February 29, 1980 the Missouri Association for Health, Physical Education, Recreation and Dance became incorporated as an association.

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NOTE: The *Missouri Journal of Health, Physical Education, Recreation and Dance* began using volume numbers with the 1991 issue, which was designated volume 1. Earlier issues do not bear a volume number.
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Sun Safety Issues: Health and Physical Educators Must Lead Prevention Efforts

Janice Clark Young

It is no secret that children and adolescents look to adults for protection, education, and advice. Kids need role models to learn how to behave in social settings and other situations. More than 75% of American children consider family members, family friends, and teachers to be role models (The State of Our Nation’s Youth, 2008). As role models, teachers should demonstrate behaviors students can emulate as they learn and grow in grades K-12.

To be positive role models, students need to observe teachers leading by example. Alignment of the information teachers present in the classroom should match their behaviors in the school and community setting. Health and physical education teachers are expected to be healthy, to be physically fit, and to “walk the walk” as well as talk it. Their behaviors outdoors should match what they are teaching indoors.

Skin cancer is the most common form of preventable cancer in the US (American Cancer Society [ACS], 2010). It can be prevented by limiting one’s unprotected exposure to ultraviolet radiation (UVR) or sunlight. UVR is the strongest between 10:00 a.m. and 4:00 p.m. when recess, outdoor physical education classes, and school-related and after-school activities occur.

Over 1 million students are enrolled in Missouri schools in grades K-12 (US Census, 2000), and they will spend a considerable amount of time outdoors while at school. Students’ “…UV radiation exposure during the school years contributes significantly to their total lifetime sun exposure” (World Health Organization [WHO], 2003, p. 2).

Each spring when the weather becomes warm, it is common for physical education teachers to be the first individuals in the schools to be suntanned. Although the idea of a “healthy tan” is losing popularity, deeply tanned teachers and coaches should be mindful of the negative example they may present to students. “Teachers, coaches, and staff should model sun protection behaviors during outdoor activities (Young & Goodwin, 2010, p. 46). Schools should be sun-safe locations for all students.

Establishing healthy routines in childhood can foster positive lifelong prevention habits, so sun protection behaviors (see Figure 1) should be initiated early (Young, 2000). Sun-safe behaviors are important because one or more blistering sunburns during childhood and adolescence more than doubles the individual’s risk of future melanoma (Gilchrest, Eller, Geller, & Yaar, 1999). Compared to adults, youth have more time and opportunities...
for UVR exposure which then increases their future risk for skin cancer (Gilchrest et al., 1999). Unfortunately, less than one-third of youth in the US practice sun protection behaviors (Cokkinides, Johnston-David, Weinstock, O’Connell, Kalsbeek, Thun, & Wingo, 2002).

There is no safe tan. All damage to skin is cumulative. Protect your skin.

Recommended Sun Protection Behaviors

Avoid unprotected exposure to sunlight.

Minimize UVR exposure between 10:00 a.m. – 4:00 p.m.

Seek shade from the sun.

Wear sun-protective clothing: tightly woven fibers with long sleeves, wide-brimmed hats (>3 inches) or Legionnaire’s caps (baseball type caps with ear and neck flaps), wrap-around sunglasses that block 99% of UVA and UVB radiation)

Use a broad spectrum sunscreen (blocks both UVA and UVB rays) with SPF ≥15. Apply generous amounts at least 30 minutes before UVR exposure, and after swimming or sweating.

Avoid tanning beds and sun lamps.

Figure 1

Sun safety education should become a part of every health and physical education teacher’s curriculum for grades K-12. “Each year there are more new cases of skin cancer than the combined incidence of cancers of the breast, prostate, lung, and colon” (ACS, 2009). Once a rarity, the incidence of skin cancer among children is now becoming more common (Maguire-Eisen, Rothman, & Demierre, 2005). Because 90% of all skin cancers are preventable (Schmid-Wendtner et al., 2002), sun-safe behaviors, sun protection education, and sun-safe school policies are critically important.

The Centers for Disease Control (CDC) has developed Guidelines for School Programs to Prevent Skin Cancer (Glanz, Saraiya, & Wechsler, 2002) to provide basic facts and suggested policies for implementing a sun safety program within a coordinated school health program. Involvement of students, staff, families, and the community is strongly encouraged as these guidelines are established. The seven recommendations for schools to reduce students’ skin cancer risks include: policy; environmental change; education; families; professional development; health services; and evaluation (Glanz et al., 2002, pp. 9-17).

Policy—Establish policies that reduce exposure to UVR. Before launching sun safety requirements, seek input from all affected groups
Consideration of existing school policies is necessary because some schools may ban hats due to possible gang colors or affiliation, or may include sunscreen as “medicine”.

A gradual shift in policy will be necessary because it is difficult or impossible to eliminate outdoor activities during school hours. Whenever possible, schools should shift outdoor activities to non-peak UVR hours. Over time, additional shade for school property can be acquired or planted. Community/business donations can be obtained to provide trees, shade structures, and sunscreen. Posters and announcements can serve as reminders for sun protection.

Sunscreen should become part of the school culture and supplies. Teachers and coaches should wear it during outdoor activities. Students should wear sunscreen to school. Parents should supply sunscreen as part of students’ school supplies. Sun safety information should be distributed to parents each year.

Environment: Provide and maintain physical and social environments that support sun safety and are consistent with the development of other healthy habits. Sun protection can be considered in the design of new schools and building additions. Students, teachers, and the community “can identify opportunities for new shaded areas”—temporary, permanent, natural or constructed (planting trees, erecting awnings, tarps and shade structures). Community partners or grants can provide sunscreen at low/no cost to the schools. Teachers, coaches, staff, and administrators should act as role models and lead by example. Incentives and awards should be presented to students and adults who consistently practice sun safety.

Education: Provide health education to teach students the knowledge, attitudes, and behavioral skills they need to prevent skin cancer. This education should be age-appropriate and linked to opportunities for practicing sun-safe behaviors. Sun safety education should be taught consistently and sequentially pre-K-12 and integrated into other subject areas as appropriate (math, science, history, social studies). Lessons should occur seasonally when UVR exposure is most likely and sun protection is needed. Peer educators can assist with sun protection lessons at most grade levels.

Families: Involve family members in skin cancer prevention efforts. As the most important determinant of sun protection behaviors in children, parents must be educated, and support the school’s sun-safe policies. Parents and guardians must advocate for wearing protective clothing, hats, sunglasses, and sunscreen.

Professional Development: Include skin cancer prevention knowledge and skills in pre-service and in-service education for school administrators,
teachers, physical education teachers and coaches, school nurses, and others who work with students. This should be integrated into existing professional development activities and tailored to the responsibilities of specific personnel.

**Health Services:** Complement and support skin cancer prevention education and sun-safety environments and policies with school health services. Permission slips to apply sunscreen before going outside should be part of students’ school health records. Sports physicals can reinforce skin cancer prevention measures among student athletes.

**Evaluation:** Periodically evaluate whether schools are implementing the guidelines on policies, environmental change, education, families, professional development, and health services. School boards and administrators should assess the effectiveness of school policies and educational curricula to determine where modifications and changes are needed. Identify which policies have the highest priority based on the needs of the students and the school district.

The Guidelines for School Programs to Prevent Skin Cancer are available at [www.cdc.gov/mmwr/preview/mmwrhtml/rr5104a1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5104a1.htm). Further suggestions for developing a school sun protection policy and sample policies can be found at [www.sunsafetyforkids.org/schoolpolicy](http://www.sunsafetyforkids.org/schoolpolicy). Many excellent, free sun protection curricula exist, so health and physical educators do not have to create original lessons. K-8 materials are available through the SunWise School Program ([www.epa.gov/sunwise](http://www.epa.gov/sunwise)), and English and Spanish versions of SunWise are available. The Sun Safety Activity Guide ([www.nsc.org](http://www.nsc.org)) also provides K-8 lessons. For grades 5-8, lessons are available from the Skin Cancer Foundation ([www.SkinCancer.org/school](http://www.SkinCancer.org/school)), and additional teacher resources can be obtained from [www.skincancer.org/school/teacherresources/resources.php](http://www.skincancer.org/school/teacherresources/resources.php). This Sun Safety Activity Guide ([www.skincancer.org/school/teacherresources/correlations.php](http://www.skincancer.org/school/teacherresources/correlations.php)) also lists the National Health and Science Standards it meets. Free K-12 curricula include SunSmart America ([www.melanomafoundation.com](http://www.melanomafoundation.com) or by telephone at 561-687-2400), and the Sun Safe School Guide ([sdhw.info/pdfs/schoolguide02.pdf](http://sdhw.info/pdfs/schoolguide02.pdf)).

As part of the school’s skin cancer education curricula, health and physical educators should also include the topic of indoor tanning. Nearly 2.3 million teens (Demeirre, 2006) tan indoors every year. Despite the safety claims, indoor tanning is not safer than sunlight, and there are no recognized health benefits from tanning beds (Food and Drug Administration, 1987; National Institutes of Health, 1989; Greeley 1993). The use of indoor tanning devices increases all three types of skin cancer (Swerdlow & Weinstock, 1998; Karagas, Stannard, Mott, Slattery, Spencer, & Weinstock, 2002). “Currently, at least 32 states regulate the use of tanning facilities by minors” (National
In 2010 Missouri House Bill 1822, which would have banned tanning device use for those younger than 16 years of age, (NCSL, 2010) did not pass. Teachers and administrators should support the reintroduction of this bill and strongly discourage indoor tanning before spring break and prom. As advocates for students’ safety, health and physical education teachers are demonstrating another facet of being positive role models and responsible community members.

By implementing a sun protection curriculum, health and physical education teachers will also contribute to reaching the HealthyPeople 2020 Objectives related to skin cancer prevention. These national health objectives include (HealthyPeople 2020, 2010):

C-8 Reduce the melanoma cancer death rate; and
C-20 Increase the proportion of persons who participate in behaviors that reduce their exposure to harmful ultraviolet (UV) irradiation and avoid sunburn.
C-20.1 Reduce the proportion of adolescents in grades 9 through 12 who report sunburn.
C-20.3 Reduce the proportion of adolescents in grades 9 through 12 reported using artificial sources of ultraviolet light for tanning.
C-20.5 Increase the proportion of adolescents in grades 9 through 12 who follow protective measures that may reduce the risk of skin cancer.

“All teachers, caregivers, coaches, school staff, school nurses and parents should become positive role models who practice and promote sun protection behaviors” (Young, 2000, p. 71). The school itself can become a role model for families and the community at large (WHO, 2003). The long-term goal is to prevent skin cancer, and health and physical education teachers can lead the effort to establish sun safety policies in their school districts. Together, we must provide students with the knowledge and skills to adopt and maintain lifelong sun protection behaviors. The unnecessary prevalence of skin cancer can be reduced in their lifetimes.

References


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Effect of Frequency of Resistance Training and Modes of Exercise on Bench Press Strength Gains in College Men

James Crone

The purpose of this study was to compare the interaction of training frequency, initial strength level, and training mode on 1RM bench press improvement in college men. Untrained men were selected based on strength level (low strength = <70 kg, n = 90; high strength = >70 kg, n = 90), randomly divided into 2d/wk and 3d/wk groups to train on free weights (FW, n = 30), supine vertical press machine (SVP, n = 30), or seated horizontal press machine (SHP, n = 30). Each group was measured for 1RM on their specific training device before and after 12 weeks of training using similar linear periodization resistance training programs. Groups were similar initially in age and height but differed in weight, BMI, and 1RM. Following training, SHP and SVP made greater gains than FW regardless of training frequency. Groups equated for initial strength may make greater gains training with machine weights than with free weights regardless of starting strength.

Key Words: training specificity, machine weights

Resistance training has gained popularity for developing muscular strength, enhancing body composition, and maintaining bone density in diverse populations. Although free weights initially may have been the most popular method of resistance training, the development of various machine weights has widened the possible application of strength training. Free weight exercise, or isotonic resistance, is predicated on the principle that the load being lifted remains constant throughout the range of motion, but the configuration of the joint causes the application of force to differ at various points in that range of motion. Several machine weights have been developed which attempt to match the resistance to the potential force capability at various points in the range of motion to maximize strength development (McMaster, Cronin, & McGuigan, 2009).

Free weights are manipulated solely by the lifter and require control of the weight throughout the range of motion by synergistic muscles (McCaw & Friday, 1994). Machine weights guide the resistance through a specific path, reducing the activation required in synergistic muscles (McCaw
Previous research has shown that differences in one-repetition maximum (1RM) exist depending on the mode used for measurement (Boyer, 1990; Cotterman, Darby & Skelly, 2005; Floyd, Otte, & Mayhew, 2009; Fry, Powell, & Kraemer, 1992; Hart, Ward, Mayhew, & Ball, 1990; Lyons, McLester, Arnette, & Thomas, 2010; Scott, Bergstrom, Bates, Bowen, Mayhew, & Visich, 1994). Some evidence suggests that individuals can lift more weight using a weight machine since the effort devoted to synergistic muscles may be used for propulsive force (Hart et al., 1990). However, recent findings indicate that greater 1RM values may not always be produced with machine weights (Cotterman et al., 2005; Floyd et al., 2009), and differences between free weights and machine weights may be lift-specific for core lifts such as the bench press and squat (Cotterman et al., 2005).

The differences in load application between free weights and machine weights through the lifting range of motion suggest the possibility of producing differences in strength gains during training. If one mode of training has the potential of producing more strength compared to another mode, it may benefit an individual to begin a resistance training program with one mode before switching to another mode to continue strength development.

With the increasing use of resistance training as a form exercise for all ages, it would be beneficial to determine if the response to training with different resistance modes would interact with training frequency to produced markedly different gains in muscular strength. Therefore, the purpose of this study was to determine the effect of different resistance training modes and training frequencies on the upper body strength improvement of untrained men.

**Methods**

**Subjects**

College men ($n = 180$) with low-strength ($n = 90$, 1RM = 53.5 ± 6.0 kg) and high-strength ($n = 90$, 1RM = 94.6 ± 14.1 kg) performances in an upper-body exercise (bench press) on three different training modes were selected from a larger cohort ($N = 670$) and strength-matched on each of three training modes. The study was fully explained to the subjects, and written consent was obtained prior to the study. The protocol was approved by the Institutional Review Board of the university prior to any testing. Physical characteristics of the subjects by group are shown in Table 1.
Table 1
Physical Characteristics of the Subjects by Strength Level and Training Frequency

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<th>Variable</th>
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<tr>
<td></td>
<td>LS (n = 45)</td>
<td>HS (n = 45)</td>
<td>LS (n = 45)</td>
<td>HS (n = 45)</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>19.4 ± 1.5</td>
<td>19.7 ± 2.0</td>
<td>19.3 ± 1.1</td>
<td>19.4 ± 1.1</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>178.1 ± 6.8</td>
<td>176.7 ± 7.2</td>
<td>178.7 ± 7.2</td>
<td>179.4 ± 8.0</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>65.2 ± 9.0ᵃ</td>
<td>84.0 ± 16.3</td>
<td>65.4 ± 9.6ᵃ</td>
<td>83.3 ± 12.6</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>20.6 ± 2.7ᵃ</td>
<td>26.8 ± 4.7</td>
<td>20.6 ± 2.6ᵃ</td>
<td>25.9 ± 3.6</td>
</tr>
</tbody>
</table>

Legend: LS = low-strength, HS = high-strength, BMI = Body Mass Index
ᵃSignificant difference between strength groups

Procedures

Free-weight (FW) 1RM bench press measurement followed a standard “touch-and-go” protocol in which the bar was lowered slowly to touch the chest before being pressed immediately to full-arm extension (Stone & O’Bryant, 1987). During testing, each subject performed a warm up according to personal preferences using light weights of approximately 50% to 70% of estimated 1RM for several sets. When testing began, a weight was selected, and one repetition was performed. If this repetition was successful, a minimum of five minutes rest was given before attempting subsequent repetitions with additional weight. The amount of weight added was dependent upon the ease of completing the single repetition and usually ranged from 1.1 to 6.8 kg. This approach allowed most subjects to reach their 1RM within three to five attempts. Each subject used a grip that was slightly wider (approximately 15-20 cm) than shoulder width. A spotter assisted in the lift-off to position the bar above the chest in a straight-arm position prior to the lift. The lift consisted of an eccentric movement followed by a concentric movement. Reliability for this procedure has been established at 0.95 (Rose & Ball, 1992).

The machine weight modes included a supine vertical chest press (SVP) and a seated horizontal chest press (SHP). The SVP (Nautilus Supine Leverage Press) was a plate-loaded vertical bench device which had a fixed pivot point producing a shallow convex arc to the upward path of the bar. The grip placed the hands approximately 10-15 cm outside the shoulder joint. The SHP (Nautilus Nitro Vertical Chest Press) positioned the subject in an upright seated posture, producing a nearly horizontal motion with the resistance bar. Seated height was adjusted to place the hand grip at the mid-chest position. The grip placed the hands approximately 5-10 cm outside the shoulder joint. Although the SHP employed a weight stack, small weight
plates (1.1 kg) allowed comparable increments in loading to the other modes. The same procedures as employed with FW testing were used for maximal strength testing with the specific machines. Following a warm-up using light weights (50-70% of projected 1RM), an initial weight was lifted for one repetition. Weight was added dependant upon the ease of completing each repetition. Both machine weight 1RM attempts were initiated in the flexed-arm position producing a concentric-only movement. Reliability for 1RM determination on these devices had been established previously at 0.96 (unpublished data).

During training, the FW group performed most resistance training exercises using free weights while the machine weight groups used motion-specific machines to perform exercises similar to those used by the FW group. Core exercises included bench press and squat (or leg presses). Supplemental lifts included seated behind-the-neck presses, arm curls, lat pulls, upright rows, and calf raises. The machine groups performed the same exercises but employed specific machines for each exercise.

The two training frequency groups underwent a similar linear periodization resistance training program either two times (2 days/week) or three times per week (3 days/week) for 12 weeks. Core lifts followed a periodized program of 3 x 10-12-RM during the first five weeks, 3 x 6-8-RM during the next four weeks, and 3 x 3-5-RM during the final three weeks. Supplemental lifts were performed in three sets of 10-RM, with weight being added when the subject could perform three sets of 12 repetitions with ease.

**Statistical Analyses**

A mixed factorial analysis of variance (strength level x mode x frequency) was used to identify significant differences in pre-training strength level and gains in upper-body strength following training. When significance was identified at $p \leq 0.05$, a Bonferroni post hoc test was used to isolate the differences. Statistical power exceeded 0.78 for all analyses. Pearson correlation coefficients were used to determine the relationships among specific variables.

**Results**

There was no significant difference ($p>0.10$) in age or height among the groups prior to training. However, there was a significant difference ($p<0.001$) between the low-strength and high-strength groups in body weight (65.2 ± 9.3 kg vs 83.2 ± 14.6 kg, respectively) and BMI (20.5 ± 2.6 kg/m² vs 26.3 ± 4.2 kg/m², respectively).

Due to the matching of groups, there were no significant differences ($p>0.30$) in pre-training upper-body strength for the main effects of training frequency, training modes, or the interactions for frequency by mode, frequency by strength groups, and frequency by modes by strength groups.
Obviously, the high-strength group had a significantly greater ($p<0.001$) 1RM value than the low-strength group.

Strength changes were determined by comparing gain scores (Post-Training – Pre-Training). There was no significant main effect for frequency ($p = 0.24$) or strength group ($p = 0.37$). The 2d/wk group made a comparable gain (11.5 ± 7.7 kg) to the 3d/wk group (10.4 ± 6.7 kg). The high-strength group made a slightly greater gain (11.4 ± 7.3 kg) than the low-strength group (10.5 ± 7.1 kg). The SHP group made a significantly greater gain (14.9 ± 7.6 kg) than the SVP group (11.0 ± 5.2 kg) which was significantly greater than the FW group (7.0 ± 6.4 kg). There was a significant mode x strength group interaction (Figure 1). When the gains were considered as percent improvements, a pattern emerged indicating the greatest gains were made by the SHP group for both low-and high-strength groups (Figure 2). Furthermore, high-strength groups had greater proportions in the higher percent gain groups than did the low-strength groups.

![Figure 1. Mode-specific 1RM strength gains for low-strength and high-strength groups. Legend: FW = free weights, SVP = supine vertical press, SHP = seated horizontal press.](image)

The relationships between initial strength level and strength gain were similar and nonsignificant for various comparisons (Table 2). The initial strength level of the subjects had no relationship to the improvement made by either the 2d/wk ($r = 0.01$) or 3d/wk ($r = 0.02$) groups. Similarly, there was no relationship between initial strength level and strength gain for low-strength ($r = 0.20$, $p = 0.06$) or high-strength ($r = -0.20$, $p = 0.06$) individuals.
There was also no significant relationship between initial strength and strength gain for any of the modes (FW, $r = 0.25$, $p = 0.06$; SVP, $r = 0.25$, $p = 0.06$; SHP, $r = 0.24$, $p = 0.07$).

**Discussion**

This study revealed that 2d/wk and 3d/wk resistance training programs produced similar gains in strength for beginning weight trainers regardless of their initial strength levels or mode of exercise. Subjects who began at approximately the same strength level (i.e., low-strength or high-strength) gained significantly more strength using machine weights than using free weights (Figure 2). The percent gain made by both SHP ($21.2 \pm 11.2\%$) and SVP ($15.7 \pm 8.2\%$) were greater than the gain by FW ($11.4 \pm 12.6\%$) when consider across frequencies and strength levels. This agreed with previous studies which have shown that the gain in upper-body strength appears to be specific to the mode of training (Boyer, 1990; Fry et al., 1992; Lennon, Mathis, & Ratermann, 2010; Mayhew, Smith, Arabas, & Roberts, 2010; Scott et al., 1994). Other studies have shown that free weights produce greater improvements in muscular strength than do machine weights (Stone, Johnson, & Carter, 1979) or there is no difference between the modes of training (Simpson, Rozenek, Garhammer, Lacourse, & Storer, 1997). The results of the current study would suggest that novice weight trainers might be advised to begin training on machine weights to gain strength rapidly before switching to free weights for continued development. This recommendation might be considered tentative at this point since there are no studies which have used a cross-over design to definitively state that strength will continue to improve after switching from one mode to another.

In addition to the questions of transfer of strength improvement from one
mode to another is the issue of the transference of strength improvement to non-movement specific performances. Rutherford, Greig, Sargeant, and Jones (1986) noted that a 200% increase in leg extension strength failed to enhance all-out cycling performance. However, few studies have focused on the transfer of strength gain from different training modes to the enhancement of performance criteria. Stone, Johnson, and Carter (1979) found that free-weight squat training produced greater improvements in vertical jump than did Nautilus leg presses and leg extensions. They ascribed this difference to movement pattern specificity between the squat and jump.

Some sources speculate that the greater gain in strength could be due to increased electrical activity in the muscle when using machine weights (Sale, 1988). Other work has shown electromyographic activity to be greater using FW than using machine weights when lifting the same submaximal load (McCaw & Friday, 1994; Schick et al., 2010). However, similar studies using maximal loads for comparisons of electromyographic activity between FW and machines weights are not yet available. A recent study using 90% of 1RM bench press produced 6-50% more EMG activity using FW than machine weights (Schick et al., 2010).

It has been suggested that free weights activate synergistic muscles to a greater degree than do machine weights and this offers better development of balance during training (Lander, Bates, Sawhill & Hamill, 1985). This, too, may be mostly speculative since evidence supporting enhanced balance following free weight training is lacking. In his review on neural adaptation, Sale (1988) has suggested that the neural learning that takes place during resistance training is probably specific to training device, indicating that little carry-over in balance would be evident from training with any of the modes since they are not specific enough to the coordination of specific activities (Fry et al., 1992).

In conclusion, the current study would suggest that untrained men of the same initial strength level might gain more strength faster using machine weights than using FW. This provides some support for the training specificity principle but does not rule out the possibility of some general gain in strength when assessed by different techniques (Lennon et al., 2010; Mayhew et al., 2010). Recent studies have documented measurement specificity when comparing different testing modes following specific training routines (Fry et al., 1992), but they also showed some degree of general strength improvement when measured using a mode different from that of the training mode (Lennon et al., 2010; Mayhew et al., 2010).

References

Table 2
Strength Characteristics of the Subjects by Weight Group and Training Mode

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low-Strength</th>
<th></th>
<th>High-Strength</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FW</td>
<td>SHP</td>
<td>SVP</td>
<td>FW</td>
</tr>
<tr>
<td></td>
<td><em>n = 15</em></td>
<td><em>n = 15</em></td>
<td><em>n = 15</em></td>
<td><em>n = 15</em></td>
</tr>
<tr>
<td>2 Days/Week</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Training 1 RM (kg)</td>
<td>51.1 ± 5.8^a</td>
<td>56.7 ± 5.5^a</td>
<td>53.3 ± 5.4^a</td>
<td>100.9 ± 18.3</td>
</tr>
<tr>
<td>1 RM Gain (kg)</td>
<td>9.1 ± 9.1</td>
<td>14.1 ± 6.7^b</td>
<td>10.2 ± 5.4^b</td>
<td>5.3 ± 2.7</td>
</tr>
<tr>
<td>Correlation^c</td>
<td>0.84</td>
<td>0.95^d</td>
<td>0.41</td>
<td>0.73</td>
</tr>
<tr>
<td>3 Days/Week</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Training 1 RM (kg)</td>
<td>49.8 ± 6.0^a</td>
<td>56.7 ± 5.3^a</td>
<td>53.2 ± 5.7^a</td>
<td>97.1 ± 19.0</td>
</tr>
<tr>
<td>1 RM Gain (kg)</td>
<td>7.7 ± 6.2</td>
<td>0.55 ± 0.12</td>
<td>0.76 ± 0.15</td>
<td>5.8 ± 5.6</td>
</tr>
<tr>
<td>Correlation^c</td>
<td>0.45</td>
<td>0.63</td>
<td>0.73</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Legend: FW = free weights; SHP = seated horizontal press; SVP = supine vertical press
^aSignificant difference between strength groups
^bSignificant difference among training modes
^cCorrelation between initial strength level and strength gain
^dSignificant at p<0.0


Getting Kids More Active

Ashley Fly and Cassidy Sigars

In today’s society, one of every five children is affected by obesity. Obesity is growing to epidemic proportions. As Physical Educators it is our job to teach and lead activities that will reverse this trend. There are many programs that teachers can use to help, such as: “The Walking School Bus,” “Run for Life,” and activities scheduled before school and after school.

