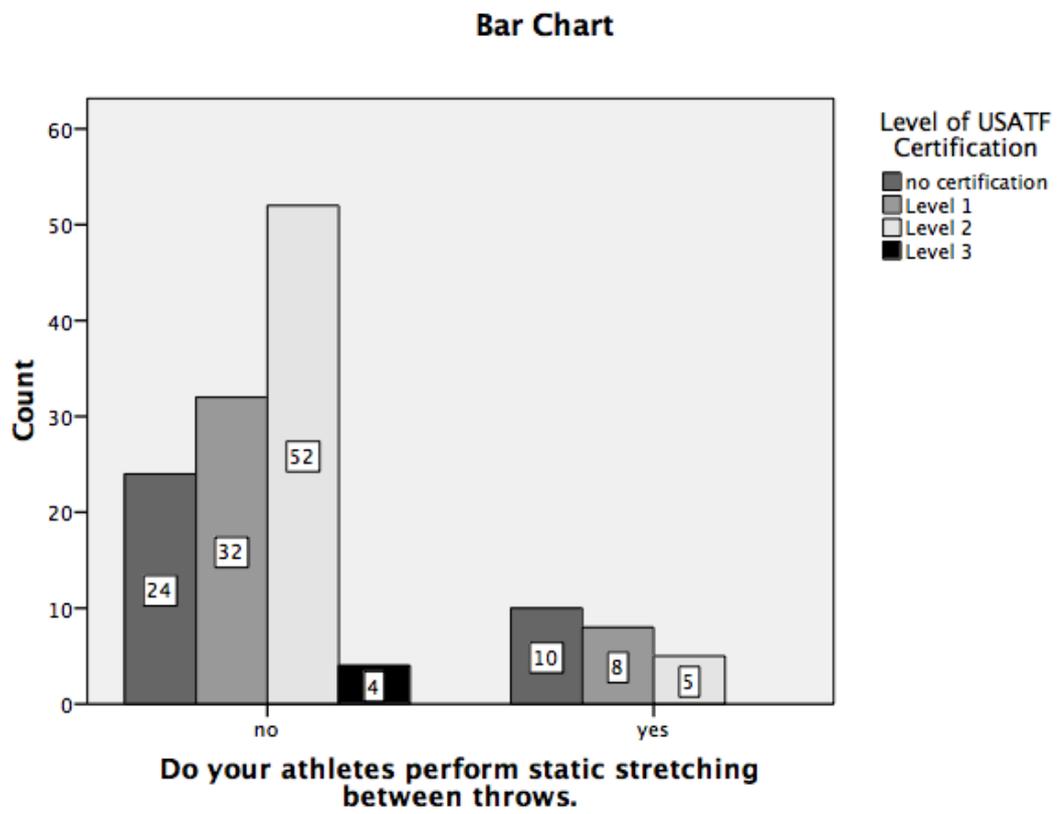


Figure 1: Significant differences for the level of USATF certification and the use of static stretching between throws.