The Walking School Bus

Many schools have taken advantage of “The Walking School Bus” program. The activity is exactly like it sounds. A group of students walk to school accompanied by one or more adults. A good way to start this program is through promoting October as the International Walk to School Month. This program is beneficial for students’ and adults’ health, as well as the environment. The people who participate in this program get potentially miles more exercise during their day than those who ride the bus to school or drive to work. This program helps the environment by reducing traffic and therefore air pollution. If a school starts the program, there will have to be staff members or parent volunteers to walk with the students. The parent volunteers will have to go through a training course that includes safety information, being familiar with the program policies, and ideas for making the walk to school fun for the kids. They should also go through a criminal background check and attend safety courses. These requirements are put in place for the children’s safety.

Most children in this program walk up to one mile to school every morning. “The Walking School Bus” routes generally start in a neighborhood within one mile of the school and follow streets determined by the home locations of the participating children. For families who live more than one mile away from the school, there should be designated staging posts where the parents can drop off their children to meet with the group to walk the rest of the way to the school. While on the walk to school the volunteers and parents make the walk enjoyable for every child.

Run for Life

“Run for Life” is a program that challenges students to be more physically active by running a certain distance each week. The motivation for the
students to participate in this program is that there is a race at the end of
the school year. All year the Physical Education teacher keeps a log for each
student as to how many miles each has run. This is based on the honor
system. The students have to be honest about their running distance each
week. The teacher promotes that fitness and running can be fun, but focuses
on participation before competition. Each week the students set goals for
how many miles or times they will run each week. The teacher sets up the
student for success by making running clubs. The number of miles or the
number of minutes run can specify these clubs. For example, there could be
a 20-mile club and 2 hour Club. The clubs’ goals keep going up depending
on students’ performance. The students participate in a mile run at the end
of the year that benefits charity programs in the city. The students pay $2 to
participate and the students vote on what charities receive the money. At the
end of the year, after the charity is decided, the money is sent.

During the summer the students also get a running log so they can log
how much they run during the summer. At the beginning of the year the
students bring in their log and it is added to the year-long running log. The
students will be encouraged to run more miles/more time than they ran the
year before.

Many students go home after school and either sit in front of a television or
in front of a computer and do no physical activity at all. Physical educators
can help familiarize children with activities that they can do when they are
at home. A list of compiled activities can be given to every child so that he or
she can go home and engage in some kind of activity.

One of the activities that each child should be exposed to is running
or jogging. Many of the students are exposed during the “Run for Life”
program that is implemented in the schools. This also gives the students the
opportunity to run at home and log it.

**Being Active Outside of P.E. Class**

Another opportunity for students to be engaged in physical activity is a
before-school or after-school program. The before and after school programs
can incorporate activities that include Frisbee, golf, tennis, badminton,
and pickle ball, among others. With many families in a money crunch, the
students can learn how to make equipment out of items at their house. For
example, the students can learn how to make a waffle ball bat out of a short
broom handle and pop bottle. During this program the students can have
the choice to either meet before or after school, which ever worked better for
the parents. Also, they can make a small notebook of the activities that they
participated in and how they could participate in them at home.

Activities should be taught in a variety of different ways. For example,
when Frisbee is taught it could be taught as Frisbee golf, ultimate Frisbee, or
regular Frisbee catch. This offers every child the opportunity to be successful
in at least one of the three different types of Frisbee. Teachers can arrange for
students to get a Frisbee sponsored by a local business to take home, were they can practice and play in the yard. The tennis and golf also are activities that students can do on their own. Teachers can show the different skills that make up each sport and how children can engage in the activities when they are at home. All of the activities that are taught in a before- and after-school program can be modified so that the children can participate in them at home.

Before- and after-school programs should accept as many students as possible, as long as students are interested in having fun and learning different ways to engage in activities. Programs could meet every morning and afternoon with different physical educators leading the activities. It can be offered the whole year long, as well as during summer school, to give every child the same opportunities.

Physical educators can implement programs that promote an active and healthy lifestyle. Every student deserves an opportunity to get healthy. The programs discussed here can help teachers reach every student and one-by-one reverse the obesity trend.

References


*Ashley Fly* and *Cassidy Sigars* are students at Missouri Southern State University. They are majoring in physical education and plan to teach after graduation.
Creating a Double Major in Physical Education and Health Education to Make Students More Marketable

David Barney and Judy Ary

On January 8, 2002, President George W. Bush signed the No Child Left Behind (NCLB) Act. This educational reform is based on “stronger accountability for states and communities, encourage proven educational methods and give parents more choices” (U.S. Department of Education, 2002). Because of this bill being signed into law, changes were in store for many educators. One of the changes that affected educators with the passing of the NCLB was for teachers to be “highly qualified teachers”. In the legislation a term “highly qualified teacher” is defined as “a highly qualified teacher is one with full certification, a bachelor’s degree and demonstrated competence in subject knowledge and teaching” (U.S. Department of Education, 2002). With NCLB taking effect, teachers can only teach subjects in the area of their bachelor’s degree. If a teacher has a minor in another area they can no longer teach in that content area until they receive further education. Thus, because of the words of “highly qualified teachers” in the legislation, college seniors that graduate with a specific major, will only teach in that specific content area. College students that graduate with a degree in English, Math, or the sciences usually do not have difficulty finding a teaching position. Students graduating with a degree in physical education or health education, find that their teaching options are more limited due to NCLB.

A goal of teacher educators is to prepare their students for a career in education. A goal of the faculty at North Dakota State University (NDSU) in the physical education and health education content areas is to assist students to be marketable after their graduation. With the passing of the NCLB legislation, students graduating with either a physical education or health education degree are well prepared, yet securing employment can be challenging. The purpose of this article is to outline the procedures that were taken at NDSU in creating and promoting a double major for students to earn, with the hope that the students would have better opportunities in securing a teaching position upon graduation.

The Procedures

When the NCLB legislation became law the NDSU physical education and health education faculty had preliminary discussions regarding the creation and promotion of a double major. Prior to discussing a double major, both physical education and health education had made changes in their content curriculum. The timing of creating a double major was right. In this section of the article, both the physical education and health education curriculum
modifications will be discussed.

**Health Education**

Through much work and effort from the department head and health education faculty a health education major was created. For a student to graduate from NDSU they need to have a minimum of 122 credit hours. Health education became a major with 33 hours in the content area (See Table 1), department requirements required 17 hours, professional education classes required 32 hours, general education credits totaled 40 hours. A year after the health education major was created the faculty from physical education, health education and the department head met and started the discussions of how a double major in health education and physical education could be offered to students. With this creation and promotion of the double major, there were changes in both curriculums that needed to take place. For example, the health education faculty eliminated two classes, taking content from those two classes and incorporating them into other established health education classes. Two classes were added to the health education curriculum from the required department classes. Also, in Table 1 it shows both curriculums for health education and physical education had four classes that were similar (Introduction to Health, Nutrition & Exercise Sciences, First Aid and CPR, Personal & Community Health & Life Span Development OR Developmental Psychology) thus helping students to gain the double major.

**Physical Education**

Just as health education met and revised their major, physical education faculty also met and modified their content curriculum. At the time of the discussion of creating a double major the physical education curriculum had gone through some changes of its own. The physical education major prior to these discussions comprised of 45 credit hours within the content area. Because physical education was an established major at this point the faculty did not have to make or create as many changes as health education. To assist the physical education faculty in modifying the curriculum, the text written by Metzler and Tjeerdsma (2000) titled *Assessment of Physical Education Teacher Education Programs* and *National Standards for Beginning Physical Education Teachers* (2003) were used during the revisions. During the process of modifying the curriculum three classes were eliminated, two classes were combined into one class, and one class was added. After all the changes, a total of 35 credit hours were required in the physical education curriculum. As mentioned previously in the health education section of the article, the same number of credits required in the department requirements, professional education studies and general education were required in the physical education curriculum. When analyzing the number of students in both content areas, the majority of the students start out declaring physical education as their major. By promoting health education degree and the benefits of double majoring to the students in their Introduction to Health, Physical Education, and Recreation class (HNES 110), many declare health education as their second major. When this happens the student will then have an additional 23 credit hours to obtain a double major in physical
education and health education for a total of 145 credit hours.

**Scheduling Classes**

In reviewing the process of creating the new curriculums, the component that required the most attention was scheduling each class. This required that the physical education and health education faculty coordinate times when the classes would meet. Physical education and health education classes had to be scheduled so that classes the students needed to take did not conflict with each other. In both the physical education and health education curriculum the classes are scheduled so that what a student learns in their freshman and sophomore years will prepare them for the content they will receive in their junior year. And the content they receive in their junior year will prepare them for their senior year and eventually their student teaching experience. One other aspect of scheduling classes, was finding rooms for the classes to be held in. At NDSU the department of Health, Nutrition and Exercise Sciences have six major options (Athletic Training, Dietetics, Health Education, Human Performance and Fitness, Physical Education, and Sport & Recreation Studies), thus, finding and scheduling rooms for each major was another component that required much attention.

**Growing Pains**

When the announcement had been made to the students of the creation of the new major and the opportunity to graduate with a double major, many students took advantage of the opportunity to do it. The problem it created was that some juniors and the seniors had to take a heavy course load in their final two semesters before student teaching in order to graduate on time. The health education faculty had informed many of the seniors of the changes that would be coming. Because the students were already working on a minor in health education, they heeded the advice from the health education faculty. Thus, the seniors had to take only an additional five classes to earn the health education degree. One other point that should be brought to the reader’s attention is that there was a period in which the health education faculty was very flexible in working with the seniors in order for them to graduate on time with the double major. Some of the ways in which the faculty were flexible was to schedule classes that were not offered during their designated semester and doing independent studies with the students, keeping the integrity of the classes intact. After the first group of juniors and seniors graduated, students that followed were advised in taking courses at the appropriate times to avoid a heavy course load at the end of their junior and senior years.
Table 1
Physical Education and Health Education Major Course Requirements

<table>
<thead>
<tr>
<th>Physical Education</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HNES 110 Introduction to Health, Nutrition &amp; Ex. Sciences</td>
<td>1</td>
</tr>
<tr>
<td>HNES 150 Foundations of Physical Education</td>
<td>2</td>
</tr>
<tr>
<td>HNES 152 Prof. Preparation in Middle School Activities</td>
<td>3</td>
</tr>
<tr>
<td>HNES 153 Prof. Preparation in High School Activities</td>
<td>3</td>
</tr>
<tr>
<td>HNES 154 Prof. Preparation in Elementary Activities</td>
<td>3</td>
</tr>
<tr>
<td>HNES 210 First Aid and CPR</td>
<td>2</td>
</tr>
<tr>
<td>HNES 253 Motor Learning &amp; Performance</td>
<td>3</td>
</tr>
<tr>
<td>HNES 300 Curriculum, Standards &amp; Assessment in P.E.</td>
<td>3</td>
</tr>
<tr>
<td>HNES 350 Fitness Education Activities &amp; Methods</td>
<td>3</td>
</tr>
<tr>
<td>HNES 352 Physical Education Activities &amp; Methods</td>
<td>3</td>
</tr>
<tr>
<td>HNES 367 Principles of Conditioning</td>
<td>3</td>
</tr>
<tr>
<td>HNES 461 Admin. &amp; Social Aspects of Physical Education</td>
<td>3</td>
</tr>
<tr>
<td>CDFS 230 Life Span Development OR HPER 217 Personal &amp; Community Health</td>
<td>3</td>
</tr>
<tr>
<td>PYSC 250 Developmental Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Total Credits</td>
<td>35</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Health Education</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HNES 110 Introduction to Health, Nutrition &amp; Ex. Sciences</td>
<td>1</td>
</tr>
<tr>
<td>HNES 160 Foundations of Health Education/Professions</td>
<td>2</td>
</tr>
<tr>
<td>HNES 341 Psychosocial Aspects of Health</td>
<td>3</td>
</tr>
<tr>
<td>HNES 345 Materials &amp; Concepts of Health Education</td>
<td>3</td>
</tr>
<tr>
<td>HNES 445 Organ. &amp; Admin. Of Coordinated School Health</td>
<td>3</td>
</tr>
<tr>
<td>HNES 210 First Aid and CPR</td>
<td>2</td>
</tr>
<tr>
<td>HPER 217 Personal &amp; Community Health</td>
<td>3</td>
</tr>
<tr>
<td>CDFS 135 Family Sciences</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 240 Principles of Nutrition OR HNES 250 Nutrition Sciences</td>
<td>3</td>
</tr>
<tr>
<td>HNES/PSYC 210 Human Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>HNES/PSYC 212 Psychological Aspects of Drug Use &amp; Abuse</td>
<td>3</td>
</tr>
<tr>
<td>CDFS 230 Life Span Development OR PYSC 250 Developmental Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Total Credits</td>
<td>32</td>
</tr>
</tbody>
</table>

Classes that are have been **Bolded** are classes that are repeated on both curricula.

**What They Say**

Since the creation and implementation of the double major in physical education and health education, a number of students have graduated and gained employment teaching either physical education or health education and in a couple cases are teaching both. During the process of writing the article, the authors were able to sit down and interview two former students (Ann & John) from the program. The interviews were casual in nature,
yet very informative. For the interview, two questions were posed to both students. First question was “Did you feel you were more marketable with the double major?” Both students said that having a double major made them very marketable. Ann said that because she had the double major it “got her in the door.” It got her an interview with the principal and because she had the interview it allowed her the opportunity to sell herself to the principal. John said that because he had the double major the principal told him that if he did not have it he would not have interviewed him. The second interview question was “What recommendations do you have for the student that might be thinking about double majoring.” Both Ann and John strongly recommended college students work towards and get the double major. Their reasons were many. First, and most obvious, the individual would be more marketable. Second, both curriculums complement each other. John said that studying both health and physical education has allowed him to incorporate both curriculums into his classes. He has found this to greatly benefit his students. And third, working on a double major was very “doable” according to Ann. Ann said at first the thought of working on a double major was overwhelming, yet after getting started it required taking a couple extra classes each semester, but it could be done. Ann summarized, “If I could do it, anybody could do it” and “It will pay off in the end.”

Another group of students that were interviewed regarding the double major were those students that are presently health education and physical education majors. These interviews were more conversations then actual interviews. Many of the students are glad that they are working towards a double major. One student said he is glad that he decided to double major for the fact he feels more confident that he will find employment. He continued saying that he felt he would be more competitive then other candidates when it came time to interview for job opportunities. Another student strongly felt that having classes from both physical education and health education go “hand in hand with each other.” She felt that the knowledge she had gained from both curriculums will greatly aid her in her teaching. And finally, these students also felt that getting a double major has taken a little more effort, yet they feel they are handling the class load. Thus, resulting in being more marketable when the time comes to interview for employment.

Concluding Thoughts

The purpose of this article was to outline the creation and promotion process of a double major in physical education and health education, with the hope students will have a better opportunity in securing a teaching position upon graduation. With careful planning and patience with changes that will be implemented, students should reap the benefits of the double major. The suggestions that have been outlined in this article probably will not fit every institution’s situation. Yet, it is the authors hope that both physical and health educators will work together to come up with the content curriculum to help students to become more marketable upon graduation.
References


**David Barney** currently teaches at Oklahoma State University in Stillwater, OK. He also taught at North Dakota State University and in the public schools in Utah and Florida for six years.

**Judy Ary** currently teaches Health Education courses at North Dakota State University. She is actively involved in state and district leadership positions.
The current study was designed to investigate superintendent perception of the importance of providing students with a quality physical education program. A total of 322 United States superintendents participated in the survey. Data were gathered through an on-line survey of a random sample. Results revealed that the majority of public school superintendents who responded perceived providing a quality physical education program as important to their school district.

Quality physical education is imperative for the development of lifelong physical activity habits that have a healthy impact on an individual’s lifetime (Kelder et al., 2003). According to Lee (2004), teachers today must prevail over serious obstacles if they are to be successful in promoting a physically active lifestyle. While critics fault teachers for low levels of academic achievement, physical education teachers are cited for not providing students with an adequate amount of health related physical activity. Across the country a growing emphasis is being placed on student achievement on standardized tests.

K-12 physical educators are required to have an expertise in curriculum development, methodology and evaluation processes. Corbin and McKenzie (2008) stated that expertise helps physical educators plan and conduct sound quality physical education programs relevant to the needs of their learners. Furthermore, they believed it crucial to the field of physical education to endorse the characteristics of a physically educated person in the K-12 physical education curriculum. Quality physical education has to take into consideration the aims and goals of the curriculum in providing quality learning opportunities in a developmentally appropriate manner for all students (Stirling & Belk, 2002).

The concept of teaching developmentally appropriate lessons is not a new concept for physical educators. Apache (2003) discussed how teaching children fundamental motor skills and game-like activities are two aspects of a quality physical education program. Justification for physical education begins with the growing body of research in the field of medicine. Le Masurier and Corbin (2006) confirmed how scientific research supports the role of physical activity in the prevention of disease and the promotion of a healthy...
lifestyle, and quality physical education represents the best opportunity to offer all students physical activity experiences that promote physical activity now and for a lifetime.

Teachers involved with quality physical education programs promote personal meaningful physical education experiences such as social interaction, increased motor competence and physical fitness for all their students (Kretchmar, 2006). However, Treanor and Housner (1999) found too many physical education programs are characterized by large classes, insufficient facilities and diminutive administrative support. Furthermore, inappropriate instruction, punishing students with exercise, permitting students to pick teams, assessing students for wearing gym clothes and allowing the athletically gifted to dominate the class are all too often permitted in physical education classes.

Quality physical education should be able to offer students a variety of curricular opportunities to promote physical activity for a lifetime. Offering students skill progression in a variety of lifetime sports will demonstrate how quality physical education is an integral part of a student’s education. In addition, the low priority of physical education in relationship to other subjects in school and lack of funding hamper the realization of a quality physical education program for all students (Treanor & Housner, 1999).

According to Trudeau and Shephard (2005), quality physical education programs are able to contribute significantly to the overall amount of moderate to intense physical activity performed on a daily basis by children. Furthermore, schools have the ability to influence the regular physical activity level of students by promoting active lifestyles outside of school. Trudeau and Shephard also found the amount of time offered in physical education classes varies among schools and according to the age of the students. In the United States, physical education programs have a tendency to increase a student’s time spent in physical education from the first year of primary school until around the sixth grade. However, after completion of the sixth grade, the allotted time for physical education drops off sharply until graduation, leading to a drop off in physical activity throughout life.

The trend to reduce the amount of time students spend in physical education is alarming. McKenzie (2007) discussed how improving physical education programs will help to improve students’ physical activity levels. However, even if physical education is offered daily to all students, it will not be enough to meet the active lifestyle standards. To truly have an impact on students’ lifestyles in the future, the field of physical education must redesign the curriculum and instructional strategies to promote out of school activity. McKenzie believed it is important to link student activity to community based activities. Linking student learning to community events and activities will allow the students to continue being active outside of school and for a lifetime.

Finally, McKenzie (2007) discussed the belief that not all physical education programs may be considered to provide quality instruction. Therefore, some individuals involved with education have even suggested physical education should be removed from the academic section of the public school system and offered as an elective after school. McKenzie believed it is important to promote physical activity outside of school to promote a healthy active
lifestyle for not only students but all members of a society. However, instead of abandoning physical education in the public school system, the use of national standards to assure quality physical education for all students should be the national objective.

Across the country, public school superintendents are in charge of overseeing all aspects of student development and achievement. Research prefers to focus most of its efforts on superintendents' efforts to improve student achievement in the core areas of math, science and communication arts. Kutnek, Blatchford and Baines (2002) discussed how teachers may not always think strategically. Therefore, it is crucial for those involved with promoting quality physical education to spend time working with school superintendents. Dillon (2006) believed staying current is tough due to the amount of research being completed in the field of education. Furthermore, there is a growing concern from the medical profession over the trend of children becoming obese at an early age.

The original purpose of schools was to educate students to become productive citizens. Weber (2007) discussed how the most influential curricula focus on the big picture and not just details. Superintendents have to focus their attention on subjects like school funding, providing students with safe schools, meeting the demands set forth by state and national standards and meeting the expectations of parents. With all of these expectations placed on a superintendent, how are they going to oversee and monitor each and every program in their school district? The answer lies in their perception of how important they believe a program is to the development of student learning. Therefore, it is crucial for members of the American Alliance of Health, Physical Education, Recreation and Dance (AAHPERD) to educate superintendents in the importance of a quality physical education program through the American Association of School Administrators (AASA). Superintendents who perceive physical education has a vital role in their school district will guarantee the continued monitoring and assessment of the program. Through the proper monitoring and assessing of the program, teachers will be held accountable for providing an appropriate lesson.

The purpose of this study was to determine how public school superintendents perceive the importance of providing students with a quality physical education program. Using the information gained from this investigation will allow the researcher to disseminate information across the country through AAHPERD to promote quality physical education. Understanding which aspects a superintendent perceives as important will allow not only members of AAHPERD to promote quality physical education but members of each regional and state organization to do so as well. It is the goal of the researcher to use a top down approach to promoting quality physical education to all students across the United States.

Methods

The study used a nonexperimental, descriptive research design. This type of research design was appropriate because no independent variables were manipulated and no treatment or interventions were provided to the participants. The data collection tool used was an original survey designed...
by the researcher to obtain information from public school superintendents about their perceptions of providing a quality physical education program to all students in their school district.

The use of a descriptive research design helped minimize the threats to internal and external validity of the study. Although the researcher must be aware of uncontrolled extraneous variables which may affect survey responses, such as the superintendent’s educational background or regional philosophies towards movement and physical activity. Knowledge of these possible complications allowed the researcher to draw appropriate conclusions. The target population for this study was public school superintendents located within the United States (n=303). The study was approved by the University Institutional Review Board and all participants consented to the study by submission of their responses through the use of an on-line survey.

**Instrument**

For the purpose of this study an original survey instrument was developed. Through the use of the national standards designed by National Association for Sport and Physical Education (NASPE), six statements were created to measure public school superintendents’ perception of the importance of providing a quality physical education program.

*Establishing Validity.* To establish face validity for the survey, the researcher recruited a jury of public school superintendents to review the instrument to determine if it measures their attitudes and perceptions about physical education. This provided the investigation face validity with the population in question. Further, the researcher established content validity by having a jury of experts in the field of physical education review the survey to determine if the survey has content validity.

*Scoring.* Each item on the survey was rated by the public school superintendent using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The numeric values associated with the rating were summed to acquire a total score for each value. The totals were divided by the number of items in each statement to provide a mean score which reflected the original rating scale. The use of mean scores provided for easier interpretation of the scores and allowed for comparisons among the statement.

**Data Analysis**

Data collected from the surveys was entered into a computer file for analysis. The analysis was divided into two sections. The first section used frequency distributions and dispersion to obtain a profile of participants and their school districts. The second section used descriptive statistics to describe the scaled variables and provide baseline information regarding the perception of superintendents and their physical education programs.

**Results**

Results of the data analysis used to describe the sample and address the research questions posed for this study are provided in this section. A total of 2835 public school superintendents were asked to partake in the study
by completing an online survey developed for this study. A total of 322 public school superintendents chose to participate in the data collection for a response rate of 11.4%.

The public school superintendents completed a short demographic section on the survey. Their responses to the questions associated to their school district’s characteristics were summarized using frequency distributions. Table 1 presents the results of this analysis.

The largest group of public school superintendents (n=137, 44.8%) reported their school district’s size as being (1,001 to 5,000) students. The second largest group (n=125, 40.8%) reported their school district’s size as being (1,000 or fewer). A total of 16 public superintendents chose not to provide a response to this demographic question.

<table>
<thead>
<tr>
<th>School Size</th>
<th>Number Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 or Less</td>
<td>125(40.8%)</td>
</tr>
<tr>
<td>1,001 to 5,000</td>
<td>137(44.8%)</td>
</tr>
<tr>
<td>5,001 to 10,000</td>
<td>19(6.2%)</td>
</tr>
<tr>
<td>10,001 to 15,000</td>
<td>12(3.9%)</td>
</tr>
<tr>
<td>15,001 Above</td>
<td>13(4.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>303(94.1%)</td>
</tr>
</tbody>
</table>

The public school superintendents were asked to answer a set of six statements dealing with the importance of providing all students with a quality physical education program to all of the students within their school district. The six statements listed in Table 2 were designed to develop a better sense of how public school superintendents perceive the importance of providing students with a quality physical education program. Statements 1, 2, 4, 5 and 6 were designed to promote the response of “Agree” or “Strongly Agree” from the respondents. Statement number 3 was designed to promote a response of “Disagree” or “Strongly Disagree” from the respondents. Therefore, the total scores were adjusted in Table 2 to represent the same scoring response as statements 1, 2, 3, 4, 5, and 6. Table 2 represents the frequency analysis of these responses.

According to the data, public school superintendents answered by selecting “Agree” as the most common selection for the following: statement 1, “Providing our districts students a quality physical education is a top priority” (n=170, 52.8%); statement number 4, “Our physical education teachers are held accountable for providing a quality physical education through the use of administrator observations” (n=198, 65.3%); statement number 5, “Our school districts physical education curriculum is aligned with the national standards set by NASPE” (n=128, 42.1%); and statement number 6, “My goal as superintendent is to provide all students with a quality
physical education by providing students with a qualified physical education teacher” (n=161, 52.6%). However, these same superintendents chose the response of “Disagree” to statement number 2, “Our students are encouraged to take the same amount of credit hours in physical education as math, science and communication arts” (n=163, 51.7%). Furthermore, statement number 3, “Our physical education teachers are given approximately $500.00 dollars or less a year to purchase new equipment for their school’s program,” which was designed to draw a response of “Disagree” drew the response of “Agree” as their number one selection (n=115, 37.2%).

Table 2
Quality Physical Education

<table>
<thead>
<tr>
<th>Scale:</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree or Agree</th>
<th>Strongly Agree</th>
<th>Total Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement #1</td>
<td>6(1.9%)</td>
<td>30(9.3%)</td>
<td>74(23.0%)</td>
<td>170(52.8%)</td>
<td>42(13.0%)</td>
</tr>
<tr>
<td>#2</td>
<td>72(22.9%)</td>
<td>163(51.7%)</td>
<td>47(14.9%)</td>
<td>21(6.7%)</td>
<td>12(3.8%)</td>
</tr>
<tr>
<td>#3</td>
<td>34(11.0%)</td>
<td>99(32.0%)</td>
<td>37(12.0%)</td>
<td>115(37.2%)</td>
<td>24(7.8%)</td>
</tr>
<tr>
<td>#4</td>
<td>1(0.3%)</td>
<td>12(4.0%)</td>
<td>16(5.3%)</td>
<td>198(65.3%)</td>
<td>76(25.1%)</td>
</tr>
<tr>
<td>#5</td>
<td>2(0.7%)</td>
<td>20(6.6%)</td>
<td>116(38.2%)</td>
<td>128(42.1%)</td>
<td>39(12.8%)</td>
</tr>
<tr>
<td>#6</td>
<td>1(0.3%)</td>
<td>1(0.3%)</td>
<td>9(2.9%)</td>
<td>161(52.6%)</td>
<td>134(43.8%)</td>
</tr>
<tr>
<td>Adjusted</td>
<td>106(5.7%)</td>
<td>341(18.3%)</td>
<td>194(10.4%)</td>
<td>777(41.8%)</td>
<td>337(18.1%)</td>
</tr>
</tbody>
</table>

Discussion

Public school superintendents have the responsibility of overseeing all operations of their school district. Physical education is only one small part of a school district’s curriculum. Therefore, it is impossible for superintendents to know everything about each subject area covered in their district’s curriculum. Nevertheless, it is crucial to develop a better understanding for how these individuals, who are in charge of so much, perceive the importance of providing their students a quality physical education.

According to the data collection, the overall perception of public school superintendents towards quality physical education would be (n=1114, 59.9%) who responded to the questions with “Agree” or “Strongly Agree”. However, it is concerning that 447 (24%) of public school superintendents responded by selecting the responses coinciding with “Disagree” and “Strongly Disagree”. Although the overall data leads us to believe public school superintendents support quality physical education, the interpretation of the data is concerning. With 59.9% of the respondents appearing to support
quality physical education, this leaves us with 40.1% of the respondents perceiving quality physical education as not important or being undecided as to its importance. These data indicate there is a lot of work to be done in the field of physical education in developing a perception with public school superintendents over the importance of quality physical education. Public school superintendents across the country have a difficult job worrying about the federal mandates set forth by No Child Left Behind. With standardized testing, school districts must show how their students are improving in the core subject areas of math, science and communication arts. It is crucial for those individuals involved with physical education to demonstrate the importance of quality physical education through the use of national standards to prevent the old “roll out the ball PE” of years past.

**Recommendation for Future Studies**

Future research should investigate how public school principals perceive the importance of providing quality physical education to students. In addition, investigation of principals’ perceptions of physical education programs when compared to those districts honored by AAHPERD as outstanding programs could provide additional understanding of the importance of promoting quality physical education to all students.

**References**


Zealand, 35(1), 69-76.

Ken Bias, Ed.D., is a assistant professor at the University of Central Missouri in Warrensburg. He received his B.S. degree in physical education from UCM, his M.S. degree in physical education from UCM, M.Ed. degree in administration from William Woods University, and Ed. D. degree in teacher leadership from Northcentral University of Arizona at Prescott.
The purpose of this study was to evaluate the difference between pre-season and in-season hydration and body composition of high school wrestlers. Male members (N = 21) of a 3-A high school team were measured during their routine preseason screening for hydration and skinfold assessment of body composition and again during an unannounced mid-season testing. While all of the wrestlers were hydrated at the pre-season screening, most were dehydrated (USG>1.025 g/cc) prior to a mid-season practice. Wrestlers had lost 3.3% body fat while gaining 1% in LBM. Therefore, despite meeting the mandated state standard for hydration during pre-season evaluation, a substantial number of young wrestlers may be exercising and competing in a dehydrated state during the competitive season.

The Missouri State High School Activities Association (MSHSAA) regulations require high school wrestlers to undergo certification for clearance to participate in the competitive season. The certification process consists of hydration analysis and body composition assessment. Hydration is determined by refractometry and requires the wrestler to have a urine specific gravity (USG) ≤1.025 g/cc to be eligible to compete. If the wrestler is above the required USG, he is not allowed to continue the certification process that day and must come back a minimum of 48 hours later to retest. If the wrestler meets the hydration standard, he is measured for three skinfolds by a state-certified technician to estimate his current body fat level (%fat) and to establish a minimum wrestling weight (MWW). The minimum %fat has been set at 7% which is used to determine the amount of weight the athlete can lose to reach MWW and to determine the weight class in which he can compete.

This approach to determining a proper competitive body weight has been established in an attempt to curb the questionable weight loss, or weight “cutting,” practices used by many wrestlers. Despite research indicating the negative effects on performance of severe weight loss practices (Horswill, 1992; Osterberg, Horswill & Baker, 2009), many wrestlers still employ food
restriction, dehydration, exercise in hot environments, or use of multiple layers of clothing to “cut” weight (Lakin, Steen & Opplinger, 1990; Sossin, Gizis, Marquart & Sobal, 1997; Lingor & Olson, 2010). Perhaps the most common method of weight loss during the competitive season is dehydration (Lingor & Olson, 2010). Wrestlers in upper weight classes commonly use fluid restriction and dehydration to achieve weight loss, while wrestlers in lower weight classes may add food restriction to these practices to reach lower body weights (Freischlag, 1984).

Wrestlers appear to engage in dehydration because it is a quick method to achieve significant weight loss in the shortest time (Lingor & Olson, 2010). It has been suggested that a significant danger exists when athletes dehydrate too rapidly to lose weight prior to competition (Buford, Rosi, Smith, O’Brien & Pickering, 2006), and this weight cycling often practiced by wrestlers may be detrimental to the athlete’s behavior, metabolism, health, and performance (Wagner, 1996). However, limited information is available documenting the frequency of weight cycling and/or the effects of prolonged dehydration on physiological and athletic performance. The assumption may be that by setting a MWW, wrestlers will maintain adequate hydration throughout the competitive season. Previous work on college wrestlers has shown this not to be the case (Utter, Stone, O’Bryant, Summinski & Ward, 1998), but thus far no data exists on high school wrestlers. Therefore, the purpose of this study was to evaluate the difference between pre-season and in-season hydration and body composition of high school wrestlers.

**Methods**

Twenty-one male members of a Missouri 3-A high school served as subjects for this study (see Table 1). The procedures for the study were approved by the University Institutional Review Board and the high school principal, and all participants and their parents signed a written consent form before beginning testing.

The pre-season evaluation was performed immediately following a regular school day in late October. Upon entering the locker room, each subject provided a urine sample for the determination of hydration level using a refractometer (model 312 ATC). If the subject’s USG was >1.025 g/cc, he was not allowed to continue with the pre-season certification. If the subject’s USG was <1.025 g/cc, he was then weighed on a certified digital scale (Belfour Inc, Cedarburg, WI) wearing only shorts; His body composition was assessed from skinfold (SKF) measurements using calibrated Lange skinfold calipers. Three measurements were made on the right side of the body at the triceps, subscapular, and abdominal sites to the nearest 0.5 mm. The averages of the
Table 1
Demographic Characteristics of High Schools Wrestlers at Pre-season Evaluation (n = 21)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>16.4 ± 1.2</td>
<td>14.6 – 18.3</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>173.9 ± 9.9</td>
<td>149.9 – 193.0</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>70.0 ± 12.8</td>
<td>42.5 – 94.7</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>23.1 ± 3.3</td>
<td>17.2 – 30.8</td>
</tr>
<tr>
<td>%fat*</td>
<td>16.8 ± 5.7</td>
<td>8.3 – 30.5</td>
</tr>
</tbody>
</table>

*Predicted from skinfolds using the Lohman equation (1981).

measurements at each site were summed and used to predict %fat from the Lohman equation (1981). Fat mass (FM) was estimated using the equation: Body Weight x %fat/100. Lean body mass (LBM) was estimated from using the equation: LBM = Body Weight – FM. Since a wrestler cannot compete at lower than 7% body fat, each wrestler’s MWW was estimated from the equation: MWW = LBM/0.93. This skinfold equation has recently been shown to closely approximate values derived from underwater weighing and multi-frequency bioelectric impedance (Utter & Lambeth, 2010).

The mid-season measurement date in late November was randomly chosen, and testing was performed with no prior knowledge by the participants. The date chosen was a mid-week day, 3 days prior to a competition. The same procedures as used at the pre-season evaluation were employed for the midseason testing, and the same skinfold tester performed all assessments.

Comparisons between pre-season and mid-season variables were performed using paired t-tests with Bonferroni corrections for multiple comparisons. One-way ANOVAs with Tukey post hoc follow-ups were used to determine differences in body composition parameters across gain and loss groups.

Results

The subjects had lost a significant amount of body weight by mid-season (see Table 2). This loss appeared to be almost entirely due to a reduction in FM which produced a significant reduction in %fat. Because LBM changed by less than 1%, MWW was practically identical at mid-season to the value calculated at the pre-season evaluation.
Table 2
Changes in Body Composition and Hydration of High School Wrestlers from Pre-Season to Mid-Season ($n=21$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Season Mean ± SD</th>
<th>Mid-Season Mean ± SD</th>
<th>%Change Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Weight (lbs)</td>
<td>70.0 ± 12.8</td>
<td>67.9 ± 12.7*</td>
<td>-3.0 ± 4.4</td>
</tr>
<tr>
<td>LBM (lbs)</td>
<td>58.0 ± 9.7</td>
<td>58.4 ± 9.7</td>
<td>0.9 ± 3.9</td>
</tr>
<tr>
<td>Fat Mass (lbs)</td>
<td>12.0 ± 5.1</td>
<td>9.4 ± 4.3*</td>
<td>-20.6 ± 11.9</td>
</tr>
<tr>
<td>Sum of 3 SKF (mm)</td>
<td>49.0 ± 19.1</td>
<td>38.0 ± 14.5*</td>
<td>-19.6 ± 11.0</td>
</tr>
<tr>
<td>%fat</td>
<td>16.8 ± 5.7</td>
<td>13.5 ± 4.3*</td>
<td>-16.9 ± 9.9</td>
</tr>
<tr>
<td>MWW</td>
<td>61.0 ± 10.3</td>
<td>61.5 ± 10.2</td>
<td>0.9 ± 3.9</td>
</tr>
<tr>
<td>USG (g/cc)</td>
<td>1.004 ± 0.004</td>
<td>1.031 ± 0.006*</td>
<td>2.6 ± 0.7</td>
</tr>
</tbody>
</table>

Legend: LBM = lean body mass, Sum of 3 SKF = triceps, subscapular, and abdominal skinfolds, MWW = minimal wrestling weight, USG = urine specific gravity.
*Significant change from pre-season ($p<0.001$).

At the pre-season evaluation, all of the subjects had USG values that were indicative of adequate hydration (see Table 2). However, during the unannounced mid-season evaluation, 17 of the wrestlers were significantly above the MSHSAA hydration standard when analyzed using a one-sample $t$-test. The subjects who were below the hydration standard lost less weight (-2.8 ± 7.3 lbs) than those who were above the standard (-5.4 ± 6.9 lbs), although the difference was not significant when analyzed using an independent $t$-test ($p=0.51$). Although the two groups lost comparable amounts of FM (-5.7 ± 5.3 lbs vs -5.8 ± 5.3 lbs, respectively) and %fat (-3.0 ± 2.5% vs -3.4 ± 2.5%, respectively), the subjects below the hydration standard gained more LBM (2.9 ± 2.8 lbs) than those above the standard (0.5 ± 5.5 lbs), although the difference was not significant due to the large variability in each group.

In the current study, 90% of the subjects lost weight by the mid-season evaluation. To further assess the changes in body composition, the sample was divided into five weight gain or loss categories (see Table 3). Only those subjects with greater than a 5% body weight loss failed to gain LBM. Only the subjects in the 6-10% weight loss group had significantly greater FM and %fat losses compared to the other groups.
### Table 3

**Changes in Body Composition Components by Weight Change Groups in High School Wrestlers from Pre-Season to Mid-Season** ($n = 21$)

<table>
<thead>
<tr>
<th>%Weight Change Group</th>
<th>n (kg)</th>
<th>BM (kg)</th>
<th>LBM (kg)</th>
<th>FM (kg)</th>
<th>%fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
<td>2</td>
<td>6.6 ± 0.2</td>
<td>2.4 ± 1.1</td>
<td>-0.8 ± 0.9</td>
<td>-1.5 ± 1.1</td>
</tr>
<tr>
<td>&lt;2% Loss</td>
<td>8</td>
<td>0.2 ± 0.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.4 ± 0.9</td>
<td>-1.2 ± 1.3</td>
<td>-1.8 ± 1.5</td>
</tr>
<tr>
<td>2-5% Loss</td>
<td>4</td>
<td>-2.5 ± 0.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.0 ± 0.5</td>
<td>-3.6 ± 1.1</td>
<td>-4.2 ± 1.5</td>
</tr>
<tr>
<td>6-10% Loss</td>
<td>6</td>
<td>-5.2 ± 1.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.6 ± 2.1</td>
<td>-4.5 ± 2.2&lt;sup&gt;c&lt;/sup&gt;</td>
<td>-5.4 ± 2.8&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>&gt;10% Loss</td>
<td>1</td>
<td>-9.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-6.9&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-2.7</td>
<td>-2.5</td>
</tr>
</tbody>
</table>

Legend: BM = body mass, LBM = lean body mass, FM = fat mass, %fat = percent body fat.

<sup>a</sup>Significantly different from the Gain group.

<sup>b</sup>Significantly different from the other groups.

<sup>c</sup>Significant difference between <2% Loss group and 6-10% Loss group.

Three wrestlers went down a weight class to compete, ten remained at the same weight class, and seven went up one weight class. The three wrestlers who went down a weight class lost comparable amounts of LBM (-5.5 ± 0.8 lbs) and FM (-6.3 ± 3.8 lbs). Of the 17 wrestlers who remained at the same weight class or went up one weight class, all gained LBM (3.0 ± 1.9 lbs) and lost FM (-5.7 ± 4.9 lbs). The gain in LBM by those who went up a weight class was significantly greater than that shown by the other groups, while the differences in FM and %fat were not significantly different across the weight change groups. One wrestler (pre-season body weight = 158.9 lbs, %fat = 12%) went down three weight classes, reducing from a preseason body fat of 12% to a mid-season of 9.5% but losing a substantial amount of LBM (see Table 3).

### Discussion

The results of this study suggest that despite meeting the state standard for hydration during pre-season evaluation, a substantial number of young wrestlers may be exercising and competing in a dehydrated state during the competitive season. This was confirmed by the higher USG readings during the unannounced, mid-season hydration test. This finding supports previous studies showing dehydration to be common in the competitive college wrestling season (Buford et al., 2006; Bledsoe, Smith, Lacy, Mayhew, Koch, Roberts et al., 2007; Utter et al., 1998). The problem might not be confined solely to wrestling, however, since other studies have shown 10-
20% of football players to be above the 1.025 g/cc standard prior to the pre-season (Radinsky, Carnelia, Boyd, Mayhew & Koch et al., 2003; Smith, Mayhew, Koch & Roberts, 2006). Maughan and Shirreffs (2010) support the notation that many athletes are not well hydrated at the being of exercise and note that most athletes drink less than their exercise sweat loss. These findings may suggest that some athletes are unintentionally in a state of mild dehydration prior to exercise training on a regular basis.

The findings of this study are not all negative. Current subjects lost significant amounts of body fat while maintain LBM, which agreed with data on college wrestlers (Utter, 2001). While these changes in body composition might be a desirable thing, it is not currently known the degree to which this might have been accomplished by questionable dietary practices. The maintenance of LBM might suggest adequate protein intake or reflect the effect of vigorous physical training on the muscle mass (Tarnopolsky, Atkinson, MacDougall, Chesley, Phillips & Schwarz, 1992; Tarnopolsky, MacDougall, &Atkinson, 1988). Reduction in caloric intake by reducing portion size and eliminating unnecessary sugar intake while maintaining a balanced diet might be a goal for the healthy athlete as well as a suggestion to stem the rising tide of obesity among teens (Gordon-Larsen, Adair, Nelson & Popkin, 2004). However, if young wrestlers are achieving competitive weights through a weight-cycling process whereby they eat above normal amounts in the week prior to a competition and reduce their dietary intake to well below adequate standards in the days before competition (Utter, 2001), it may have negative effects on performance and health (Wagner, 1996) and predispose athletes to obesity in later life (Saami, Rissanen, Sarna, Koskenvuo & Kaprio, 2006).

Emphasis on rehydration during periods of strenuous training has shown excellent results for maintaining a hydrated state in athletes (Smith et al., 2006). The current findings might suggest that the dehydrated state in young wrestlers may be a voluntary phenomenon which they feel is necessary to reach and/or maintain a competitive body weight. Several studies have noted USG values may be higher than desirable during the collegiate season despite only modest weight losses (Bledsoe et al., 2007; Utter et al., 1998). The current results offer support for those findings and present evidence of it at the high school level. When hypohydrated (USG > 1.025 g/cc), the athlete will initiate training in an altered physiological state. With vigorous exercise, core body temperature begins to rise, the ability to dissipate heat is decreased, and increased strain is placed on the cardiovascular system (manifested by an increase in heart rate), resulting in a decrease in performance (Casa, 1999). Fluid loss of only 1% of body weight will increase plasma osmolarity, and a 2% water loss will have a negative effect on exercise performance (Bossingham, Carnell, & Campbell, 2005). Recent studies show that as many as 50% of professional basketball players may be hypohydrated at the start of competition (Osterberg, et al., 2009). In the current study, 81% of the wrestlers entered a mid-season practice day in a dehydrated state.
One approach to aiding young wrestlers in maintaining adequate hydration throughout the season would be to have a convenient, simple measurement technique for routine checking of body water level. Multi-frequency bioelectric impedance analysis (BIA) has shown that well-trained athletes have a greater extracellular water to total body water ratio (Battistini, Virgili & Bedogni, 1994). A new multi-frequency device appears to hold promise as a simple tool for determining body composition and total body water (Utter & Lambeth, 2010). Such a device might provide a quick estimate of the ratio of extracellular water to total body water, since loss of water from either of these compartments has been shown to reduce strength, power, and muscular endurance (Judelson, Maresh, Anderson, Armstrong, Casa, Kraemer & Volek, 2007). However, the current cost may be prohibitive for each wrestling program to acquire such a device. Other less expensive BIA models might not provide the accuracy needed in these subjects (Utter et al., 2005). This fact prompted Utter et al. (2005) to indicate that skinfold measurements might be preferable to leg-to-leg BIA when assessing the body composition of young wrestlers, but this does little to aid in identifying hypohydration.

Previous studies have noted variability in skinfold assessment of %fat among testers (Bird, Mayhew, Schwegler, Crossgrove, Peterson & Etemady-Deylamy, 2009; Lacy et al., 2009). These variations could result in differing advice concerning weight loss to achieve MWW and incorrect assignment to weight classes for some high school wrestlers (Lacy et al., 2009). There is insufficient evidence at present to determine the extent of such occurrences; perhaps a larger study needs to be performed to evaluate the magnitude of possible discrepancies in weight class assignment in high school wrestlers.

In summary, it appears that high school wrestlers may be at risk of training and competing during the season at less-than-optimal hydration levels. It may be difficult to reverse the long-standing tradition of water restriction and/or dehydration among young wrestlers to “make weight.” Perhaps a more concerted effort should be made to educate coaches and parents on the proper techniques for maintaining hydration while reducing body fat and losing weight for competition would provide greater margins of safety and good health for young athletes.

References


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Individual Health Consultation at the People’s Clinic of Morehead, KY

Steve Chen, William Salazar, Mark Deaton and Nathania Bush

Counseling has become a popular and vital service in many corporate, federal and state agencies, as well as in educational institutions. In this article, the authors present a service learning project, in partnership with The People’s Clinic of Morehead, KY, that teams nursing students with nurse practitioners and patients to incorporate two learning objectives: (1) to apply student’s theoretical knowledge to the clinic patients through a series of personal health consulting sessions; and (2) to engage in service learning activities in order to serve vulnerable non-insured community members through one-on-one health consultation sessions.

Presently many corporate, federal and state agencies, as well as educational institutions provide mental health consultation and wellness counseling services to help their employees prevent and remedy stress, illnesses and psychological and emotional issues (Kirk & Brown, 2003; Proper, 2003). Wellness counseling programs, as a main component of the employee-assistance programs (EAP), has evolved into holistic well being programs in the workplace (Personal Best, 2007). Data suggest that health counseling programs have a positive impact on employees’ mental and physical health and work productivity (Kirk & Brown, 2003; Proper 2003). Unfortunately in today’s economy, businesses are often forced to eliminate those programs for part-time employees.

Many communities, through social service agencies and churches have recognized the need to offer medical and psychological interventions and health education programs to at-risk unemployed, underemployed, or disabled community members. Examples of these community programs include The Community Health Center for King County (Renton, WA), Coalitions of Community Health Clinic (Portland, OR), Community Health Free Clinics (Cedar Rapid, IA), and The People’s Clinics of Morehead (Morehead, KY). Research shows that well-designed and holistically-oriented community health supportive services can significantly impact and improve the lives of its citizens and reduce the number of emergency room visits (Clawson, 2001; Cole, Pengelly, Eyle, Stieb, & Hustler, 1999; People’s Community Clinic, 2005).

Through integrating personal health information, teaching wellness
courses, and monitoring healthy lifestyles, community counseling programs may assist community members and staff to instill and maintain positive health practices. These programs also offer support groups and continual health education to monitor these behavioral changes. With integrated personal health information and the health education courses, health consultation programs can be a service to help citizens manage healthy lifestyles and encourage individuals to take an active role in their mental and physical well-being (Health Equations, 2007; Osborne, 2008; Pratt, Unruh, Civan, & Skeels, 2006).

Despite the success of community health programs that offer health consultation sessions, one must be aware that disseminating health care information to community members and encouraging people to be involved in their health consultation is a challenging task (Osborne, 2008). To deal with the disparity of health care counseling, The People’s Clinic of Morehead agreed to enter into a collaborative project with the Morehead State University’s Department of Nursing, the Institute for Regional Analysis, and the Department of Health, Wellness, and Human Performance to carry out a personal health consultation program that would assist the residents of Morehead, KY and surrounding counties.

The service learning project, in partnership with The People’s Clinic of Morehead in 2009, provided two major educational goals for Morehead State University (MSU) students enrolled in the Nursing or Health Promotion Programs: (1) to apply student’s theoretical knowledge and practical clinical experience to the patients of The People’s Clinic in Morehead through a series of personal health consulting sessions; and (2) to participate in service learning activities (a Morehead State University mission objective) by developing and selecting a series of teaching materials (poster boards, handouts, diagrams, etc.) under the auspices of a service learning paradigm designed to serve vulnerable community members through one-on-one health consultation sessions. As a result of participating in this project, The People’s Clinic patients also benefited from the students’ expertise and individual attention through the presentation of personal wellness, hygiene, and healthy life style.

Project Description

More Stories Like This: Organization of the People’s Clinic of Morehead

The People’s Clinic is a non-profit foundation, established by Dr. Enawegaw Mehari, that offers free dental, medical, and diabetic clinical services to outpatients on Monday, Tuesday and Wednesdays. The medical services are offered on Tuesdays from 10:00 a.m. to 7:00 p.m. and the dental clinic is open on Monday afternoon from 4:00 p.m. to 7:00 p.m. The diabetes clinic also operates on Wednesday afternoon. Approximately 800-1,000 patients from six counties in the Eastern Kentucky region are served each year.

The clinic employs a part time Nurse Practitioner who sees patients from 12 to 7 P.M., and six to seven physicians who volunteer their services on a rotating basis. Each physician usually signs up for 2- to 3-hour sessions per month. Due to the limited number of physicians, patients usually have at
least a 15 minute waiting time before they see a physician. In the evening or during peak hours, patients may wait for more than 30 minutes before seeing a doctor. To maximize the efficiency and use of the waiting time, the project investigators and staff of The People’s Clinic believed that a series of health consultation sessions can be offered to the patients during that time.