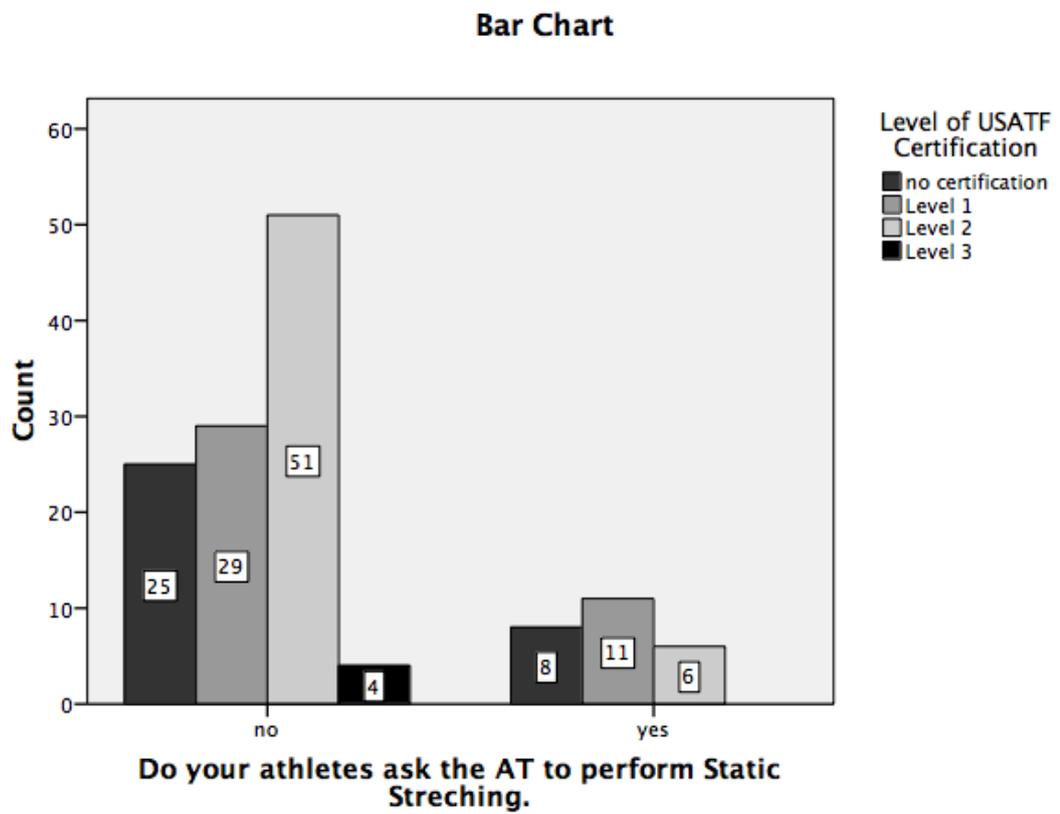


Figure 2: Significance differences for the level of USATF certification and requesting the athletic trainer (AT) to perform static stretching.

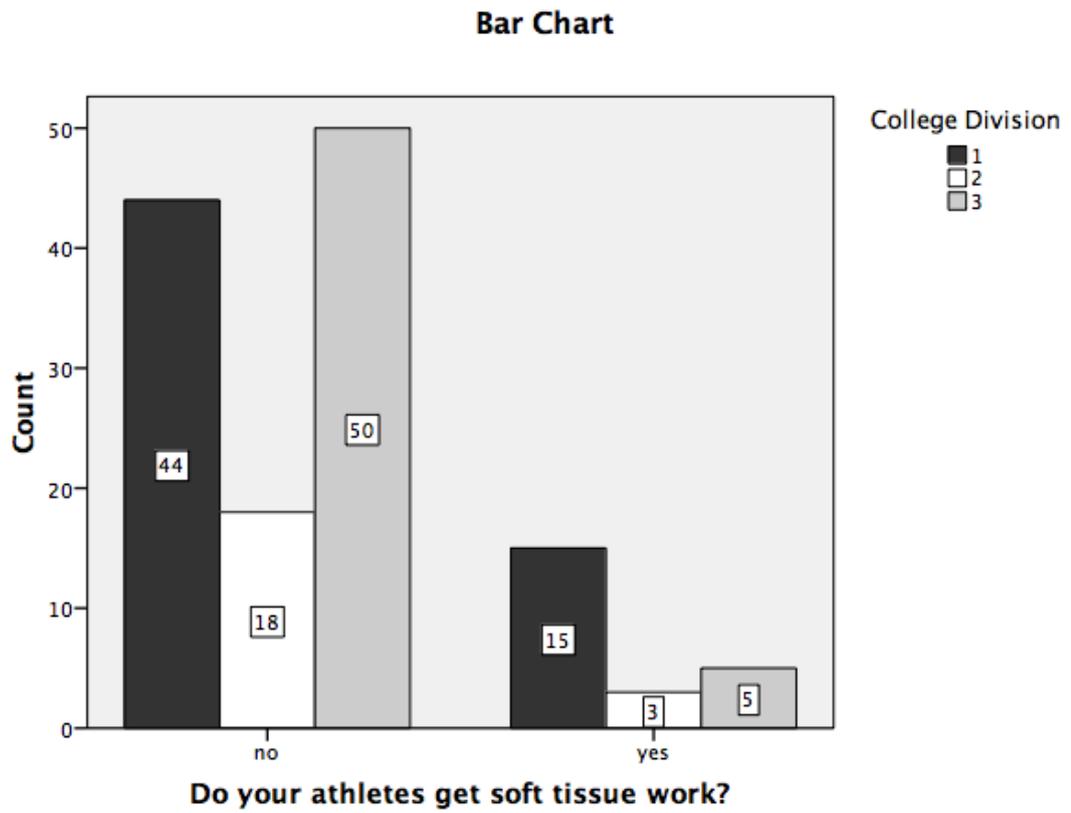


Figure 3: Significant differences for the NCAA division level and the use of soft tissue work.