For the preparation of this project, two of the project investigators met with the executive director of The People’s Clinic in early 2009 to assess the needs of the clinic. Morehead State University upper division students in the Department of Nursing and Health Promotion program were considered to be the ideal candidates for providing the health consultations. In addition, with patients’ permission, the student consultants also accompanied the patient to attend their clinical sessions with the physician.

Recruitment of the Students
To ensure that The People’s Clinic patients received quality health consultation sessions, the investigators recruited six responsible dedicated upper-class students from the Department of Nursing to participate in the project. All of them were interested in community health and desire to participate in a hands-on learning experience. Before students could conduct consultations to the patients, they received training in the protection of human research subjects from the Collaborative Institutional Training Initiative (CITI). Together, the nurse practitioner, the clinic’s executive director and the project investigators conducted a series of training and orientation sessions for the students. These sessions were created to ensure that students performed effectively, ethically, and professionally, so the students could understand the needs, health conditions, issues of confidentiality, and office procedures. The recruitment and training sessions took place from mid- to late January, 2009.

Procedures for Individual Counseling
Students made a total of 13 visits to the clinic. The actual consultation started in mid-February and finished on April 14, 2009. One student group \( (n = 3) \) visited the clinic in the morning or early afternoon and the other student group visited the clinic in the evening. Each of the project investigators took turns visiting the students at the clinic on Tuesday afternoon or evening. The project investigators would take turns observing the students’ practices in their consultation session. Students observed the following procedures when carrying out their counseling services. Students also prepared educational materials and purchased the packaged hygiene kits with one of the project investigators, the Nursing faculty. The contents of those educational materials included methods for maintaining healthy diets and weight, tips for smoking cessation, and guidelines for managing depression, diabetics, high blood pressure, and high cholesterol.

1. Two to three students would work together as a team to conduct health consultation sessions. In each session, the staff of The People’s Clinic introduced the student consultants to the assigned patients at the intake stage or when the patient arrived for the appointment.
2. Each student engaged in a 15 to 20-minute conversation with a patient
to identify his/her personal health information and medical needs. Patients were encouraged to fill out an informed consent and a 15-item health risk appraisal form.

(3) With the permission of the patient, the students would accompany the patient to meet the physician. Students assisted the patient to further understand medical terminology and the medical and wellness instructions given by the physician.

(4) Students recorded and summarized their conversations with the patients and physician. The recorded information would help the students, under the guidance of the project investigators, to design an individual-based health consulting plan for the patient. Students also determined what prepared educational materials were appropriate to give to the patients.

(5) Students set up follow-up meetings to conduct health education counseling sessions in accordance to the patient’s specific needs. In addition, students provided patients with a packaged personal hygiene kit and the appropriate educational pamphlet (or brochure) based on their medical condition.

(6) If time permitted, students would attempt to meet with their patients for additional consulting sessions to reinforce healthy life style behaviors.

Project Evaluation

Evaluating the effectiveness of this project, for both the patient and students, was challenging. Post evaluation procedures were difficult to conduct because the principle investigators, students, and The People’s Clinic staffs all have limited time to meet together for exchanging feedback. Limited monetary resources also hinder the amount of time that students could spend in the project. Students were required to submit a portfolio upon the completion of the project. One of the project investigators, the Nursing faculty, met with students once a week to monitor teaching and learning progress and check the action plans. The portfolio contained the following basic items for progress evaluation:

(1) Weekly journals -- documenting the conversations with the contacted patients during all meetings;

(2) Health reports – recording doctor’s comments on patients’ health and changes in physical and behavioral symptoms;

(3) Teaching kits – including items such as flyers, diagrams and pamphlets that are used to educate the patients about health promotional activities;

(4) Final reflection paper – summarizing the overall experience in regards to the project (i.e., most memorable and challenging experiences or things that can be improved); and

(5) Evaluation form-- comments and suggestions provided by the nurse practitioner and The People’s Clinic director.

Findings of the Project, Discussion and Recommendations

During the 13 visits, the students conducted health consultation with 50 patients. Students encountered a variety of the medical symptoms such as
advance stages of diabetes, gastrointestinal pain, toenail pain, toothaches, and chronic pain. To generalize the students’ experience, Table 1 was created based on three categories: medical cases, provided services, and challenges, to classify students’ services and encountered issues.

**Table 1**  
The Summary Table of Student Learning

<table>
<thead>
<tr>
<th>Medical Cases</th>
<th>Provided Services</th>
<th>Challenges/Issues</th>
</tr>
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<tbody>
<tr>
<td>• Diabetes (2 cases)</td>
<td>• Food screening</td>
<td>• Nature of the project</td>
</tr>
<tr>
<td>• Toenails pain</td>
<td>• Dental care</td>
<td>• Management/Organization</td>
</tr>
<tr>
<td>• Toothaches</td>
<td>• Therapy/exercise</td>
<td>• Foreign language support</td>
</tr>
<tr>
<td>• Lower back pain</td>
<td>• Stress management</td>
<td>• Availability of vocational rehab</td>
</tr>
<tr>
<td>• Depression/Knee pain</td>
<td>• Smoking cessation</td>
<td></td>
</tr>
<tr>
<td>• Physical check up</td>
<td>• Financial consultation</td>
<td></td>
</tr>
<tr>
<td>• Hip pain</td>
<td>• Proper mechanics</td>
<td></td>
</tr>
<tr>
<td>• Insomnia</td>
<td>• Nutrition/diet</td>
<td></td>
</tr>
<tr>
<td>• Gastrointestinal pain</td>
<td>• Blood pressure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sleeping medicine</td>
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</tbody>
</table>

According to students’ reflective journals and verbal group-session feedback on their participation in the health consultation sessions, the program provided a valuable hands-on experience to practice their communication skills and medical knowledge competency. Interestingly, students were particularly excited about working with non-English speaking Hispanic patients. Learning the medical terminologies in a foreign language and the use of an interpreter were memorable cultural experiences. In addition, the
students were fascinated by the many different types of medical cases they encountered during their health consultation sessions.

There were two specific areas that deserved further evaluations to improve the quality of this program: (1) Students’ role in participation of this current project could be better clarified. Some of the volunteer physicians or nurse practitioners simply assumed that the students were there for the purpose of shadowing their practices throughout the clinic session rather than being engaged in the process. Sometimes the physicians or nurse practitioners pulled the students away to do other things, while the students were interacting with the patients; and (2) According to the project investigators’ plan, it is important and necessary for the students to interact with the patients during the waiting time. The students found that the patients felt uncomfortable when approached during their waiting time. Some of the patients felt overburdened by filling out the health risk appraisal form because many of the items were similar to those on the medical assessment form they had already filled out for the clinic.

Future Collaborations

If additional collaborative opportunities can be offered to continue this project, the project investigators would like to make two recommendations to modify the program.

(1) To better assess the development of students’ professional (medical) skills and knowledge, it would be beneficial to include an orientation session that includes teaching behaviors and medical professional skills, as well as a module on social economic knowledge of the clients. An orientation session designed by the volunteer physicians, nurse practitioners would also be beneficial by explaining the goals of the health consultation program and clarifying the role of the student nurses.

(2) Additional health education courses, such as smoking cessation, weight control, healthy diet, exercise instruction, and maintenance of normal blood pressures can be offered by the Health Promotion and Nursing students to the patients. The People’s Clinic can offer these seminars as part of the treatment process and provide incentives such as brown bag lunches, gas cards and priority appointments to encourage patients’ future participation. The project investigators hope that this service learning project could become the model for college or university health education programs in the Appalachian region. It can create a win-win situation for the community and university by engaging community health care providers to work collaboratively with the students in cultivating hands-on experience that provides three important and much needed health components: health education, preventative health practices, and service learning experience.
References


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Refereed Paper

Effect of a Seven-Week Weight Training Course on Resting Energy Expenditure

Steve Burns

There has been a significant amount of interest recently on the efficacy of weight training for weight control and reduced risk for hypokinetic diseases. Weight training has the ability to increase lean body mass which should lead to an increased resting energy expenditure (REE) and decrease the percentage of body fat. This study was designed to look at the effects of participation in an undergraduate weight training class on the students’ REE and upper-body strength. Participants (N=20, BMI= 25.8 ± 5.0, 8 males, 12 females) were college students with no previous weight training experience. Subjects participated in a seven-week resistance training program. Pre-to-post data was collected on total body weight, REE, 1 rep max (1 RM), and percent body fat. No significant differences were observed pre- and post-REE, 1RM, and %BF (1803 ± 332 kcal/day, 1813 ± 382 kcal/day, 22.2 ± 8.9%, 21.6 ± 9.3% respectively) however there was a significant difference observed in 1RM pre-training 51.1 ± 22.5kg, to post 53.7 ± 23.4kg. The seven-week resistance training program was not of sufficient intensity or duration to observe a significant change in REE, or %BF. However seven weeks of general strength training led to an increase in upper-body strength. Perhaps a longer training program, more subjects, or a higher intensity program would have led to greater changes in REE and/or percent body fat.

Physical activity classes are offered and often required in college to allow the students an opportunity to increase their overall health and fitness levels and learn about healthy lifestyles. These classes vary from aerobic to anaerobic activities, skilled and unskilled sports. Many of the degree programs in college require a certain amount of college credit in physical activity and/or fitness classes in an effort to promote a lifestyle of health and fitness. Trying to determine ways to encourage and motivate college students to be more physically active through physical activity programs has become an important concern (Gao, 2008). There has been a significant amount of interest recently on the efficacy of weight training for weight control and reduced risk for hypokinetic diseases. Even in higher education, instructors tend to gloss over scientific reality in selling their passions to students. Interest in this study was generated after attending a class session in a weight training class in which the instructor touted the benefits of weight training (bone health, stress management, increased lean body mass, increased strength, etc) to undergraduate students representing the general population of the university that had signed up for a weight training class. The aim of
this study was to explore the facts presented to this class concerning weight-loss and metabolism and conclude if students were receiving a true message based on scientific fact, and if not, what might the instructors tell a student that is closer to the reality of participating in a college weight training class.

When referring to weight management, the goal of physical activity is to increase the amount of energy used. Increasing daily energy used helps to put an individual into a negative energy balance thus positively effecting weight loss. Total daily energy expended is composed of three main parts; resting energy, energy for daily activity, and diet induced energy. Resting energy expenditure (REE) or resting metabolic rate refers to the sum of the metabolic processes of the active cell mass required to maintain normal regulatory balance and body function at rest (McArdle, Katch, & Katch, 2007). Weight training has been shown to increase REE when tested 14.5 hours after the training was complete (Gillette, Bullough, & Melby, 1994). The fact that REE is increased by weight training is controversial because another study has shown no increase in REE when the subject has discontinued their training for at least 72 hours (Poehlman, Denino, Beckett, Kinaman, & Dionne et al., 2002) or no chronic increase in REE was observed in another study using both resistance and endurance training (Broeder, Burrhus, Svanevik, & Wilmore, 1992). Weight training increases the potential for an individual to increase their lean body mass (LBM) (McArdle et al., 2007) and with an increase in LBM there is the potential for an increase in the individual’s (REE). Heavy resistance training has been shown to increase lean mass increasing the size of skeletal muscle, and the increase in lean muscle mass has been associated with an increased REE (Hunter, Wetzstein, Fields, Brown, & Bamman, 2000).

Energy expenditure is increased immediately following a bout of exercise due to Excessive Post Oxygen Consumption (EPOC). Research conducted to see which type of activity increases an individual’s EPOC for a longer duration following a bout of exercise found that heavy-resistance weight lifting produced a significantly greater EPOC than cycling (Elliot, Goldberg, & Kuehl, 1992). Therefore it is within the scope of possibilities that a weight training class may increase EPOC and lead to a chronic increase in REE if weight training is continued. The purpose of the current study was to investigate the effects of a 7-week weight training class on REE, total body mass, lean body mass, and upper-body strength.

**Methods**

**Experimental Approach to the Problem**

For this study, data were collected from students participating in at least 90% of the classes of a 7-week weight training class meeting two times per week offered by a mid-western division II University located in a rural community. There were seven weeks of class meeting two times per week. Students attending class spent 45-50 minutes each day lifting weights using general conditioning exercises. The research hypothesis was that students who attend an undergraduate weight training class would have an increased REE over the 7-week period. Variables measured were resting energy expenditure (REE), 1 repetition maximum on the bench press (IRM), total body weight (kg), percent body fat (%BF), and lean body mass (LBM).
Subjects
Twenty college students (8 males and 12 females), were recruited from a weight training course. Approval for this study was granted by The Human Subjects Review Committee at the University of Central Missouri. Prior to study participation, all subjects understood and signed the University approved informed consent.

Procedures
The subjects were assessed twice, once prior to beginning the 7-week course and again, 7 weeks after attending the class. For both tests, the subjects reported to the human performance laboratory in the morning (6:30-8:30) after a 10 hour food fast. The subject’s height was measured with a stadiometer and weight was measured using a balance scale.

**Measurement of REE.** The subjects had their REE measured using a ParvoMedics TrueOne Resting Metabolic gas analyzer (Parvomedics Salt Lake City, UT). The subjects lay supine with a hooded, hard plastic canopy placed over their head to collect and analyze expired gases. Expired gases were collected for 15 min after a 5 min period of familiarization to the equipment. Volume of oxygen consumed was measured, converted to kcals and extrapolated to a 24 hr period to determine daily REE.

**Measurement Of Body Fat.** Body density was estimated by the sum of 3 sites skinfolds using gender appropriate equations. Females were measured at the suprailiac, triceps, and thigh; males at the chest, abdominal, and thigh. Body density was converted into body fat percent using the appropriate equation based on age, gender, and ethnicity (Hayward & Stolarczyk, 1996).

**Measurement of Strength.** Strength was determined by a 1RM bench press test (free weight). Subjects watched a demonstration of proper technique before performing the lift. After a warm-up of 8-10 repetitions of approximately 40% of their estimated 1RM, subjects performed a maximum of 3 trials after warm-up to reach their 1RM with 2-3 min rest between each trial. If 1RM was not reached within 3 trials, subjects returned 5 days later for a second test.

Statistical Analyses
In the current study, the level of significance used was $p \leq 0.05$. The null hypothesis was that there would be no difference in pre and post REE ($p > 0.05$). A paired t-test was calculated from the subjects’ pre and post test REE, %BF, 1RM, total body weight, and LBM.

Results
Pre-to-Post mean differences for total body weight, %BF, LBM, 1RM and REE, were analyzed for significance (see Table 1). The only significant difference in the pre- to post-assessments was in strength represented by a higher mean 1RM. A paired samples $t$-test revealed a significant increase in pre - to - post 1RM of 2.62 kg ($t (19) = -4.72 p < 0.05$).
Table 1
Pre To Post Means And Standard Deviations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre measure Mean ± SD</th>
<th>Post measure Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent body fat</td>
<td>22.2 ± 8.9</td>
<td>21.6 ± 9.3</td>
</tr>
<tr>
<td>LBM* (kg)</td>
<td>57.7 ± 9.7</td>
<td>58.2 ± 11.6</td>
</tr>
<tr>
<td>Total Body weight (kg)</td>
<td>75.0 ± 14.8</td>
<td>75.2 ± 15.1</td>
</tr>
<tr>
<td>1RM (kg)</td>
<td>51.1 ± 22.5</td>
<td>53.7 ± 23.4**</td>
</tr>
<tr>
<td>REE (kcal/day)</td>
<td>1803 ± 332.9</td>
<td>1813 ± 382.9</td>
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</table>

* LBM = Lean body mass
**p<0.05

Discussion

This study was designed to look at the effects of participation in an undergraduate weight training class on the students REE and other variables. After comparing the pre- and post-test data from 20 subjects who successfully completed the course, no significant increase in REE was found. This could be due to the short duration of the course. Hunter et al. (2000), studying older adults with a time period of 26 weeks, found an increase in REE but other studies have shown no significant increase in daily energy expenditure (not REE) after a 6 month resistance training program (Poehlman, Denino, Beckett, Kinaman, & Dionne et al., 2002) or in REE (Broeder, Burrhus, Svanevik, & Wilmore, 1992). In contrast to these studies, Villanova, Pasqui, Buracchini et al. (2006) indicated that obese subjects increased their REE by increasing their physical activity without the use of weight training.

Although the change in REE was not significant in this study, there was a significant increase in the mean weight lifted during the 1RM. The gains experienced in strength potentially show that had the duration of the resistance training been longer, there may have been a greater potential for an increase in the subject’s LBM which might have increased their REE. The previous postulation is based on facts cited in McArdle et al., (2007) which for every .45 kg increase in fat free mass, the individual can increase their REE by 7-10kcal/24hr. Since LBM did not increase in the current study the increase in strength is attributed to neural factors (McArdle et al., 2007).

A more controlled resistance training program may have offered a better control of intensity concerning the subject’s workouts and allow better maintenance of intensity for each workout session. The environment of the classroom was such that the students chose their own exercises and intensity of their workout. When reviewing another study on high and low intensity resistance training, Thornton and Potteiger, (2001) concluded that high intensity resistance training had a higher excess post exercise oxygen consumption (EPOC) than lower intensity training, which was attributed to higher post exercise energy expenditure (Thornton & Potteiger, 2001). When
comparing circuit weight training to set weight training, research supports that circuit weight training results in a longer duration EPOC and higher net caloric cost estimate following the completion of the workout (Murphy & Schwarzkopf, 1992). The potential differences in workout intensity and variance in type of training of the subjects in this study might have been a factor in the lack of change in REE data. The frequency of the weight training also may have affected the results. The seven week course met twice a week. A course offering a training program at a higher frequency may have a higher potential for more of an increase in LBM and resulting REE. The subjects in the weight training class did not decrease either total body weight or body fat percent indicating that even though they were doing regular physical activity they continued to maintain their energy balance overall.

Although the current study only investigated four main variables related to strength and metabolism, there are many positive reasons one should regularly engage in strength training over the lifespan. Strength training has also been associated with increasing lipid oxidation in individuals who went through a resistance training program (Hunter et al., 2000; Malatesta, Werlen, Bulfaro, Cheneviere, & Borrani, 2008). Additional positive health related benefits of strength training include increased bone density, improved fasting blood glucose, improved functional abilities, lower resting blood pressure, and reduced lower-back pain (Winnett & Carpinelli, 2001).

For this study, the hypothesis was that if you attended a seven week weight training class then you would have an increased REE over the semester. There was not a significant increase in REE therefore the hypothesis was not supported by these data. The resistance training was successful in increasing 1RM indicating the strength of the subjects increased without an increase in LBM or REE.

Practical Applications

Even though there was no significant increase in the subjects REE, weight training even for only half a semester still resulted in an increase in strength which indicates the training program was beneficial for training the general population to increase their strength. There may be a potential for a larger increase in strength with a weight training program at a higher frequency and duration. The initial impetus for conducting this study was to verify facts that were espoused by the instructor about the benefits of the weight training class. Probably the most important goal that instructors of weight training college classes need to address are the chronic adaptations to strength training and health benefits of a regular lifetime activity that weight training offers and not dwell too much on the short-term effects of 7 weeks of training. Also important is the fact that weight training classes may give individual students confidence and knowledge in programming and technique to apply to their lifetime exercise program.

References

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The Comparison of Dietary Intakes Based on Injury Occurrences in Collegiate Track and Field Athletes

Lisa Wojahn, Yeong Rhee, Pamela Hansen, and Donna Terbizan

The purpose of this study was to compare dietary intakes based on injury occurrences in National Collegiate Athletic Association Division I track and field athletes. Nine collegiate track and field athletes participated in the study. Dietary intake data were collected using 3-day food records. Injury data were collected from participants and through review of the participants’ charts with the Department of Athletics for a 10-week period. Significant differences were seen in total fat intake ($p = 0.029$) between male participants who did not miss practice as a result of injury and male participants who did miss practice as a result of injury. Calcium intakes were significantly different between male participants reporting a mild injury and those reporting a severe injury ($p = 0.022$). No other significant differences in nutrient intakes were seen in male participants. No significant differences in nutrient intakes were seen between female participants who did not miss practice or competition ($n = 3$) and female participants who missed one or more days ($n = 2$). Similarly, no significant differences in nutrient intakes were seen between those with mild injury ($n = 4$) and a participant with severe injury ($n = 1$) in females. Further studies will be needed to prove whether nutrient intake affects injury risk.

Key Words: Dietary intake, athlete, injury

Dietary intake provides energy for training and competition, and supplies the nutrients needed for building muscle and keeping tissues healthy. Inadequate diet can compromise performance through increased susceptibility to fatigue or suboptimal muscle repair and growth. Physiological changes that occur as a result of inadequate nutrient intake may increase the risk of injury (American College of Sports Medicine [ACSM], American Dietetic Association [ADA], & Dieticians of Canada [DC], 2009). Currently, however, research investigating the relationship between dietary intake and injury occurrence is limited.

Injuries are a major problem for athletes for several reasons. Injuries cause physical pain and/or discomfort, which may reduce the level of performance that athletes are able to reach in competition. Further, injuries may force athletes to reduce their training load, or stop training altogether, in order
to allow time for the injury to heal. Reduced training time, if extensive, can result in decreased fitness level and performance capability. It is easy to see the importance of minimizing the occurrence of injuries (Maffulli, Longo, Spiezia, & Denaro, 2011; Adirim & Cheng, 2003).

Injuries can occur suddenly, or can develop over a period of time. Sudden, or acute, injuries may result from a sudden impact, fall or collision, from an abrupt change in motion, or from overexertion (O’Connor, 1998). These types of injuries can occur to soft tissue (e.g. muscles, tendons, or ligaments) or bones. Chronic injuries are those that occur as a result of accumulated trauma to a structure. These injuries occur most often in bones and tendons, in the form of stress fractures and tendonitis (O’Connor, 1998). Like injury, illness is a condition that can impact an athlete’s ability to train or compete. The stress of intense physical activity can also cause immune system changes making athletes more susceptible to illness (Weidner & Sévrier, 1996). Therefore, athletic trainers may consider injury and illness together as pathophysiological conditions that negatively impact performance.

The impact of nutrition on injury prevention may vary based on the nature of the injury or condition. Low bone mineral density (BMD) has been associated with increased risk of stress fractures in females, but not in males (Bennell et al., 1996). Magnesium intake was positively correlated with BMD in the femoral neck (Burrows et al., 2003). Magnesium may influence BMD through effects on the secretion of parathyroid hormone, which regulates calcium uptake. Calcium is the mineral most associated with bone health. It is important for athletes to meet the recommendation for daily intake of calcium, but evidence shows that consuming calcium in excess of the recommendation does not provide additional protection from injury (Bennell et al., 1996). Amenorrhea is also associated with bone loss and low BMD (ACSM, 2007). It is clear that maintaining normal menstrual function is important for bone health. In several sports, including distance running, gymnastics, figure skating, and dance, the rate of injuries has been reported to be higher in amenorrheic athletes than in those who have normal menstrual function (Anderson & Anderson, 1993). The reversal of amenorrhea through increased caloric intake and the evidence of metabolic changes coinciding with menstrual cycle changes provided strong support for the involvement of negative energy balance in menstrual dysfunction (Williams et al., 2001). As noted, maintaining normal menstrual function can reduce the risk of bone mineral density loss and thus reduce the risk of stress fractures and simple fractures. Other studies, including an evaluation of runners with sacral stress fractures, indicated the importance of nutrition in recovery from fractures (Johnson, Weiss, Stento, & Wheeler, 2001). Johnson et al. found that athletes with the best overall diet quality had faster recovery rates.

Fat, stored muscle triglycerides, is an energy source during mild to moderate intensity exercise, and for an aerobic exercise. The amount of fat in an athlete’s diet may affect the risk of injury and performance (Gerlach, 2003; ACSM, ADA, & DC, 2009). Less than 20% of energy from fat or more than 70% energy from fat is not recommended for athletes (ACSM, ADA, & DC, 2009). Runners who experienced injury in the following year had reported a lower intake of dietary fat than those who did not experience injury (Gerlach, 2003). Muscle glycogen depletion also has been implicated as a risk factor.
for injury (Schlabach, 1994). Jentjens and Jeukendrup (2003) reported that the most rapid rates of glycogen synthesis occur in the first 30-60 minutes following an exercise bout. Ingesting adequate amounts of carbohydrates during this time period will result in the most effective glycogen synthesis. Ivy et al. (2002) found that a combination of protein and carbohydrate resulted in more effective glycogen synthesis than a carbohydrate-only meal of equal energy content.

Exercise can cause ultrastructural damage to tissues, such as small tears in muscles and oxidative damage to cells (Adirim & Cheng, 2003; Anderson & Anderson, 1993). Adequate nutritional intake is important to help heal such damage. Vitamins B$_6$, B$_{12}$, C, and folate have been found to be necessary for tissue repair (ACSM, ADA, & DC, 2009). Magnesium is also important for normal muscle function; reduced levels of magnesium can result in muscle weakness and neuromuscular dysfunction (Warburton, Welsh, Haykowsky, Taylor, & Humen, 2002).

Like injury, illness can impair an athlete’s ability to train or compete. The stress of exercise may lead to depressed immune function and increased incidence of illness (Aoi, Naito, & Yoshikawa, 2006; Weidner & Sevier, 1996). Upper respiratory tract infections and gastrointestinal infections are the most common illnesses experienced by athletes (Weidner & Sevier, 1996). It is believed that a well-balanced diet can help keep the immune system strong to help stave off infection and illness (Aoi et al., 2006; Gleesong, Nieman, & Pedersen, 2004).

Injuries that occur in the course of sports training hamper an athlete’s ability to reach a high performance level. Injuries may result in lost practice time and lost competition opportunities, may affect the mental preparedness of the athlete, and may cause considerable physical pain. Preventing the occurrence of injuries is, therefore, very important. Adequate nutritional intakes through the diet provide energy and support growth and repair of tissues. Inadequate dietary intake may cause physiological changes and increase susceptibility to fatigue or suboptimal tissue growth and repair, thus leading to increased risk of injury. To prevent injuries, factors that increase their likelihood must first be identified and then modified, and also adequate nutritional intake must be emphasized. The purpose of this study was to compare dietary intakes based on injury occurrences in National Collegiate Athletic Association (NCAA) Division I track and field athletes.

Methods

Participants
Participants were recruited from a NCAA Division I university men’s and women’s track and field teams by the lead researcher, who addressed the team during a regularly scheduled team meeting. Informed consent was obtained from all who agreed to participate. Prior to data collection, approval for this project was obtained from the Institutional Review Board (IRB) of the university. A total of nine track and field athletes (four male and five female) completed the study during the fall semester.
Measures

Demographics. Demographic information including age, gender, event/training group, training intensity, and menstrual history for females, was collected via a short questionnaire. Height and weight were measured by the lead researcher at the beginning and end of the study. Body composition was also assessed at these times using a bioelectrical impedance analyzer (TANITA® Body Composition Analyzer, Model # TBF-300A, TANITA® Corporation of America, Arlington Heights, IL).

Nutrient Intake. Dietary intake data were collected using self-reported 3-day food records. Participants were asked to complete three separate 3-day records during weeks one, five, and 10 of the 10-week study period. Participants were instructed to record intake during two weekdays and one weekend day for each 3-day record. The participants received instructions for keeping the food records and were given visual examples of portion sizes using food models by a trained researcher. The food records were then analyzed for nutrient content using the Diet Analysis Plus software program, Version 6.0 (Wadsworth Learning, 2003). The following nutrient intakes were analyzed: energy; carbohydrate; protein; fat; calcium; magnesium; and vitamins $B_6$, $B_{12}$, C, and folate. These nutrients were selected because their potential roles in injury prevention have been discussed in previous research.

Energy Needs. The Harris-Benedict formula (Frankenfield, Muth, & Rowe, 1998) was used to calculate the participants’ resting energy needs. Participants completed an activity log during the same time that they kept the food record. This activity information and the calculated resting energy needs were used to estimate each participant’s estimated energy expenditure by multiplying the resting energy needs times an activity factor. Values for activity factors were 1.60-1.89, which is based on the estimated ratio of total energy expenditure to resting energy expenditure for active persons (Institute of Medicine, 2005). Energy balance was then calculated based on the difference between estimated total energy intake and estimated energy expenditure.

Injury Data

Injury data were collected by participant survey and also by chart review from the university’s Department of Athletics from the same 10-week period in which the participants completed food records and activity logs. Information collected from the chart review included injury type and the recommendations of the Athletic Trainer for reduced participation in training. Information was collected from the participants at the midway point (week five) and at the end of the study period (week 10). Participants were classified as ‘injured’ if they sought advice from an Athletic Trainer during this period regarding physical damage or discomfort resulting from training or competition leading to the inability to participate in practice or competition sessions, or if they self-reported missing practice time due to illness or injury.

The number of practice or competition days missed was used to rate the severity of the injury. Severity was determined based on the standard used by the NCAA Injury Surveillance System (NCAA, 2008). An injury was classified as “mild” if it resulted in less than seven days of missed
participation and “severe” if it resulted in seven or more days missed.

Statistical Analysis
Data were analyzed using SPSS® Version 12.0.1 for Windows (SPSS Inc., 2004). For all analysis, values beyond two standard deviation of the group mean were removed as outliers. Descriptive statistics for each variable were calculated. Participants were classified as injured or non-injured. These two groups were compared for each of the previously mentioned dietary intake variables measured using a one-way ANOVA. For further analysis, comparisons were made based on injury severity, injury type, and gender. These groups were also compared using a one-way ANOVA. The level for significance was set at \( p < 0.05 \). All data are reported as mean ± standard deviation (SD).

Results

Demographics
A total of nine athletes participated in this study, including five women and four men. A dietary intake of one participant was removed from data analysis as an outlier. The mean age was 19.7 ± 1.2 years. The mean body mass index (BMI) was 22.0 ± 1.7 kg/m\(^2\) at the baseline and 21.9 ± 1.9 kg/m\(^2\) at the end of the study. The mean % body fat was 13.5 ± 7.3 at the baseline and 13.0 ± 7.4 at the end of the study. Specific characteristics of males and females are reported in table 1. Average training time per week was 13.4 ± 1.3 hours. Five participants participated in sprint events; two participated in multi-events; one participated in throwing events; one participated in jumping events.

Table 1
Participant Characteristics

<table>
<thead>
<tr>
<th></th>
<th>All N=9</th>
<th>Females n=5</th>
<th>Males n=4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>End of Study</td>
<td>Baseline</td>
</tr>
<tr>
<td>BMI (kg/m(^2))</td>
<td>22.0±1.7</td>
<td>21.9±1.9</td>
<td>22.7±1.9</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>13.5±7.3</td>
<td>13.0±7.4</td>
<td>19.6±3.4</td>
</tr>
</tbody>
</table>

Data are presented as mean ± standard deviation (SD)
*significant compared to female body fat at baseline \( p=0.0007 \)

Injury
All participants reported experiencing some form of illness or injury during the study period; however, not all participants missed practice or competition as a result. A total of six participants (66.6%) reported missing practice or competition due to illness or injury during the study period. Three of these participants (33.3% of total participants, 50% of participants
who missed practice due to injury) reported an injury that caused them to miss seven or more days and were, therefore, classified as having a severe injury. Injury types experienced by the participants are shown in table 2. All illnesses reported (n=4) were described as upper respiratory tract infections, with one of these described as upper respiratory tract infection plus flu-like symptoms.

Table 2
Illness/Injury Types Experienced By Participants

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of times reported</th>
<th>Number causing 1 – 6 days missed</th>
<th>Number causing ≥ 7 days missed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illness</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Strain/Sprain</td>
<td>5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Stress Fracture</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other Fracture</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shin Splints</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Menstrual Irregularity</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

Nutrient Intake
Participants were asked to complete a total of nine days of food records (three 3-day food records) throughout the study period. The number of records actually received from participants varied from three to nine days, with three participants providing just three days of records, three participants providing six days of records, and three participants providing nine days of records. The nutrient intake from all records received was used to determine the average intake for each participant.

When intakes of male and female participants were compared, it was found that the males had a significantly higher total calorie intake than females (Table 3). Intakes of most other nutrients were higher for males than females, but no other differences reached the level of significance (Table 3).

Since all participants reported some form of injury, it was not possible to compare nutrient intakes between injured and completely non-injured participants. Instead, comparisons were made between participants with injuries that caused missed training or competition (n=5) and participants who reported injury but did not miss training or competition (n=3). No significant differences were found between these groups.
Table 3
Dietary Intakes Of Participants

<table>
<thead>
<tr>
<th>Energy/Nutrient</th>
<th>All (N=8^8)</th>
<th>Males (n=4)</th>
<th>Females (n=4)</th>
<th>DRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (Kcal/d)</td>
<td>3212 (\pm) 1102</td>
<td>4019 (\pm) 1015</td>
<td>2405 (\pm) 258*</td>
<td>2400^1, 3000^2</td>
</tr>
<tr>
<td>Energy balance</td>
<td>698 (\pm) 898</td>
<td>1891 (\pm) 595</td>
<td>154 (\pm) 248</td>
<td></td>
</tr>
<tr>
<td>Carbohydrate (g/d)</td>
<td>412 (\pm) 146</td>
<td>508 (\pm) 151</td>
<td>316 (\pm) 45</td>
<td>270-390^1, 338-488^2</td>
</tr>
<tr>
<td>Protein (g/d)</td>
<td>117 (\pm) 36</td>
<td>141 (\pm) 32</td>
<td>93 (\pm) 23</td>
<td>60-210^1, 75-262^2</td>
</tr>
<tr>
<td>Fat (g/d)</td>
<td>129 (\pm) 67</td>
<td>169 (\pm) 78</td>
<td>88 (\pm) 15</td>
<td>53-93^1, 67-117^2</td>
</tr>
<tr>
<td>Vitamin C (mg/d)</td>
<td>164 (\pm) 131</td>
<td>128 (\pm) 74</td>
<td>200 (\pm) 176</td>
<td>75^1, 90^2</td>
</tr>
<tr>
<td>Vitamin B6 (mg/d)</td>
<td>2.8 (\pm) 1.1</td>
<td>3.3 (\pm) 1.0</td>
<td>2.2 (\pm) 1.0</td>
<td>1.3^1,2</td>
</tr>
<tr>
<td>Vitamin B12 (µg/d)</td>
<td>5.8 (\pm) 2.8</td>
<td>5.2 (\pm) 3.5</td>
<td>6.4 (\pm) 2.3</td>
<td>2.4^1,2</td>
</tr>
<tr>
<td>Folate (µg/d)</td>
<td>533 (\pm) 222</td>
<td>635 (\pm) 242</td>
<td>432 (\pm) 172</td>
<td>400^1,2</td>
</tr>
<tr>
<td>Calcium (mg/d)</td>
<td>1408 (\pm) 379</td>
<td>1601 (\pm) 468</td>
<td>1215 (\pm) 131</td>
<td>1000^1,2</td>
</tr>
<tr>
<td>Magnesium (mg/d)</td>
<td>374 (\pm) 143</td>
<td>464 (\pm) 151</td>
<td>285 (\pm) 64</td>
<td>310^1, 400^2</td>
</tr>
</tbody>
</table>

Data are presented as mean \(\pm\) SD
^8Dietary intake data of a female participant more than two standard deviations from the group mean was removed as outlier.
*significantly lower than males, \(p=0.022\)
DRI: Dietary Reference Intakes

DRI for females aged 19-30 years; 2DRI for males aged 19-30 years

Nutrient intake comparisons were then made based on injury severity. No significant differences were found in nutrient intakes between mild and severe injuries in all participants. When comparing nutrient intakes of the male participant who experienced injury but did not miss practice or competition (\(n=1\)) with that of males who missed at least one day (\(n=3\)), significant differences were seen in total fat intake between these two groups. The male participant who did not miss practice due to injury had a significantly higher fat intake (282.2 g/d vs. 131.4 \(\pm\) 22.7 g/d, \(p = 0.029\)) compared to male participants who did miss practice due to injury. No other significant differences in nutrient intake were seen between these groups.

Nutrient intakes were also compared between males with mild versus severe injuries. A significant difference between male participants with mild injury (\(n=2\)) and male participants with severe injury (\(n=2\)) was found for calcium intake, with the male participants experiencing mild injury reporting...
a higher calcium intake compared to those experiencing severe injury (1997.4 ± 151.7 mg/d vs. 1205.3 ± 76.0 mg/d, p = 0.022).

When nutrient intakes of females were analyzed, no significant differences were seen between females who did not miss practice or competition (n=3) and females who missed one or more days (n=2). Similarly, no significant differences were seen between those with mild injury (n=4) and a participant with severe injury in females (n=1).

Nutrient intakes were also compared between athletes experiencing different injury types. Injuries that caused a participant to miss participation were included in this analysis (illness, n=3; stress fracture, n=1; shin splints, n=1). No significant differences were found between these groups. The sample size was insufficient to test for differences between injured and non-injured participants based on event groups.

Discussion

In the current study, the severity of the injury was rated based on the number of days missed practice or competition. The number of days missed practice or competition is commonly used to rate the severity of the injury (Centers for Disease Control and Prevention, 2006; Gaudio, Greenwald, & Holton, 2010).

The average BMI and percent body fat classify the participants as being healthy (Garrow & Webster, 1985; Lee & Nieman, 2003). The average energy intake of participants was 3212 Kcal, and all participants had a positive energy balance. When comparing energy intake to the Dietary Reference Intakes (DRI) for gender and age specific groups (2400 Kcal for females aged 19-30 years and 3000 Kcal for males aged 19-30 years), female participants met DRI and male participants exceeded DRI by 1000 Kcal (Institute of Medicine, 2005). No menstrual irregularity in female participants also indicates that these female participants maintained a positive energy balance and good health status in this study. The average percentage of calories provided by carbohydrate, protein, and fat was 53%, 15%, and 34%, respectively. The percentage of these macronutrients met DRI (Institute of Medicine, 2005) for carbohydrates (45-65% of total calories), fats (20-35% of total calories), and protein (10-35% of total calories).

When calculating an average carbohydrate intake (g) per kilogram (kg) body weight, female participants had 6.58 g carbohydrate per kg body weight where male participants consumed 6.91 g carbohydrate per kg body weight. To maintain optimal glycogen synthesis, six to ten grams of carbohydrate per kilogram body weight is recommended (ACSM, ADA, & DC, 2009). Although carbohydrate intake before and after training or event or actual muscle glycogen concentrations were not determined, the average carbohydrate intake indicates that these participants would have maintained effective glycogen synthesis in the body, which may reduce a risk of injury (Schlabach, 1994). Moreover, both male and female participants’ protein intake (1.93 g protein per kg body weight for male and 1.92 g protein per kg body weight for female) exceeded the recommended amount of protein for athletes (1.2-1.7 g protein per kg weight; ACSM, ADA, & DC, 2009) which may also contribute to a decreased risk of injury.
The mean intakes of fat for male and female participants were 38% and 33% of total calories, respectively. The male participants exceeded while the female participants met the recommended amount of fat for DRI and athletes, which is 20-35% total calories from fat (Institute of Medicine, 2005; ACSM, ADA, & DC, 2009). The exceeded or recommended amount of dietary fat intake may also contribute to a decreased risk of injury and no adverse effects on performance in these participants (ACSM, ADA, & DC, 2009).

Vitamins C, B₆, B₁₂, and folate intakes met Recommended Dietary Allowances (RDA) for gender and specific age groups (Institute of Medicine, 2000, 1998). The average dietary calcium intake of 1601 ± 468 mg/d (males) and 1215 ± 131 mg/d (females) also met Adequate Intake for gender and specific age groups, which is 1000 mg/d (Institute of Medicine, 1997). However, the average dietary magnesium intake was lower than RDA (310 mg/d; Institute of Medicine, 1997) for female participants (285 ± 64 mg/d) while male participants (374 ± 143 mg/d) exceeded RDA in this study. The lower dietary intake of magnesium might influence the muscular functions and bone mineral density in female participants. Because magnesium is important for bone mineral density, normal muscle function; reduced levels of magnesium can result in muscle weakness and neuromuscular dysfunction (Burrows et al., 2003; Warburton, Welsh, Haykowsky, Taylor, & Humen, 2002).

However, the specific relationships between dietary magnesium intake and injury were not assessed in the current study.

Previous research has shown potential relationships between the intake of certain nutrients and the risk of injury; however, examples of strong relationships have not been extensively proven. For example, Bennell et al. (1996) found no differences between the intake of energy, protein, carbohydrate, fiber, calcium, sodium, or phosphorus in male and female track and field athletes with stress fractures and those without stress fractures. However, a difference was seen when examining the fat intakes of the female participants; female athletes with stress fractures had a lower fat intake than females without stress fractures. The study of Bennell et al. (1996) had a larger sample size and a longer study period than the current study, which could account for the different results observed.

Conversely, intake of one nutrient, calcium, was found to be different when males with mild injury were compared to males with severe injury. Both groups, however, exceeded the minimum recommended daily intake of calcium for males aged 19-30 years, which is set at 1000 mg (Institute of Medicine, 1997). The male participant who did not miss practice time had a fat intake of 50.5% of total calories, which is above the normal daily recommendations of 20-35% of total calories (Institute of Medicine, 2005; ACSM, ADA, & DC, 2009).

Although, the participants might have been taking dietary supplements such as vitamins, minerals, herbs, or protein powder, the nutrient intake analysis was limited to the food sources excluding supplement sources in the current study. The additional nutrients from supplement sources might have also affected the injury status in these participants, suggesting the need to assess dietary intake including supplements.

It is known that hydration status affects injury occurrence (ACSM, ADA, & DC, 2009); however, the relationship between hydration status and injury
was not assessed in the current study. Since energy intake for both male and female participants met or exceeded DRI which was enough to meet DRI for most micronutrients, except magnesium in female participants, it was not possible to identify the relationships between injury and specific micronutrient intakes in these participants.

With the small sample size, it was not also possible to make comparisons based on event groups because there were not both injured and non-injured athletes represented within each event group. Moreover, due to the small sample size, several “groups” used in the analyses consisted of only one participant. This limited the statistical power to detect differences between groups. Also, since this study was observational in nature, care must be taken in the interpretation of significant differences. It cannot be established whether different nutrient intakes contributed to injury.

Based on the results of this study, it cannot be concluded that intake of any specific nutrient was different for athletes who experienced injury compared to those who did not. There was some evidence that fat intake was lower in male participants who missed practice time due to injury compared to those who did not and that male athletes who had a severe injury had a lower calcium intake than those who had a mild injury. However, due to the very small sample size, these results may be misleading. Continuing this research with a larger sample size would help define if nutrient intake is related to injury risk and status.

A longer study period would also be beneficial. The likelihood that a given athlete will experience injury during the study period is reduced when shorter time spans are used. The current study period was 10 weeks; a study period encompassing an entire sports season or an entire year would be an improvement. Further studies will be needed to prove whether nutrient intake affects injury risk.

References


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Successful community-based youth wellness programs combine intrinsically-motivating physical activity with family involvement and are enhanced by peer support, role-modeling, and mentoring. The purpose of this study was to determine the impact of a community-based youth wellness program on targeted psychological and attitudinal outcomes in a sample of youth participants. Youth participants (N=28; 13 males, 15 females) were paired with an adult family member and a college-student mentor and attended 12 weekly educational sessions on health topics followed by 60 minutes of physical activity. Results suggest that mentor-based youth wellness interventions have a positive impact on self-esteem and perceived stress.

National overweight and obesity trends in children and adolescents reveal increases in the prevalence of obesity for both females and males (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006). According to the United State Department of Health and Human Services (USDHHS; 2000), two main factors contributing to the poor health of overweight and obese children are less exercise and poor nutrition. Research has found that reductions in physical activity during childhood and adolescence are related to elevations in adiposity in adulthood (Kimm et al., 2005). Also, unhealthy childhood behaviors track into adulthood, thus childhood and adolescence are critical periods for promoting healthy behaviors (Goran, Ball, & Cruz, 2003).

Perceptions of exercise barriers are negatively related to actual physical activity involvement (Sallis, Hovell, Hofstetter, & Barrington, 1992) and, for youth, include lack of time, lack of parental support, previous inactivity, and siblings’ nonparticipation in physical activity (Sallis, Prochaska, & Taylor, 2000). Therefore, youth wellness interventions require a comprehensive, holistic, family-based approach (Spear et al., 2007). Support from significant others who model healthy behaviors is an essential component toward improving the likelihood that children will eat healthy foods and pursue a physically active lifestyle (Epstein & Goldfield, 1993; Gordon-Larsen, 2000).
Nelson, & Popkin, 2004). Multidisciplinary approaches appear most effective in combating youth obesity, and those that include behavioral modification along with changes in nutrition and physical activity seem to be the most successful approaches for improving weight and health status in children and adolescents (Riddoch et al., 2004; Spear et al., 2007). Psychological factors such as intrinsic motivation, stress reduction, mood improvement, and self-esteem are important potential outcomes of youth wellness programs aimed to increase participation in physical activity (Fox & Biddle, 1988). High self-esteem, in particular, serves as a protective factor to youth involvement in risky health behavior (Young, 1993) and is associated with higher academic achievement, involvement in sport and physical activity, and development of general coping skills (Gurney, 1987; Torres, Fernandez, & Maceira, 1995).

Ecological approaches to wellness interventions emphasize the importance of social context (Heaney & Israel, 1997) and the maintenance of strong, positive family and social support is an important predictor of good health. In particular, social support is strongly associated with general well-being (Israel & Rounds, 1987) and weight loss (Epstein & Wing, 1987). For youth, peer support and mentoring have a positive influence in the development of physical competence and weight loss interventions (Holt, Bewick, & Gately, 2005). In general, youth who have a positive mentor relationship during adolescence are more likely to eat healthier and be more physically active (Rhodes & DuBois, 2008). Specifically, the concept of mentoring involves pairing an adult and a youth needing assistance, with the goal of reducing negative health behaviors and connecting the youth to other school or community support networks (DeAnda, 2001). The mentor serves as a positive role model while providing support. Unfortunately, many mentor programs are based on anecdotal evidence and the use of mentoring in youth wellness interventions targeted to nutrition and physical activity is lacking.

Finally, the family is an important target in youth health behavior change (Epstein, 1996; Ransdell et al. 2001). Family supported obesity treatment and prevention programs and have demonstrated long-term activity increases in at-risk youth (Epstein, Valoski, Wing, & McCurley, 1994). Youth who have social support are more effective in making healthy, informed decisions and demonstrating stress resiliency (O’Donnell, Michalak, & Ames, 1997; Simons-Morton, Crump, Haynie, & Saylor, 1999). As such, community-based, youth-mentoring programs that focus on involving participants in interactive, youth-oriented, cooperative activities where problem-solving skills are developed, and parental involvement is included have been shown to be effective in building self-esteem and positive connections to school, peers, and family (King, Vidourek, Davis, & McClellen, 2002).

**Purpose**

Given the association between physical activity and the affective domain, the purpose of this study was to determine the overall impact of a community-based youth wellness program, which emphasized mentoring and family involvement, on targeted psychological and attitudinal outcomes in a sample of youth participants.
Methods

Program Description

The 12 week program, G.A.M.E (Goal Accomplishment through Mentoring and Exercise) On, Griffs!, was designed to promote healthy lifestyles to enhance self-esteem, decrease stress, and increase enjoyment of physical activity in children ages 8-13 years old. Key components of the program were: (1) participation by one adult family member along with the child, and (2) direct involvement of college student mentors with participant teams.

Upon project approval from a university human subjects committee and school administrators, the program was promoted to area elementary and middle school programs, with a program theme based on popular television “reality” shows in which participant “teams” completed a series of challenges. The goal of the adult family member participation was to encourage family involvement and support for the child. In addition, the goal was also that they would learn nutrition and physical activity habits together as a family unit. Undergraduate nursing and physical education majors were paired with child/parent teams and were responsible for mentoring their youth, based on a structured curriculum designed to provide participants with personalized nutritional and physical activity strategies individualized to the youth’s lifestyle.

Mentor Recruitment and Training

Prior to the program, 26 undergraduate mentors were obtained from a mid-western university. Mentors received training from program coordinators (authors), which included an overview of the curriculum, effective mentoring principles (Fresko & Werthheim, 2006; Ryan & Olasov, 2000), and responsibilities to participants. Mentors were encouraged to individualize their counsel to meet the needs of each participant, based on familiarization with their child’s current attitudes, lifestyle, and habits in the areas of physical activity and personal nutrition.

The Program. The 12 week program consisted of a kick-off event, ten weeks of once-weekly meetings (90-minutes), and a wrap-up “celebration” event (in which post-program measures were taken). The purpose of the kick-off event was to pair mentors with youth/parent participant teams, provide an overview of the program, distribute the program curriculum, engage in teambuilding activities to foster mentors/participant-team relationships, and obtain pre-program physical and psychological assessments. The wrap-up event allowed for parental program feedback and post-program assessment on outcome measures. Weekly meetings included 30 minutes of curriculum time in which healthy nutrition practices were addressed, followed by 60 minutes of structured physical activity. National recommendations (USDHHS, 2005) suggest that young people should engage in at least 60 minutes of moderate-intensity physical activity each day. The moderate intensity guideline usually refers to movements that make one breathe hard, requiring at least as much effort as brisk walking (Bar-Or & Rowland, 2004). The program was constrained to a once-a-week design due to the semester format, as well as mentor and facility availability. The authors realized this format did not fully allow the program alone to meet the aforementioned
recommendations, so a main theme of the curriculum was educating families on the importance of meeting this guideline and incorporating the mentors to counsel youth on ways to meet this guideline.

For the nutrition curriculum, program coordinators and a registered dietician led discussions on nutrition and provided interactive and applied learning experiences on healthy nutrition practices. Examples of topics included: using the food guide pyramid, reading food labels, nutritious restaurant choices, portion control, and preparing healthy school lunches. A curriculum overview is provided in Table 1. Weekly topics were followed by mentor-led small-group discussion. For the physical activity component, coordinators and mentors planned a variety of activities in which teams could participate, along with their mentors. Emphasis was placed on lifetime physical activities that were available within the community.

Since mentoring was a key component, sessions were structured to maximize time and interaction between mentors and participant teams, and the curriculum was designed so that participants were learning primarily from mentors. Participants were required to keep a journal of their dietary and physical activity behaviors as they related to individually-set goals at the beginning of the program, and mentors worked with participants by providing feedback on their journaling exercises. Finally, mentors maintained regular, weekly behavior change support through telephone and e-mail contact with their teams.

Participants
Forty-seven family participant-teams were recruited through the local school district and through program advertisement at a local pediatrician’s office. Thirty-three teams were selected for the final sample. The program was targeted toward children who were at risk for overweight and obesity; however, since it was felt the social stigma attached to children’s involvement in an intervention for an at-risk population would lower enrollment, the program was not openly advertised as an intervention for at-risk children. However, children at-risk were given first priority followed by participant selection on a first-come, first serve basis. “At-risk” was defined according to CDC guidelines (Guo, Roche, Chumlea, Gardner, & Siervogel, 1994) for BMI where BMI is plotted on growth charts and the upper 5th percentile equates to “obese”, the 85th through 95th percentile equates to “overweight”, and the 5th through the 85th percentile equates to “healthy weight”. In the final sample, 11 boys met the “at-risk” criteria and 13 of girls met this classification resulting in 72% of the final sample classified as “at-risk”. Five males and four females were classified as having a “healthy weight” according to their BMI data. One team dropped out and three teams were unable to complete data collection due to scheduling conflicts. Complete data were obtained on 28 youth (13 males, 15 females). In order to be eligible for prizes upon program completion, all teams were required to attend the kick-off and wrap-up event and miss no more than two weekly sessions.

Procedures
Children’s pre-program BMI, self-esteem, perceived stress, and enjoyment for physical activity were measured during a kick-off event for the program.
Program mentors established assessment stations for youth participants in separate, adjacent rooms for the physical and psychological measures. Psychological measures were read to program participants to facilitate their comprehension. Post-program measures were also collected in the same manner.

**Measures**

**Body Mass Index.** Children were assessed for height and weight at both the kick-off event and the wrap-up event in order to calculate BMI. Body mass index is a simple measure of overweight and has been identified by a number of researchers as an appropriate tool for identifying overweight in children and offering the opportunity to predict overweight and health risks in adulthood (Guo et al. 1994; Must, Jaques, Dallal, Bajema, & Dietz, 1992).

**Rosenberg Self-Esteem Scale** (*RSES*; Rosenberg, 1965). The RSES was developed as a unidimensional self-report measure of feelings of global self-esteem in youth and adolescents. The RSES consists of 10 items – 5 positive statements and 5 negative statements about the self. Examples include “On the whole, I am satisfied with myself,” and “At times I feel that I am no good at all.”. A four-point response format was used: strongly agree, agree, disagree, strongly disagree. Scores for each item are summed, giving a total score range from 10 to 40, with higher scores indicating higher self-esteem. Reasonable internal consistency has been reported, with Cronbach’s alphas of between .72 and .88 (Byrne, 1996), and evidence of the construct / predictive validity has been provided relating poor self-esteem to anxiety, depression, and loneliness (Rosenberg, 1965). The satisfactory convergent and discriminant validity of the RSES has also been well dokumented (Blascovich & Tomaka, 1991).

**Perceived Stress Scale** (*PSS*; Cohen, Kamarck, & Mermelstein, 1983). The PSS assesses perceived stress on a global level over the past month. Examples include, “In the last month, how often have you been upset because of something that happened unexpectedly?” and “In the last month, how often have you felt you were unable to control the important things in your life?” with responses ranging from “never” to “often”. The PSS is scored by summing items (scaled from 0-4), with seven items reverse scored. PSS scores range from 0-56, with higher numbers indicating higher perceived stress. The scale has been demonstrated valid and reliable (Cohen, Kamarck, & Mermelstein, 1983).

**Physical Activity Enjoyment Scale** (*PACES*; Kendzierski & DeCarlo, 1991). The PACES includes 18 items scored on a 7-point bipolar scale and gauges the extent to which a person enjoys doing any physical activity. Sample items include “I feel bored / I feel excited” and “I feel good physically while doing / I feel bad physically while doing it”. Scores can range from 18 to 126 and higher scores are representative of individuals who perceive physical activity with greater enjoyment. Evidence of factorial validity and convergent evidence for construct validity indicates that the PACES is a valid measure of physical activity enjoyment among adolescents (Motl et al., 2001).

**Positive Affect Negative Affect Schedule-Children** (*PANAS-C*; Crook, Beaver, & Bell, 1998). In order to determine if weekly physical activity sessions improved children’s affect, the PANAS-C was administered to
children before and after each 60-minute physical activity session. The PANAS-C is a brief, 20-item self-report, revised from the original PANAS (Watson, Clark, & Tellegen, 1988) that is appropriate for use in grade-school age children and contains a list of 10 positive adjectives and 10 negative adjectives describing various positive mood states. Sample positive mood adjectives include interested, excited, and eager. Sample negative mood adjectives include irritable, nervous, and afraid. Each adjective is scored on a five-point scale (ranging from not at all to extremely), and reflects the degree to which the child is experiencing various moods at a given moment. Test-retest reliability of the PANAS-C has been found to range from .658 to .821 and internal consistency to be strong with alpha coefficients from .855 to .916 (Crook, Beaver, & Bell, 1998).

Data Analysis

Paired sample *t*-tests were conducted to assess program impact on youth participants’ BMI and psychological measures (self-esteem, perceived stress, enjoyment for physical activity). In addition, two separate repeated measures ANOVAs were conducted to determine whether children’s pre-post activity positive and negative affect were different from weekly physical activity participation within the program. Analyses were performed with the Statistical Software Package for the Social Sciences (SPSS) and alpha level of significance was set at *p* < .05.

Table 1
G.A.M.E. On Griffs! Curriculum Overview

<table>
<thead>
<tr>
<th>KICK-OFF EVENT</th>
<th>PHYSICAL ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Welcome and Overview of GAME ON GRIFFS</td>
<td>• Campus scavenger hunt using pedometers.</td>
</tr>
<tr>
<td>- Breakfast / Teambuilding activity (M) (Get to know the student-mentors)</td>
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<tr>
<td>- Motivational Speaker</td>
<td></td>
</tr>
<tr>
<td>- What is Physical Activity? (Discuss and hand out pedometers) ... Group led physical activity could be with pedometers</td>
<td></td>
</tr>
<tr>
<td>- Introduce (1) The Physical Activity Pyramid (2) The Food Guide Pyramid</td>
<td></td>
</tr>
<tr>
<td>- Introduce “5-a-day the Color way”</td>
<td></td>
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<tr>
<td>- Affective Pre-program assessments (Children with mentors)</td>
<td></td>
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<tr>
<td>- Dietitain-led discussion with parents on healthy eating.</td>
<td></td>
</tr>
<tr>
<td>- Journaling explanation</td>
<td></td>
</tr>
<tr>
<td>- Body Mass Index Chart for Boys/Girls</td>
<td></td>
</tr>
<tr>
<td>- Introduce goal sheet for the kids</td>
<td></td>
</tr>
<tr>
<td>- Take-home activity: Wear your pedometer for 30 minutes and measure number of steps in 30 minutes (kids and parents). *</td>
<td></td>
</tr>
</tbody>
</table>
### Week 1 –
- Review Take-Home Activity
- Behavior modification activity – designate a target health behavior (either negative one they’d like to decrease or positive one they’d like to increase)
- Food Record Sheet
- Review pedometer use.
- 5-A-DAY the Color Way: BLUE / PURPLE!!

### Week 2 –
- What is Aerobic Exercise? (Introduce THR Concept)
- The personalized meal plan & the “Energy Balance Equation”
- The FOOD GUIDE PYRAMID revisited – Healthy Choices in each food group – Target analogy / activity.
  - "Go, Slow, and Whoa Foods"
- 5-A-DAY the Color Way: GREEN!! Eating hints activity

### Week 3 –
- What is Strength Training?
- Serving Size Info / Activity … Making sense of Serving Sizes (Discussion led by RD)
- 5-A-DAY the Color Way: WHITE!!

### Week 4 –
- Healthy/Fun Family Recipes
- Talk @ fun ways that kids/parents spend time together, that are physically active.
- Spot the Block! Reading Food Labels (Teams bring in 1 healthy, 1 unhealthy food label for a prize next week).
- 5-A-DAY the Color Way: YELLOW/ORANGE!!

### Week 5 –
- Review Spot the Block Activity – Healthy/Unhealthy food labels
- Fluids: The good, the bad, and the ugly (M)
- Building Self-Esteem activity
- Healthy Calcium
- 5-A-DAY the Color Way: RED!!

### Week 6 –
- Healthy Snacks kids can prepare
- Ways to make Snacks healthy
- Heart Healthy Foods !!!
- The dangers of too much “screen time”.

### Physical Activity
- **Week 1**
  - Sand Volleyball
  - Interactive video games
    - DDR
    - Game Bikes
    - Wii
  - Tennis activities.
- **Week 2**
  - Outdoor scavenger hunt
  - Pickleball
  - Interactive Video Games
  - Speedminton
  - Interactive video games
- **Week 3**
  - Prisonball
  - Repelling
  - Tug-o-war
  - Interactive video games
- **Week 4**
  - Ultimate Frisbee
  - Indoor soccer
  - Interactive video games
- **Week 5**
  - Swimming
  - Frisbee Golf
  - Nia
  - Interactive Video games
- **Week 6**
  - Wallyball
  - Scoopball
  - Invasion games
  - Interactive Video games
## Results

### Pre- and Post-Program Outcomes Comparison

Means and standard deviations for youths’ pre- and post-program physiological measures ($N=28$, Overall $M$ age=9.48 years, $SD=1.38$; Males ($n=13$), $M$ age=9.85, $SD=1.28$; Females ($n=15$), $M$ age=9.13, $SD=1.35$) are displayed in Table 2. Paired $t$-test results on pre- and post-program physiological outcomes revealed no differences on BMI ($t(27)=.643$, $p=.526$). Repeated measures ANOVA results for pre- to post-session differences in affect were nonsignificant for both positive affect ($p=.771$) and negative affect ($p=.852$). In addition, no pre-post program differences in physical activity enjoyment were observed ($t(27)=-1.04$, $p=.308$). However, significant pre-
post program differences were found for children’s general self-esteem ($t(27) = -2.77, p < .05$), with greater general self-esteem at the end of the program ($M=20.87, SD=2.97$) compared to the beginning of the program ($M=18.83, SD=3.66$). In addition, there was also a significant pre-post program difference observed in youth participants’ perceived stress ($t(27) = 3.16, p < .05$), indicating significantly less perceived stress at the end of the program ($M=15.82, SD=6.65$) compared to the end of the program ($M=21.46, SD=7.40$).

**Adult Participant Feedback**

During the wrap-up event, program feedback was obtained from adult participants. Results of this response indicated a mean overall rating of 9.56 (out of 10). When asked to rate mentors’ effectiveness in helping participant teams meet program goals, the mean overall mentor rating was 9.37 (out of 10). Finally, program feedback was also obtained through qualitative comments from adult participants and is contained in Table 3.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Pre-Post Physiological Outcome Variables by Gender (Means and Standard Deviations)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Program</td>
</tr>
<tr>
<td></td>
<td>Males a</td>
</tr>
<tr>
<td>Height (in)</td>
<td>54.98 (3.63)</td>
</tr>
<tr>
<td>Weight (lb)</td>
<td>99.58 (39.10)</td>
</tr>
<tr>
<td>BMI</td>
<td>19.80 (8.39)</td>
</tr>
</tbody>
</table>

a $n=13$, b $n=15$

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Adult Participant Feedback from G.A.M.E. On Griffs!</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The aspect that I enjoyed most was being with Ashley (daughter) while she learned to be healthier. It was better that she heard from others and not me all the time. She actually joined the basketball team as a result and is doing well.</td>
<td></td>
</tr>
<tr>
<td>• I enjoyed the activities. Everything was great. Both of the mentors were very supportive and my daughters looked up to them which I felt was very important in motivating the girls.</td>
<td></td>
</tr>
<tr>
<td>• As a result of the program, we make sure we do some type of physical activity. We are doing better eating healthy. We still eat our junk food, but not as much. We eat better proportions and better foods.</td>
<td></td>
</tr>
<tr>
<td>• As a result of this program, the snacks that my son has and the activities that we engage in together have changed.</td>
<td></td>
</tr>
<tr>
<td>• Ashley (mentor) was awesome! We have even involved her in our life outside of GAME On Griffs!</td>
<td></td>
</tr>
</tbody>
</table>
• Samantha and I loved the Dance Dance Revolution. The activities were a great way to introduce exercise activities – kind of like try it before you buy it.
• Our mentor was a very good mentor. She showed a lot of concern and was very involved with my child. She e-mailed and called my son. When we were doing activities, if Matthew didn’t know how to do an activity, she worked with him until he got it. Beth (mentor) was great!
• I enjoyed everything about this program: spectacular! It was well planned and executed. This program is very good for both parents and kids.
• Tammy (mentor) was very informative, fun, and helpful. My daughter and I had fun with her. We’ll miss you.
• We liked playing new games and meeting new people. The pedometer was especially fun to track our movement.
• This program helped me to quit smoking!
• As a result of this program, he (son) doesn’t argue about needing to get up and get moving vs. spending all his free time in front of the computer.

Discussion

Our main purpose was to determine whether a 12-week community-based youth wellness program which emphasized a mentor-led curriculum and family involvement influenced selected physical and psychological outcomes in youth participants. While not impacting physical health outcomes, the program provided encouraging results related to improvements in self-esteem and perceived stress which may be attributable to certain program components. For example, the program format provided a template for youth to “experiment” with physical activity and healthier eating habits within a positive, supportive and “safe” environment while supported by mentors and family members. School-based mentoring research indicates programs offering safe environments, empowering activities, and guidelines for appropriate behaviors enhance self-esteem (Rhodes & DuBois, 1992) Social support and mentoring networks have been further shown to buffer the effects of stress on one’s health (Brooks, 1992). Concurrent increases in self-esteem and decreases in perceived stress appear to support these findings.

Several limitations regarding lack of physiological outcomes need to be noted. First, a once-a-week, 12-session program may be insufficient to promote meaningful BMI changes. Secondly, because the program was voluntary, a decision was made to minimize invasiveness of physiological measures. We acknowledge that more rigorous measures of overweight and obesity risk (e.g. pre- and post-program blood cholesterol, fasting blood glucose) and objective physical activity measures may have enhanced the ability to detect changes in physical health outcomes. Finally, the nonsignificant pre-post program comparison on physical activity enjoyment was surprising given one program objective was to enhance youths’ attitudes toward physical activity. However, the sample mean for the pre-program PACES was 107.15 (SD=13.36) (scale range of 18-126). Therefore lack of observed differences may have occurred due to a ceiling effect resulting from
self-selection of participants who already had high enjoyment of physical activity in a voluntary program.

Future research should scrutinize the role mentors play in community wellness programs. In particular, peer-based mentoring may develop physical activity efficacy as well as enhance social norms for engaging in positive health behaviors. Overall perceptions of peer support for physical activity, including encouragement, talking about activity, and being active together, have been shown to predict physical activity behavior (Beets, Vogel, Forlaw, Pitetti, & Cardinal, 2006; Duncan, Duncan, & Strkyer, 2005; Trost et al., 2003). Future work should include assessment of youths’ perceptions of peer norms and social support to determine whether these factors are predictive of youth physical activity patterns and attitudes.

Finally, further examination on more active parent roles needs to be done. Adult family members are influential figures capable of promoting behavior change and previous community intervention studies have indicated the need for more direct, active parent roles (Gorczynski, Morrow, & Irwin, 2008; Nader et al., 1989). As such, prolonged interaction between mentors and youth participants in wellness interventions, combined with positive parental involvement, may be more likely to enhance children’s perceived behavioral control, provide healthier norms, and improve attitudes toward making healthier behavioral choices. Current results suggest that mentor-based interventions for physical activity and healthy nutrition promotion hold promise, in that self-esteem was enhanced and perceived stress was lessened.

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References


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Refereed Paper

Team Building Activities in Physical Education and Increased Pro-Social Behaviors in High School Females

Rachael Schmidt and Carla Smith

The purpose of this study was to investigate the effect of team building activities (TBA) on pro-social behaviors in physical education and overall student satisfaction of high school girls’ physical education. A convenience sample of 60 girls in three secondary physical education classes participated. Participants completed daily TBA as part of class warm-up during a two week implementation phase. Frequency of occurrence of pro-social behaviors was recorded before and after implementation of team building unit. Students completed satisfaction and perceptions surveys before and after the study. After two weeks of TBA, there was a significant increase in occurrence of pro-social behaviors in all three classes.

Physical education is a setting in which valuable social skills can be practiced and learned. To enhance the curriculum and focus on novel content teachers may consider using team building activities (TBA) within other activity units. Team building challenges are activities in which people learn that success comes through working together. TBA can provide the context in which cooperation, compassion, and positive communication are critical for group success. TBA can promote effective team functioning, build trust and communication among team members, and inspire feelings of self empowerment and group involvement (Nilson, 1993).

Over the years the field of physical education has dealt with a variety of criticisms. One of those criticisms has been a middle school and high school physical education curriculum focused on team sport. In the team sports competitive model students may not feel successful, and too much competition can hinder an educator’s attempt to produce character qualities such as a high self-concept, leadership, and responsibility (Courturier, Chepko, & Couglin, 2005). Reducing the time devoted to team competition and replacing it with TBA can lead to a healthier type of interaction in challenging situations, as
well as enhance sportsmanship and group spirit (Cherubini, 2009). Team building has been used to enhance group interactions in a variety of settings, from summer camps to corporations. Familiar TBA include tug of war and trust fall, but an abundance of other activities are widely available (Rohnke, 1989).

Team building and group cohesion have most often been studied in an athletics context. Voight and Callahan (2001) studied two university teams in their attempt to implement a team building intervention program into the soccer season. The addition of TBA produced positive results in the area of leadership and unity among team members. Steps in the team building intervention included: meetings where the team building program was discussed; development of short and long term goals; and conflict management. Not only did players report that the program enhanced their individual performance, but also significantly helped the team’s performance. Team unity, team communication, team problem solving, and motivation were cited as benefits of the team building program. Coaches also acknowledged the positive influence team building had on their coaching and relationships with players (Voight & Callaghan, 2001).

TBA have the potential to enhance a positive atmosphere. Bloom, Loughead, and Newin (2008) found that team building in a youth sport setting affected both athletes and coaches in positive ways. Age appropriate TBA designed to encourage athletes to work together, listen to one another, share ideas, and solve challenges were used within a typical practice. Coaches reported feeling more comfortable communicating with players and giving appropriate feedback. In addition, the TBA increased leadership characteristics among group members, improved player recognition of responsibilities, and created a more positive team/group-oriented atmosphere.

In addition to creating a more positive atmosphere and unifying group members, team building can also improve exercise adherence by improving group dynamics. Group cohesion is the strength of the bond among the members within a group. Group cohesion is dependent upon interpersonal attraction, individual attractions to the group, and commitment to the group (Carron & Hausenblas, 1998). Spink and Carron (1993) found that group dynamics improved with female exercise participants after a team building program. The study found that classes incorporating team building had fewer dropouts and less lateness than classes without the team building program. As a result, adherence to the exercise program did increase. Participants in classes with the team building program also perceived the activities as more enjoyable (Spink & Carron, 1993). Improving group cohesion and sense of belonging in a physical education setting could increase activity levels by utilizing TBA or exercises.

A majority of children cite a lack of confidence as a reason for avoiding participation in physical education (Cherubini, 2009). Socha, Potter, and Downey (2003) found that the use of team building activities in physical education classes increased students’ self-concept. Children exposed to
activities related to team building in their first two weeks of classes reported enjoyment of the TBA, recognized improvements in peer-relationships, and improved social self-confidence (Socha, Potter, & Downey, 2003).

Pro-social behaviors are actions that promote communication, cooperation, and demonstrate concern for the feelings or welfare of others (Sansock, 2007). Creating an environment in physical education that promotes acting in ways that benefit others is a desirable goal for educators. The purpose of this study is to determine the effect of TBA on high school girls’ pro-social behaviors and satisfaction with physical education class.

**Method**

Participants included 60 female high school students from three single gender physical education classes at a suburban high school in the Midwest. A physical education course was a graduation requirement at the school in which the research was conducted. However, some students had chosen the class as an elective. A convenience sample of three intact classes was used. All participants were assigned to single gender physical education class for the school semester, as per school scheduling. Class sizes ranged from 14 participants during the first hour class, 24 participants in the second hour class, and 22 participants in the sixth hour class. Ages of participants ranged from 14 to 18 years.

Consent and assent forms were completed prior to implementation according to the supervising university’s Institutional Review Board. Each participant was required to participate in the team building activity at the beginning of each class. All physical education classes met five days a week. TBA were presented over a ten day period. First week activities were: train wreck, human knot, all aboard, pull-up, and elbow tag; second week activities included: chain tag, frenzy, mine field, Popsicle push-up, and train wreck (Midura & Glover, 2005; Rhonke, 1989). Each team building activity was discussed in full detail and instruction for the activity was given prior to participation each day. Team building activity times were between five and fifteen minutes. Following the team building activity warm-up participants completed physical education class as usual.

Participants were assessed for pro-social behavior using a teacher/researcher developed behavioral checklist for four class periods prior to implementation of the TBA. This checklist contained categories for behaviors such as cooperation (willingness to work with others), respect (showing consideration for classmates or teammates; refraining from interfering or causing problems), positive verbal (any type of positive communication), positive physical (positive student actions including helping another student up, putting away equipment, demonstrating a skill to a peer, leadership, and honesty). Two copies of this checklist were completed each day. A checklist of auditory behaviors was completed by the researcher/teacher, and a
checklist of visually observable behaviors was completed simultaneously by a trained assistant, who was also a certified teacher, and assisted in the development of the checklist. The checklist completed by the researcher recorded verbal or auditory student comments related to positive social behaviors including leadership, honesty, respect, positive verbal comments, and cooperation. Due to the fact that the assistant observer could not hear all the interactions, this checklist focused only on physical behaviors that could be visually observed, but auditory cues were not possible due to the distance across the gymnasium from the actual interaction. The teacher/researcher and co-teacher/assistant discussed each category of behaviors to obtain simple face validity; no data was collected on actual interobserver reliability for the instrument. Categories were tallied during class interaction. The total number of positive behaviors was based on the combined auditory and visual behavioral checklists completed in each class.

Participants were also asked to complete a survey before the TBA began and after the team building unit. The instrument was based on a public access survey used by the New Zealand National Education Monitoring Project. The survey contained three sections: general attitude toward physical education; preferred teaching strategy; and preferred grouping strategy. The first section of the survey used a five point scale with choices ranging from “strongly agree” to “strongly disagree.” The survey rated how students felt before and after the team building unit in categories such as: whether students wanted more physical education classes or less in the school week (More PE/Less PE); how student’s felt about their abilities in physical education class (Good at PE/Bad at PE); student perceptions of how peers and friends viewed their skill level (Friends Good PE/Friends Bad PE); whether or not the students felt comfortable trying things in physical education class that they have not tried before (Not Tried Would PE/Wouldn’t); enjoyed participating in physical activity in their own time or outside of school (Own Time Would PE/Own Time Wouldn’t PE); whether or not students liked physical education class in school or not (School PE like/School PE not like); and whether or not students desired to be active later in life (Active Would/Active Wouldn’t).

Preference of instructional methods was collected by providing a list of nine typical strategies seen in Physical Education. Students were given the list of cooperative, lecture, team building exercises/activities, stations, worksheets, drills/repetition, demonstration, competition games/activities, or skill development. Participants were asked to mark the three favorite teaching strategies. The survey also asked participants to choose the preferred way to learn in groups: by myself, within groups, or only with my friends.

Data was analyzed using SPSS 15.0 to complete a dependent t-test to determine if significant differences in the observable pro-social behaviors took place from pre TBA to post TBA. Alpha level was set at .10 due to small sample size and the use of field type behavioral research techniques. Microsoft Excel was used to calculate percentages for the survey data.
Results

All participants were engaged in physical education lessons in accordance with general class participation school rules for the teacher/researcher data collection of observable pro-social behaviors. A total of 60 participants completed the pre and post surveys of attitudes and preferences in physical education. Results indicate that there was a significant difference in two pro-social behaviors following the implementation of the TBA. Changes include observations of positive physical behaviors $t(60) = -2.96, p < .10$, and respect $t(60) = -4.96, p < .10$ (see Table 1). Although not significant, means increased on all pro-social behaviors except honesty (see Table 2).

### Table 1
Pro-Social Behaviors: Positive Physical and Respect

<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD</th>
<th>$t$</th>
<th>$p$</th>
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<tbody>
<tr>
<td>Positive Physical</td>
<td>2.25 ± 2.63</td>
<td>-2.960</td>
<td>.013</td>
</tr>
<tr>
<td>Respect</td>
<td>-1.41 ± 0.99</td>
<td>-4.962</td>
<td>.000</td>
</tr>
</tbody>
</table>

*Note. N=60*

### Table 2
Means of Pro-Social Behaviors Before and After Team Building Activities

<table>
<thead>
<tr>
<th></th>
<th>Positive Physical</th>
<th>Cooperation</th>
<th>Leadership</th>
<th>Honesty</th>
<th>Respect</th>
<th>Positive Verbal</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE-TBA</td>
<td>2.25</td>
<td>4.33</td>
<td>1.25</td>
<td>1.75</td>
<td>1.17</td>
<td>2.92</td>
</tr>
<tr>
<td>POST-TBA</td>
<td>4.5</td>
<td>4.42</td>
<td>1.5</td>
<td>1.3</td>
<td>2.58</td>
<td>4.08</td>
</tr>
</tbody>
</table>

*Note. N=60*
Results from satisfaction surveys show changes took place from before to after implementation of the team building unit. Primarily, there was a 5.0% increase in students who wanted more physical education each week. Additionally, there was a 10.0% increase in students who thought they were good at physical education. Students who believed their friends thought of them as being good at physical education increased from 27.0% to 41.7%. There was a 3.3% increase in students who would be willing to try new activities they had never tried. Another difference that took place was a 10.0% increase of students who liked having physical education class at school, and a corresponding decrease of 11.7% of students who did not like physical education class (see Table 3).

### Table 3
Percentage of Student Perceptions Before and After Team Building Activities

<table>
<thead>
<tr>
<th></th>
<th>BEFORE TBA</th>
<th>AFTER TBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>More PE in School</td>
<td>15.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Less PE in School</td>
<td>31.6%</td>
<td>31.6%</td>
</tr>
<tr>
<td>I’m Good at PE</td>
<td>48.3%</td>
<td>58.3%</td>
</tr>
<tr>
<td>I’m Bad at PE</td>
<td>20.0%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Friends Good PE</td>
<td>27.0%</td>
<td>41.7%</td>
</tr>
<tr>
<td>Friends Bad PE</td>
<td>13.3%</td>
<td>15.0%</td>
</tr>
<tr>
<td>Not Tried Would PE</td>
<td>55.0%</td>
<td>58.3%</td>
</tr>
<tr>
<td>Not Tried Wouldn’t PE</td>
<td>16.6%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Own Time Would PE</td>
<td>51.6%</td>
<td>48.3%</td>
</tr>
<tr>
<td>Own Time Wouldn’t PE</td>
<td>25.0%</td>
<td>26.6%</td>
</tr>
<tr>
<td>School PE Like</td>
<td>31.6%</td>
<td>41.6%</td>
</tr>
<tr>
<td>School PE Not Like</td>
<td>38.3%</td>
<td>26.6%</td>
</tr>
<tr>
<td>Active Would</td>
<td>88.3%</td>
<td>78.3%</td>
</tr>
<tr>
<td>Active Wouldn’t</td>
<td>0.03%</td>
<td>01.0%</td>
</tr>
</tbody>
</table>

*Note. N=60*

Results from survey information on student learning preference indicated a more positive view of team building as a result of the implementation of activities specifically designed to improve team interaction. Only 48.3% of students chose team building as one of their preferred learning strategies.
prior to the use of team building unit. However, this figure increased to 81.7% after the team building unit. The percentage of students who preferred to work in groups increased from 65.0% to 76.7%. Students who would prefer to have daily physical education increased 10.0% following the TBA unit (see Table 4).

<table>
<thead>
<tr>
<th>BEFORE TBA</th>
<th>AFTER TBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperative</td>
<td>66.6%</td>
</tr>
<tr>
<td></td>
<td>60.0%</td>
</tr>
<tr>
<td>Lecture</td>
<td>08.3%</td>
</tr>
<tr>
<td></td>
<td>11.6%</td>
</tr>
<tr>
<td>Team Building</td>
<td>48.3%</td>
</tr>
<tr>
<td></td>
<td>81.7%</td>
</tr>
<tr>
<td>Stations</td>
<td>18.3%</td>
</tr>
<tr>
<td></td>
<td>11.7%</td>
</tr>
<tr>
<td>Worksheets</td>
<td>06.6%</td>
</tr>
<tr>
<td></td>
<td>01.6%</td>
</tr>
<tr>
<td>Drills</td>
<td>18.3%</td>
</tr>
<tr>
<td></td>
<td>26.7%</td>
</tr>
<tr>
<td>Demonstrations</td>
<td>36.7%</td>
</tr>
<tr>
<td></td>
<td>23.3%</td>
</tr>
<tr>
<td>Competition</td>
<td>60.0%</td>
</tr>
<tr>
<td></td>
<td>53.3%</td>
</tr>
<tr>
<td>Skill Development</td>
<td>36.6%</td>
</tr>
<tr>
<td></td>
<td>25.0%</td>
</tr>
<tr>
<td>By myself</td>
<td>05.0%</td>
</tr>
<tr>
<td></td>
<td>00.0%</td>
</tr>
<tr>
<td>With partner</td>
<td>30.0%</td>
</tr>
<tr>
<td></td>
<td>23.3%</td>
</tr>
<tr>
<td>In groups</td>
<td>65.0%</td>
</tr>
<tr>
<td></td>
<td>76.7%</td>
</tr>
<tr>
<td>5 Days PE</td>
<td>48.3%</td>
</tr>
<tr>
<td></td>
<td>58.3%</td>
</tr>
<tr>
<td>4 Days PE</td>
<td>10.0%</td>
</tr>
<tr>
<td></td>
<td>10.0%</td>
</tr>
<tr>
<td>3 Days PE</td>
<td>20.0%</td>
</tr>
<tr>
<td></td>
<td>15.0%</td>
</tr>
<tr>
<td>2 Days PE</td>
<td>00.0%</td>
</tr>
<tr>
<td></td>
<td>06.6%</td>
</tr>
<tr>
<td>1 Day PE</td>
<td>05.0%</td>
</tr>
<tr>
<td></td>
<td>01.0%</td>
</tr>
<tr>
<td>0 Days PE</td>
<td>16.6%</td>
</tr>
<tr>
<td></td>
<td>08.3%</td>
</tr>
</tbody>
</table>

*Note.* N=60
Discussion

TBA utilize strategies that require all students in the group to be interdependent and interacting positively in order to be successful at a task. Implementing team building activities in physical education led to more positive social interactions within the physical education. The most important outcome of this study was evidence that team building activity increased the occurrence of pro-social behaviors of female high school physical education students. Two of the pro-social behaviors, respect and positive physical behaviors toward classmates, increased after implementation of the team building unit which indicates that participation in these activities can create an environment that supports and encourages positive social behaviors.

The team building unit had many positive outcomes. Students’ self-perception of being good in physical education, and being positively evaluated by peers improved. This might affect the overall improvement of students liking physical education and wanting to be in physical education more often.

Using TBA or team building as an instructional strategy could have a significant effect on girls’ participation rates, which are shown to decline during adolescence (Kimm, et. al., 2002). Following the team building unit, students in this study were more willing to try a new activity they had never before attempted. This could be due to the fact that the TBA created a more psychologically safe learning environment, one in which students trusted their classmates to not ridicule in the case of failure or embarrassment. For female adolescents in a physical activity setting, the reduced social anxiety of physical evaluation could be enough to remain engaged in activity at much higher rates than might be common in learning environments where students perceive high levels of competition or peer evaluation.

Although there appears to be a dramatic increase in students who prefer TBA as an instructional strategy, it is possible that following the daily discussions and activities, students simply had a better cognitive understanding of what classified a strategy as “team building.” This might also account for the seemingly opposite effect the team building unit had on the concept of “cooperative” as a strategy. Students may not have had a clear understanding of what “cooperative” or “team building” actually meant. What they had previously perceived as “cooperative” may have shifted to being labeled “team building.” Regardless of semantics, students clearly developed a preference for activities that included the components commonly used in TBA, particularly, the need for the group to work together to reach success on a common goal.

Although data were not analyzed for between-class results, the researcher/teacher and the co-teacher/assistant observed a noticeable change in attitude and behavior in the first hour class. Prior to implementation, students in the first hour class rarely communicated with each other, were unfriendly, and did not exert much effort into any physical activity. The increase in pro-social
behaviors was most obvious in this class, perhaps due to its smaller size. TBA may produce more obvious results in smaller groups, where student interaction is more personal and students interact with the same people more often. The issue of trust may be more easily developed in smaller groups, which seems logical when considering its historic use as a strategy to build group cohesion within small groups or squads.

Educators who seek to increase participation rates of girls, or prefer to place less emphasis on competition and more on cooperation may use this learning strategy to improve engagement in all areas of physical education content. TBA are exciting, novel and challenging. Physical educators should consider implementing TBA to improve positive social behaviors in physical education.

References


Physical Education: Teaching More Than Just Sports

Ashley Bunch and Lauryn Berger

What is physical education? The dictionary defines physical education as “education in the care and development of the human body, stressing athletics and including hygiene.” If you were an outsider looking in on a physical education class you would believe this is all that is taught; but there is so much more to it than that. Physical education not only consists of lessons in sports and health, but most importantly lessons in life. Physical educators teach their students how to learn from failure, about team work and sportsmanship, accepting and being open to new opportunities, importance of a good work ethic, and how to build confidence and self-esteem.

Learning from Failure

Babe Ruth once said, “Never let the fear of striking out keep you from playing the game.” Not only does this saying relate to sports, but it is also an important life lesson. In a physical education class there are going to be those students who feel they must always succeed and be the best at every activity that is taught. As physical educators it is our job to teach students that in life they are not always going to be successful, they will face their own failures. Students need to understand that being able to learn from their failures is more important than being concerned with failing.

Students in a physical education class tend to be afraid of activities they are not successful doing. They often give up, or act out during the difficult activity. These students may claim “I just can’t do it”, and “can’t” is a word physical educators should take out of the vocabulary. Students need to realize that the spot light is not always on them; other classmates may not even realize that they are struggling because they are more focused on themselves. When these students act out they are only drawing attention to themselves, so that their classmates do realize that they are struggling.

As physical educators it is our job to teach students the importance of accepting the fact that nobody is perfect. In order to do this we need to encourage students, who may be struggling, to keep trying. Also we can be role models by showing our students that we are not always perfect, and are not masters of every skill. Teaching students that even we accept failure, and take it as a learning experience can be a way to convince students that this is true.

Be Open to New Opportunities

A comfort zone is often a place where a student lives, and feels they never
want to leave. In order for our students to succeed in life they are going to have to face situations in which they may not feel comfortable. As educators it is our job to help students get out of their comfort zones, and feel ready to face new opportunities. The best place to teach this is in a physical education class.

One of the best units in a physical education class which truly takes students out of their comfort zone is dance. Most students would rather lose their participation points than dance in front of their peers. Dance involves coordination that some students may not display, and often requires nearness to the opposite sex that frightens many students. Yet a dance unit can be a great way to have students step out of their comfort zones and try something new.

Teaching students to get out of their comfort zones and try new things will help them in the future, and teach them to be open to new opportunities that may come their way.

**Teamwork and Sportsmanship**

Vince Lombardi once stated, “Individual commitment to a group effort—that is what makes a team work, a company work, a society work, a civilization work.” Teamwork is one of the most valuable attributes a student can obtain. As a physical educator we have the perfect opportunity to instill this concept in our students. Emphasizing the importance of teamwork can help prepare our students for careers, relationships, and life in general. Just like in sports, no matter where life takes you there will always be times where you will have to work with others to achieve a common goal. If we can successfully teach our students this concept we can help change our society, and produce more productive citizens.

Sportsmanship and teamwork go hand in hand. In sports it is important for participants to learn how to respect their own talents, their teammates, and the game. Just like in sports, students not only need to learn how to work well with others, they also need to learn how to respect themselves, each other, and the cause. In order to teach sportsmanship to students, a physical educator needs to implement expectations when the students compete against each other. Not allowing “smack talk”, or put downs and having the students encourage each other during activities can help enforce good sportsmanship. Bad sportsmanship should be highly discouraged, and have consequences when it does occur. For students it is easier to respect one another and demonstrate good sportsmanship when they feel like they are one the same level. A physical education class should feel somewhat like a family. Everyone has their own strengths and weaknesses and the class is able to work together cooperatively. The real world is a competitive place, and students need to be prepared to deal with this in a positive way. We have to teach our students that if in life things don’t go our way we cannot give up, or throw a fit. Students have to learn to work through it and embrace the challenge.
Work Ethic

There are many students in this generation who feel like they can just walk through life and have everything handed to them. They will be extremely surprised when they get out into the real world! In life you face many struggles and challenges. As educators, are we teaching our students to take the easy path, or are we teaching them that if they work hard in achieving something the possibilities are endless?

High school students, at times, appear to lack motivation to participate in physical education class. As educators it is our job to encourage and motivate students to participate, and to give full effort every day. Students are more likely to participate in an activity of interest to them. In order to encourage participation physical educators can use this to our advantage. At the beginning of a semester, or school year, ask the students what activities they enjoy, then incorporate them into the yearly curriculum. This will help keep the students motivated throughout the semester and increase student participation.

Once students are interested and participating, then we can teach our students the importance of a work ethic. Always encouraging students to try their best, even if they are not very good at the activity, can increase participation and effort. If we can teach students to have a good work ethic they will be prepared for any challenges they may face in their future endeavors.

Self-Esteem and Confidence

Physical educators can have a great influence on a students’ self-esteem and confidence. We must create an environment where the student feels comfortable and confident participating in all activities in the class. In order to accomplish this good sportsmanship and cooperative learning must take place. Physical education class can be a breeding ground for bullies. This kind of behavior needs to be recognized and eliminated. In order to do this, we must discourage hateful words, taunting, or criticism during activity.

We have to teach our students to have a good perception of themselves, and to have feelings of self confidence and self worth. In order to do this we must show that we as teachers have confidence in our students, and encourage and not criticize. Teaching about self image, diversity, and that everyone is a special and unique individual. It is important to teach students that what students see on television, or in the media is not something they have to live up to. Teaching students to have confidence in themselves will help them in their future, if a student lacks self confidence they can find it difficult to become successful. According to Mind Tools, “Self-confident people inspire confidence in others: their audience, their peers, their bosses, their customers, and their friends. And gaining the confidence of others is one of the key ways in which a self-confident person finds success” (“Building self confidence”, 2010).
Conclusion

As physical educators not only do we have the responsibility to teach the history, rules, and skills of different activities, but we also need to teach our students various life lessons. In a physical education class we can teach our students, how to learn from failure, be open to new opportunities, about teamwork and sportsmanship, how to have a good work ethic, and have high self-esteem and be confident. These are the most important lessons a physical educator can teach his or her students. Even if students never score a point, if they show some of these qualities then we have truly done our job.

References

Overload/Underload Training: A Look into Weighted Baseball Throwing

Tyrus Powe and Joe Deutsch

Overload/Underload (OU) training can be defined as one type of specific resistance training employed to increase an athlete’s power. Research involving overload training has been going on for decades. Underload training techniques became more widely known in the 1970’s due to the success of the Soviet Union and East-European track and field teams. A great deal of this research has been published in prestigious, peer-reviewed journals around the world. Shot-putters, javelin, discus and hammer throwers, and sprinters were the early adopters of this training method (Pavlovich, 2007).

There are many studies pertaining to some general type of OU training, and many of the findings from these studies have reported success (success usually referring to strength and/or power). Research specifically focusing on baseball players dates back to the 1960’s according to Pavlovich. The authors and studies that follow below are a miniature timeline of how research in weighted ball training has developed, and are specific examples of case studies that primarily concentrated on a type of OU training in baseball (Brose & Hanson, 1967; Litwhiler & Hamm, 1973; Bagonzi, 1978; DeRenne, Buxton, Hetzler, & Ho, 1994; and DeRenne, Ho, & Murphy, 2001).

In the studies cited above, subjects were either high school or collegiate players showing an increase in their throwing velocity using weighted baseballs. There were no reports of harmful effects such as joint soreness, torn ligaments or tendons, nor reports of problems with mechanics and control. The benefit to OU training is to increase strength-endurance in the arm structures used to throw a baseball, improve on-field performance, and enhance neuromuscular conditioning, although this is typically done when “out of season” as described by Pavlovich. The purpose of this study was to determine if a weighted baseball throwing program (OUT-Overload/Underload Training) would increase overall velocity, stamina/endurance, and accuracy once implemented at the beginning of the season.

Participants

Three pitchers (one starter, one relief, and one closer) from the Fargo-Moorhead RedHawks of the Northern League (Independent Affiliation) participated in this study. “Starter” for this study was defined as a pitcher who would be starting the game. “Relief” was defined as a pitcher who would enter the game in the middle to latter innings, taking the game over for the starter. “Closer” was defined as the pitcher who entered the game (regardless if he enters the game after the starter or relief pitcher) usually in 9th inning with their team leading, and his job was to get the last three outs of the game. The mean physical characteristics for the three pitchers were as...
follows: age 26.33 years old, height 74 inches, and weight 198.33 pounds. The throwing velocities and stamina (in averages) along with end-season results of the 6 week throwing program of the subjects are presented in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>Throwing Velocity (Avg. MPH) Beginning of season</th>
<th>Throwing Velocity (Ag. MPH) End of 6 Weeks</th>
<th>Stamina (Avg. Pitch Count) Beginning of Season</th>
<th>Stamina (Avg. Pitch Count) End of 6 Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitcher A (Starter)</td>
<td>81-83</td>
<td>84-86</td>
<td>80</td>
<td>110</td>
</tr>
<tr>
<td>Pitcher B (Relief)</td>
<td>86-88</td>
<td>92-96</td>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>Pitcher C (Closer)</td>
<td>81-83 sidearm 84-85 overtop</td>
<td>84-85 sidearm 88-90 overtop</td>
<td>30</td>
<td>50</td>
</tr>
</tbody>
</table>

Methods

Subjects who volunteered for this study and participated in the 6 week throwing program were all professional baseball players with at least 2 years of professional pitching experience. The Overload/Underload Training or OUT program was a modified interval throwing program that was used to increase overall velocity, stamina/endurance, accuracy, and potentially improve on the field performance, as most throwing programs are designed to do. Each subject was given an OUT program that included every aspect to the throwing program that they would undergo. In the program, there were specific, detailed instructions on when they would be throwing, how long they would throw, what distance they would throw, which weighted ball to throw, and how much rest time they were to take. The subjects were to begin the 6-week OUT program at the beginning of the season once their baseline throwing velocities and stamina/endurance (in pitch count) were collected.

Results

The players in this study were all similar in throwing velocity averages at season beginning, and in increased average pitch count by season end (Table 1). But one dramatic increase in throwing velocity by season end could have affected the statistical analysis of the predictive throwing velocities. Therefore, a subsequent analysis of on field performance was completed for each pitcher, and is represented in Table 2.
Table 2

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2-4</td>
<td>4.22</td>
<td>81.0</td>
<td>42</td>
<td>19</td>
<td>106</td>
<td>44</td>
<td>38</td>
<td>2</td>
<td>.315</td>
</tr>
<tr>
<td>B</td>
<td>3-1</td>
<td>3.94</td>
<td>48.0</td>
<td>48</td>
<td>25</td>
<td>44</td>
<td>24</td>
<td>21</td>
<td>7</td>
<td>.246</td>
</tr>
<tr>
<td>C</td>
<td>1-0</td>
<td>1.48</td>
<td>30.1</td>
<td>30</td>
<td>11</td>
<td>23</td>
<td>8</td>
<td>5</td>
<td>22</td>
<td>.213</td>
</tr>
</tbody>
</table>

In Table 1, Pitcher A increased his velocity after the 6 week throwing program by 3 mph and pitcher C increased his velocity by 1-2 mph throwing sidearm and 3-5 mph throwing over the top. These numbers are consistent with other 6 week throwing programs where average increased mph is 3-6 (Zawrotny, 2009). The fact that Pitcher B increased his velocity by 4-8 mph draws slight attention to the researcher that something could have gone wrong. Because all three pitchers increased their average pitch count by 30, and Pitcher B increased more than the others in mph, an on field analysis was also conducted.

Table 2 (above) showed on field performance in a statistical manner, and although on field performance can be seen as subjective, the bolded statistics represent a performance category that was seen as a success. Pitcher A, being a starter, threw 81.0 innings (more innings are typical for a starter). Pitcher B averaged a strike out/inning, and held opponents batting average to .246 while picking up 3 wins in a relief role. Pitcher C also averaged a strike out/inning, led the Northern League in saves with 22 (also setting the new career saves mark for the Northern League), and holding opponents batting average to a miniscule .213.

**Discussion**

A weighted ball throwing program can increase velocity, stamina, and potentially on field performance, which is in agreement with similar findings for weighted ball throwing programs (DeRenne et al., 2001). While other studies have reported more increased throwing velocities over a 12 week or 15 week period, and out of season (Gargone, 2006), this study is one of the few to assess the feasibility to implementing a weighted ball throwing program with similar results, but at the beginning of the season. The difference between previous findings and the current study might be partially explained by the length of a weighted ball throwing program, and when to implement it. Players should only use weighted balls three times a week, and should take at least one day of rest in between training sessions. Players should
progress through each weight in two or three week increments (Gargone, 2006). Gargone’s hypothesis contradicts the findings from this study, but it does better validate that a weighted ball throwing program could increase velocity, but how it is fully conducted can be individualized.

**Conclusion and Limitations**

With much research, including this study, results suggest that using an interval throwing program with weighted balls can improve arm strength, increase velocity, and increase stamina/endurance, and in some cases, even improve accuracy and on field performance. When implementing a weighted ball throwing program, most agree that proper techniques and mechanics are essential if the player intends on improving in these aspects, and to prevent injuries. The duration of the throwing program and how it is to be conducted is debatable, but proper use of a weighted ball throwing program can get positive results.

A possible limitation to this study is that the sample size was fairly small, and only looked at one starter, one reliever, and one closer. Another limitation is that a coach could not observe what the pitchers did off the field, and because there is no drug testing policy in the Northern League, it is possible that a pitcher could have taken steroids or some other type of performance enhancing drug before or during the 6-week program, which could also potentially increase velocity as well. Pitcher C participated in the 6-week program, and came away from it unscathed, but towards the end of the year he became injured. This could have come from usual wear and tear of the body from playing in a minor league season, or it could have been the end result from the weighted ball throwing program.

**Recommendations**

The research findings suggest that more research should be done in the field of weighted ball throwing programs and the long term effects of such a program. More research should be done looking at what age a player could start using a weighted ball throwing program, and length of program. Research is needed to better understand which time period is better for a throwing program, in-season or out of season. Along with that, future research is needed to investigate how many times or how often a player should participate in a weighted ball throwing program, once a year, twice a year if a player plays in the fall and in the summer, etc.

It is recommended that if coaches are to implement a weighted ball throwing program into their team or organization, coaches should either train or have a trained coach on staff to monitor their player’s mechanics/techniques and tendencies during the throwing program to watch for potential signs of injury or fatigue that could lead to injuries.

Furthermore, it is recommended that for professional pitchers, if they are to partake in a weighted ball throwing program, they see their doctor or physician to make sure they have the proper health and arm strength needed to participate. This researcher further recommends anyone looking for an edge over the competition, whether pitcher or position player, to partake in a
weighted ball throwing program because if done properly, it could only aid in becoming a better player. For professional pitchers looking for mega dollar contracts, increasing their fastballs by 4 miles per hour, using a weighted ball throwing program can be well worth the research.

Reference


Tyrus Powe, M.S., is a graduate of North Dakota State University and an assistant coach with an independent professional baseball team of the Northern League.

Joe Deutsch, Ph.D., is an Assistant Professor in the Department of Health, Nutrition, and Exercise Sciences at North Dakota State University.
Refereed Paper

A Critical Thinking-Based Approach to Teaching University Wellness Courses

William Russell, Betty Block, Justin Kraft, and Suzanne Kissock

This study compared a critical thinking-based pedagogical approach to a traditional lecture driven approach on critical thinking ability in university wellness courses. Participants (N=162) were undergraduates enrolled in introductory wellness courses. Experimental classes (3; N=69) limited instructor-driven lectures, and included in-class interactive group activities, analytical writing assignments, and reflective projects. Control classes (4; N=93) consisted solely of instructor-led lectures. Results indicated students in experimental conditions performed significantly better in all written critical thinking components and composite scores at the end of the course compared to students in control classes. College wellness courses teach wellness principles at a time when negative health habits are likely to develop. While these courses increase wellness knowledge, behavior change also requires critical thinking skills. Improved critical thinking may enhance success in navigating health decisions and current findings suggest educators should emphasize development of critical thinking skills in wellness courses.

Key Words: College teaching, curriculum, critical thinking, decision making

Life transitions can significantly affect human experience and ultimately how a person interacts in the world. Examples of developmental life transitions include the transition from childhood to adolescence and leaving home for college. Health professionals should understand the complex nature of developmental life transitions and how these transitional periods influence health (Kaiser, Kaiser, & Barry, 2009). Negative health changes in college students making a transition often include weight gain, decreased physical activity, increased stress, and adoption of unhealthy behaviors such as alcohol, tobacco, and drug use (National Center for Health Statistics, 2009; Ogden et al. 2007; Physical Activity Guidelines Advisory Committee, 2008; U.S. Department of Health and Human Services, 2000). College students face physical and social environmental challenges that test their ability to make healthy personal decisions that influence personal wellness. Young adults lacking healthy wellness behaviors while living at home as high school students may be at even greater risk for adoption or continuation of
unhealthy lifestyles while at college (USDHHS, 2000).

College and university wellness courses serve a key role in building critical thinking skills regarding healthy lifestyle choices and developing positive lifetime wellness behaviors and attitudes (Welle & Kittleson, 1994). This is especially evident in general studies curricula that sometimes include a wellness course as a requirement for graduation. Further, colleges and universities are realizing the need to integrate critical thinking instruction into general education programs (Halpern, 2001). Although most first-year students may have had some previous critical thinking instruction prior to entering a university’s general education program, their critical thinking skills still need further development (Jacobsen & Mark, 2000). Scholars agree that critical thinking skills are necessary for everyone, not only in the classroom, but also as a lifelong skill (Browne & Stuart, 2004; O’Keefe, 1986, 1995). The university curriculum offers an excellent opportunity to improve health-related fitness knowledge and provide college students occasions to increase positive behaviors and meaningful fitness outcomes. These courses teach positive health habits that counter negative lifestyle behaviors associated with traditional college lifestyle transitions, including limited physical activity, poor sleep habits, poor nutrition, alcohol use, and academic stress (Adams, Graves, & Adams, 2006). Most importantly, college wellness courses can have a positive influence on students’ health and wellness behaviors (Abu-Moghli, Khalaf, & Barghoti, 2010; Welle & Kittleson, 1994).

Students born after 1982 are part of what is known as the Millennial generation (Oblinger, 2003) and comprise the majority of today’s college students. Millennials are characterized as a generation who feels entitled, confident, and digitally and socially connected (Atkinson, 2007; Howe & Strauss, 2007). As a result, these students often lack critical thinking skills due, in part, to the fact that they have always known a world in which technology (e.g. computers and the Internet) has provided them with immediate answers and solutions (Tapscott, 1998). Despite Millennials’ information searching skills, their ability to critically evaluate this relatively limitless information is weakened (Block, Wells, & Kraft, 2008). Millennials tend to be impatient, expecting immediate answers (primarily from reliance on technology), and educators are now realizing that new approaches may be necessary with this population (Carlson, 2005). In addition, there is concern that while Millennials are highly proficient on communicative devices (e.g. e-mail, texting, blogging, social networking) their interpersonal communication (both written and oral) and critical thinking skills may be underdeveloped (Block, et al., 2008; Carlson, 2005; Moore, 2007). Therefore, as colleges cater to students expecting greater information access and immediate answers, many faculty may be focusing less on teaching students to be contemplative, reflective, and independent critical thinkers (Carlson, 2005). The characteristics of this generation call for new ways to present material, including different teaching and learning modalities that develop critical thinking skills (Lewis & Smith, 1993).
Critical thinking is a higher-order thinking skill which consists of evaluating arguments and helping one to make decisions that guide beliefs and behaviors (Astleitner, 2002). Inconsistent use of the term has contributed to confusion surrounding its definition; however there appear to be at least three distinct components: (1) problem solving, (2) evaluation or judgment, and (3) decisions based on these judgments (Lewis & Smith, 1993). Proficient critical thinking can be learned, is not dependent on high intellectual ability, and appears to involve the intellectual analysis of the relevance of available information, reliability of its sources, use of evidence to make a reasoned judgment, and application of evidence to action (Bruning, Schraw, & Ronning, 1995). Such thinking has been associated with academic qualities and skills such as decision-making, creativity, reasoning, problem-solving, debating, mindfulness, and reflection (Woolfolk, Winne, & Perry, 2000). Critical thinking has been viewed as a key skill within education in general (McBride, 1991; Lodewyk & Winne, 2005) and health behavior contexts in particular, as Lodewyk (2009) argues, “. . . critical thinkers are assumed to make more informed and responsible decisions about healthy pursuits, since they more effectively identify problems, judge information, and draw prudent conclusions (p. 13).” Using critical thinking strategies in a university wellness course is a non-traditional approach that corresponds to Millennials’ need for social interaction, desire to achieve, and need for quick information access.

Research has shown that large-class lecture formats are still prevalent for a variety of reasons. Many large lecture formats in higher education are obsolete but remain common because they are pragmatic, generating income by allowing greater enrollment at lesser cost (Foreman, 2003). The cost-savings drawback from this format results in lost opportunities for more enduring learning. Ideal learning situations are specific to students’ needs and learning modalities, provide more immediate, constructive feedback, motivate students, and build lasting conceptual structures (Foreman, 2003). Even if a lecturer engages students, holding their attention for an entire class lecture may be difficult, resulting in less ideal learning environments. In essence, what is known about good learning principles is contrary to the structure of and conditions in large lecture courses (Mayer, 1986).

For critical thinking to occur, students must first be given opportunities for personal inquiry, something that tends to be missing from traditional, lecture-based formats (Garside, 1996). In order for inquiry to occur, students must transition from passive exposure to material to a process of active problem solving. Beyer (1987) describes classrooms that reinforce and support thinking as those where students feel comfortable to risk, challenge, and question. There is student-to-student interaction focused on information processing, where students consider ideas, contributions and arguments of peers and the teacher’s role is not to “tell” but to aide students’ abilities to critically analyze ideas. Students become active learners and take responsibility for their own thinking and learning (Kruse, 1988;
Halpern, 1987; Lindsey, 1988). As such, teachers must be willing to foster critical thinking by creating an environment of cognitive dissonance and by nurturing formats where students take responsibility for their thinking and pursuit of solutions (Gabbard & McBride, 1990).

A key to developing critical thinking lies in creating conditions for participation rather than passivity, and in providing opportunities for the emotional engagement with course materials (Mayer, 1986). McPeak (1990) suggests that teachers need to change their methods of presentation from a didactic mode to a more discursive or argumentative mode of teaching and assessment in order to emphasize critical thinking skills. In short, teaching for critical thinking emphasizes meaningful, purposeful learning, not rote memorization. Learning is more relevant and meaningful when associations with the material are based on a variety of approaches. In essence, the more associations that can be made, the more meaningful ideas become (Eggen & Kauchak, 1988). The purpose, then, of this study was to compare a traditional approach to teaching a general studies, university-based wellness course to a revised, critical thinking-based approach on students’ written critical thinking skills.

Method

Participants and Design

Participants were 162 undergraduate students enrolled in wellness courses at a mid-size, Midwestern university. The course was required as part of the general studies curriculum at this university, and as such, was deemed a vital point for critical thinking implementation. The majority of students enrolled in this course were traditional underclassmen (first or second-year students) and thus, were early in their transition to adulthood independence. A convenience sample of three classes comprised the experimental group while four other classes served as the control group. Participation in the current study was implemented as a course requirement, but students’ pre- and post-course critical thinking measures were not factored into students’ overall course grade. All procedures were approved by the institutional review board prior to data collection. A simple two-group static pre-post comparison experimental design was used in which a critical thinking measure (designed for this study) was used to assess written critical thinking of experimental and control groups at the beginning of courses and again at the end of the courses.

Critical Thinking Measure

Assessment of written critical thinking skills was based on the SEEI (State, Elaborate, Example, Illustration) method (Nosich, 2005), which requires students to engage in interpretation, personal reflection, and critical analysis of material as it relates to one or more areas of the course content. Students
were asked to read brief (1-2 pages) wellness-themed articles at the beginning and the end of the semester, and write brief narrative reflections in response to the articles. Responses were then scored according to a rubric developed for this study.

The SEEI (Nosich, 2005) method includes four specific and separate components designed to demonstrate proficiency in written critical thinking, when responding and reflecting on content learned through a given course. These components were as follows: (a) **State:** In the first section of the response, students were required to create a paraphrased statement of the main point of the article in 2 - 3 sentences and clearly identify the aspects of the issue of consequence within this opening statement. Highly proficient statements clearly identified both the explicit and implicit issues embedded within the article; (b) **Elaborate:** In this section, students were required to restate the main point of the article in a paragraph that began with *In other words* followed by several sentences involving logical and original construction. Proficient elaborations included a clear demonstration of a position related to the main point of the article that was justified and defended by the statements made within this section; (c) **Examples:** In this section, students were required to offer examples that supported their position by connecting it to concrete examples within the article, or an application of a personal experience relevant to the article that began with *For example.* Proficient examples effectively provided conceptual linkage from the example to students’ argument with commentary; (d) **Illustrate:** The final section required students to generate metaphors, analogies, pictures, or diagrams of the basic article thesis, to connect it to other meanings already understood by the writer. Students were instructed to begin this section with *It’s like* and proficient illustrations were well-structured, supported and clarified the main point of the original statement, and served as a point of further reflection for the reader. For example, a student wrote a wellness-related illustration relating the importance of eating breakfast to fueling a vehicle: “Not eating breakfast in the morning is like going on a long trip in your car with barely any gas in the tank: you’ll never have enough fuel to achieve your objective.”

**Procedures**

Four separate courses were used for the control condition and were taught using traditional large lecture formats, in which students were passive note takers, and student performance was assessed by exams based on assigned textbook readings and lectures. Specific instructions were given to instructors of the control courses not to alter their pedagogical format from their typical instructional format.

Experimental sections of the course (alternative critical thinking based approach) were taught by an instructor who was trained in critical thinking methodologies (Nosich, 2005). Experimental course design was primarily based on student generated material and discussion rather than on a didactic
model, based on research supporting that overt discussion, active student participation, and meaningful interaction with material to enhance critical thinking (Garside, 1996; Smith, 1990; Hill, 1990; Vermette, 1988). Activities for academic engagement including the philosophical analysis of decision-making, writing newspaper articles, creating alternative solutions to existing problems, as well as comparing and contrasting differing points of view were pedagogical techniques used in the experimental classes. Tapping into Millennials’ need for social interaction was a carefully designed element of the experimental course. Therefore, many opportunities for group work were integrated into the course. For example, small groups worked together to critically analyze academic material, such as health-related current events; debate different health issues, offer healthy solutions, develop printed health promotion materials for the campus and local community, volunteer in community service projects, write and present speeches on health related topics, and create personal health behavior change plans. Associated with every academic, civic, and group activity were opportunities to research and document topics through immediate internet access via cell phone or computer. These opportunities were designed to capitalize on Millennials’ need for technology. One important aspect of the delivery of the class was student preparedness, so lectures were limited to allow students opportunity for small group interactions with each other and the course material.

Student engagement in the form of group discussions was strongly emphasized in the experimental sections of the course, based on research demonstrating that overt discussion is sound practice for learning (Garside, 1996; Mazer et al., 2007). Research indicates that complex skills and difficult material can be learned in shorter times if the learner verbalizes the information (Mazer, et al., 2007) and discussion has been shown to help critical thinking because students do the thinking and there is opportunity for them to check their understanding against each other (Smith, 1990; Hill, 1990; Vermette, 1988). Additionally, students were given multiple assignments that required them to develop work products that assimilated information in meaningful ways, such as preparing informational brochures and newsletters and presenting health-related information to individuals outside the classroom setting.

Critical thinking abilities were evaluated by using the standardized SEEI format. Pre- and post-course measures were electronically submitted using the institution’s instructional web platform (WebCT) after an initial training session for all course instructors participating in the study. Instructors then used standardized directions to assign the activity to their students. All pre-course SEEI measures were completed during the first week of the classes and post-course SEEI measures were completed during the last week of the 16-week semester. Student SEEI responses were anonymously coded, blinding readers of written responses to course sections and course conditions (experimental or control) from which students’ responses originated.

In order to standardize specific format elements of the written responses,
students at both assessment points (pre- and post-course) were given specific length requirements for each of the four SEEI sections, with explicit directions that (1) the Statement section was two-three sentences in length, and (2) the Elaboration, Examples, and Illustration sections all were at least one-paragraph in length, respectively. The specified length requirement ensured standardization in minimal length and breadth of written reflections for both the pre- and post-test condition. Instructors within both the experimental and control courses developed standardized instructions on the SEEI method for the purpose of this study, and spent 20 minutes at the beginning of the semester to explain the SEEI technique to students as well as a rubric on which their responses would be scored. In order to protect against testing effects, students responded to a different article, of similar length and complexity, on the post-course assessment. Each student then performed an SEEI in response to the article and critical thinking performance was assessed according to a specific rubric (Table 1).

A two-tiered rubric was designed for this study to measure students’ written critical thinking proficiency. The first tier divided students’ performance into proficiency categories: low performance, approaching expectations, or meets expectations. In addition, a secondary tier was incorporated by providing numerical values (0-10) to each individual SEEI component of the rubric to increase student performance discrimination sensitivity. The addition of the (0-10) numerical scale was integrated to increase the sensitivity with which the rubric could measure critical thinking variations (see Table 1).

Scoring

A standardized procedure was developed for scoring the critical thinking assessments, with four independent readers individually scoring SEEI pre and post-course assessments and providing ratings (0-10) for each SEEI component as well as an composite score (the sum of the individual SEEI component scores). Student responses were rated by individual readers separately, after which the readers met together to discuss individual ratings for each student on each SEEI component. When rating discrepancies across readers occurred, group discussions were conducted until there was a unanimous group consensus among readers regarding each student’s SEEI component. This scoring method was chosen because the scoring rubric adopted was created for this assignment. Thus, no inter-rater reliability coefficients were available. Finally, in order to protect against “halo effects” as a source of inter-rater error, researchers who rated the critical thinking responses were blinded to both individual students and course sections.
<table>
<thead>
<tr>
<th>State</th>
<th>Low Performance</th>
<th>Approaching Expectations</th>
<th>Meets Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 – 1 Omits statement or fails to identify &amp; summarize</td>
<td>4 – 5 Partially summarizes but confuses information or intent</td>
<td>8 – 9 Summarizes accurately with some implicit thought and/or challenges</td>
</tr>
<tr>
<td></td>
<td>2 – 3 Reorders topic sentence or copies headline or theme sentence</td>
<td>6 – 7 Summarizes accurately with some confusion, but meaning is not obscured</td>
<td>10 Clearly identifies implicit challenges</td>
</tr>
</tbody>
</table>

| Elaborate  | 0 – 1 Omits elaboration or adopts inaccurate position                            | 4 – 5 Adopted with limited thought (reworded author)                                    | 8 – 9 Constructs original perspective                                             |
|            | 2 – 3 Clearly copies from article or creates an illogical argument               | 6 – 7 Argument has original thought and simple extensions                                | 10 Logical and original construction                                               |

| Examples   | 0 – 1 Omits examples or provides inaccurate evidence                             | 4 – 5 Correctly summarizes examples from article, but may lack intentionality          | 8 – 9 Examines the evidence and source of evidence by providing compelling or original examples with commentary |
|            | 2 – 3 Copies examples from article or rewords evidence in article               | 6 – 7 Selective & appropriate evidence from article with commentary                    | 10 Links original examples to argument with commentary                             |

| Illustration| 0 – 1 Omits illustration or restates argument                                    | 4 – 5 Simplistic illustration loosely supports statement & argument. The reader must draw own conclusions | 8 – 9 Multifaceted or compelling illustration with incomplete explanation          |
|            | 2 – 3 Provides an example rather than an illustration or provides an irrelevant illustration | 6 – 7 Simplistic illustration with clear meaning and simple explanation                | 10 Multifaceted or compelling illustration with explanation                        |
Results

Complete data was collected on 162 undergraduate students (69 experimental-course; 93 control-course students). In order to determine whether critical thinking skills were similar across conditions at the pre-course measurement of critical thinking, separate independent t-tests were calculated on pre-course SEEI components and composite scores across conditions. None of these comparisons were significant ($p > 0.05$), indicating that all students were similar in written critical thinking performance at the outset of the study. Means and standard deviations for pre- and post-course individual SEEI components and composite critical thinking scores are displayed in Table 2. In order to determine whether written critical thinking performance was significantly different at the end of the courses across course format, five separate $2 \times 2$ (condition by time) repeated measures ANOVAs were performed on individual SEEI components and overall composite scores. Significant condition x time interactions were found for the critical thinking subcomponents of State ($F_{1,159} = 9.04, p = .003$), Elaborate ($F_{1,159} = 8.13, p = .005$), Example ($F_{1,159} = 6.12, p = .015$), Illustrate ($F_{1,159} = 34.78, p = .0001$) and the overall composite measure ($F_{1,159} = 29.31, p = .0001$). Post-course comparisons of SEEI component and composite scores indicated that compared to pre-course measures, experimental group students scored significantly higher on the written measure of critical thinking than traditional course students. Specifically, critical thinking scores in all four subcomponents (state, elaborate, example, illustration), as well as overall composite scores, were significantly higher for the experimental students compared to control students on post-course measures.

Discussion

Results indicated that the non-traditional approach in a general education course significantly improved written critical thinking skills. This supports work suggesting that course formats requiring students to weigh evidence and draw conclusions from existing evidence promotes critical thinking (Williams, Oliver, & Stockdale, 2004; Williams & Worth, 2001). Within the area of health, research has also demonstrated that a scenario based approach to teaching community health to nursing students significantly improved critical thinking skills (Sandaor, Clark, Campbell, Rains, & Cascio, 1998). The current findings also support previous results indicating that instruction employing direct instruction on the process of critical thinking (Bensley & Haynes, 1995) or enhanced critical thinking models (Isaacs, 1991; Mazer, Hunt, & Kuznekoff, 2007; Reed & Kormer, 2001) are effective at improving critical thinking scores and these improvements are enhanced by housing specific critical thinking training within discipline specific courses (Williams et al., 2004; Royalty, 1995).
Improved critical thinking skills may have a profound impact on the expressed outcome of most university wellness courses, namely to improve health behaviors. College wellness courses and interventions often provide a final opportunity for formal health education and formation of positive health behaviors and have been shown to be effective in promoting healthy behaviors (Abu-Moghli, Khalaf, & Barghoti 2010; McClanahan, 1993; Welle & Kittleson, 1994). It has also been demonstrated that health-related fitness knowledge increases upon completion of a university health class and that the higher levels of knowledge are retained several years after completing such a course (Adams et al., 2006). If courses incorporating enhanced critical thinking course design improve decision making due to enhanced critical thinking skills, they may be more effective in enhancing the longevity of knowledge retention and the utilization of that knowledge to influence health behaviors, despite the passage of time.

Visual examination of the data indicates that the largest improvements occurred in the illustration component (pre to post difference in the experimental group for each component: \(S = 0.89\), \(E = 0.84\), \(E = 0.49\), and \(I = 2.33\)). This is noteworthy because it would seem that the illustration would require the greatest cognitive demand. When comparing the SEEI components to Bloom’s taxonomy (Bloom, Englehart, Hill, Furst, & Krathwohl, 1956), one observes that the state and elaborate components primarily require comprehension, while providing an example extends to the process of application. On the other hand, the illustration component requires the student to analyze the article, identify the essential element of the theme, and synthesize the theme into a completely new format. Selection of specific illustrations can also convey a personal judgment or evaluation in regard to the author’s claim. This supports other critical thinking research (Garside, 1996), reporting a significant increase in high order (analysis, synthesis, and evaluation) questions but not lower order (knowledge, comprehension, and application) questions as defined by Bloom’s taxonomy following a discussion-based teaching format. Therefore, the critical thinking based approach had the greatest influence on arguably the most complex aspect of critical thinking. Furthermore, while scores for illustration remained in the same broad category, (approaching expectations: scores 4-7) students in the experimental group progressed from near the bottom of the category (4.26 ± 3.02) to near the top of the category (6.59 ± 2.63) and did progress to a new sub-category (Table 1). Improvements in clarity and relevance were the key distinguishing factor between the sub-category for scores (4-5) and (6-7), hence it might be argued that the experimental approach significantly enhanced the clarity of understanding in regards to the readings.

Bensley and Hanyes (1995) demonstrated that providing direct instruction in critical thinking and argumentation enhanced critical thinking in a written response. A portion of the direct instruction included a step-by-step outline of a written argument. The process consisted of three steps (statement of problem and definition of terms, development of discussion including
Table 2
Means and Standard Deviations for Pre- and Post-Course SEEI Components and Composite Scores

<table>
<thead>
<tr>
<th></th>
<th>Pre-Test</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>5.96 (2.38)</td>
<td>5.42 (2.40)</td>
</tr>
<tr>
<td>Experimental</td>
<td>5.88 (2.25)</td>
<td>6.77 (2.56)</td>
</tr>
<tr>
<td><strong>Elaborate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>6.11 (1.98)</td>
<td>6.04 (2.02)</td>
</tr>
<tr>
<td>Experimental</td>
<td>6.30 (1.97)</td>
<td>7.14 (1.67)</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>5.80 (2.17)</td>
<td>5.29 (2.53)</td>
</tr>
<tr>
<td>Experimental</td>
<td>6.10 (2.25)</td>
<td>6.59 (2.22)</td>
</tr>
<tr>
<td><strong>Illustrate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>5.23 (2.53)</td>
<td>4.65 (2.95)</td>
</tr>
<tr>
<td>Experimental</td>
<td>4.26 (3.02)</td>
<td>6.59 (2.63)</td>
</tr>
<tr>
<td><strong>Composite</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>23.10 (6.96)</td>
<td>21.41 (7.20)</td>
</tr>
<tr>
<td>Experimental</td>
<td>22.32 (7.25)</td>
<td>26.51 (7.45)</td>
</tr>
</tbody>
</table>

*Standard deviations are in parentheses

presentation of evidence, and conclusion or summation and evaluation of main points). Students in the experimental group were similarly provided instruction in the process of thinking and responding critically to ideas, specifically, students were taught to use intellectual standards (Nosich, 2005) rather than analyzing health behaviors based on psychological standards (basing decisions on egocentric assumptions and biased thought processes). The SEEI model required a written response in which students stated the problem (S) and elaborated (E), provided evidence through example (E), and summarized and evaluated the article through the use of appropriate illustrations. The current findings, therefore, corroborated previous findings that teaching the process of thinking while teaching content knowledge is an important factor in improving critical thinking skills.

Several limitations of the current study should be noted. First, the sample size was limited by the number of students and number of sections provided, as teachers volunteered their course section for inclusion in the study. Second, while the readers made an a priori decision not to evaluate responses in regards to writing or grammar, the SEEI requires a written response, which is inherently dependent on the ability of the student to formulate
thoughts in writing. It is plausible that the difference in improvement in the SEEI scores between groups could result from improved ability to express ideas through discussions and critical thinking opportunities – opportunities that the control group did not experience. Additionally, although students in both the experimental and control group were required to complete the SEEI responses, students were aware that they were not being graded. It is plausible that the experimental group perceived the assignment to be similar in demands to discussions and assignments routinely performed in class, whereas students in the control group perceived the assignment as novel. The novelty of the assignment to the control group and lack of external motivation (in the form of a grade) may have influenced control group effort and partially account for lack of improvement within the control group. Finally, it is recognized that use of students’ written reflections represented only a written facet of critical thinking. One’s ability to use critical thinking skills in how he/she actually uses strategies to solve a problem in ‘real world’ situations was not directly examined. As such, future research could develop health situation scenarios by which students’ solutions could be assessed and evaluated by course design condition.

Implications for Practice

The observed differences within wellness courses across conditions in this study – namely, that students within a non-traditional, critical-thinking based approach were significantly improved in written critical thinking compared to students within a traditional, lecture-driven approach – has implications for how general studies wellness courses are taught. Additionally, there are important implications regarding the development of critical thinking strategies as they pertain to personal wellness. Much like other student competencies, critical thinking skills improve under circumstances in which regular, systematic opportunities for practice are provided and feedback on skill development is provided. It is clear that critical thinking skills are improved when direct and structured instruction on the process and skill of critical thinking is provided in a context with which students are able to identify (Bensley & Haynes, 1995), and specific forms of critical thinking may be best developed when practiced in a discipline-specific context (Williams et al., 2004; Royalty, 1995). While one goal of any health education course is to enhance discipline-specific knowledge, developing the ability to successfully navigate healthy behavior decisions may rely more on critical thinking skills than rote information retention. While the current statistical results of this study are limited to written critical thinking, we found that other forms of critical thinking including dialoging with others about health behaviors, peer teaching, and group discussions and debates could also be systematically improved through course design, such as has been shown in general education college communication courses (Mazer et al., 2007). When
considering health behaviors, a key factor determining one’s external or internal locus of control for changing to healthier behaviors (and yielding healthier personal health outcomes) may be an individual’s perceived efficacy, or the extent to which he or she believes he or she is able to take behavior change action to avoid negative health outcomes (Rimal & Real, 2003). As such, a key component in developing the necessary perceived efficacy is strengthening critical thinking skills regarding health decisions in a health education context. Thus, college wellness instructors may reconsider course design so that structured opportunities for critical thinking development are a main course component. We would posit that critical thinking within wellness courses can be defined as reflective thinking used to make reasonable and defensible decisions about health choices. Our results suggest that continued and overt teacher instruction fostering critical thinking is required, as are numerous opportunities for the learner. When these pedagogical elements are present, students will be more prepared to critically analyze and articulate the health behavior decisions they make.

Conclusions

The current investigation indicates that incorporation of critical thinking strategies into a content specific health course can effectively improve general critical thinking skills and that the revised critical thinking approach employed was more effective in improving critical thinking skills than a traditional lecture format. Results further provide evidence that direct instruction with regard to the thinking process may be vital in improving critical thinking. Additionally, the higher order processes, as delineated by Bloom’s taxonomy, were the processes most improved through direct intervention. Therefore, colleges and universities should consider implementing similar revised critical thinking curricula within general studies coursework.

References


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Beliefs and Intentions of Restaurant Patrons Regarding Secondhand Smoke Exposure and Smoke-Free Ordinances

Ronald Williams, Jr., Jeremy Barnes, Ryan Humphries, Barry Hunt, and Eric Henry

Businesses, such as restaurants and bars, are encouraged in many communities, to provide smoke free environments due to acknowledged health risks associated with second hand smoke exposure. Resistance to these changes by business owners is often attributed to concerns over possible loss of revenue due to consumer preferences. This study was designed to examine the attitudes and beliefs of restaurant patrons regarding the health effects of secondhand smoke and intentions to patronize establishments that enacted smoke free ordinances. Restaurant customers (n=390) completed a survey instrument measuring their intent to continue to patronize establishments that adopted smoke free policies. The sample included both smokers (n=87, 22.3%) and non-smokers (n=303, 77.7%). Significant differences existed between smoker and non-smokers beliefs regarding potentially negative health consequences of second hand smoke exposure. Most study participants reported that the frequency with which they visited establishments would either not change, or possibly increase, in the event of smoke free policies being adopted. Results of the study support the contention that smoking ordinances in restaurants would not result in decreased patronage by smokers or non-smokers. Implications suggest positively framing advocacy messages targeting business owners about the effects of smoke free ordinances on customer preference would be beneficial.

Environmental tobacco smoke, otherwise known as secondhand smoke, is a mixture of both sidestream smoke that originates from a burning cigarette and exhaled mainstream smoke (National Cancer Institute, 2007). Containing 69 known carcinogens and over 7,000 chemicals, it has been reported that secondhand smoke is potentially more toxic than the direct smoke inhaled from the filtered cigarette (U.S. Department of Health and Human Services, 2010). In 2006, the Department of Health and Human Services estimated that routine exposure to secondhand smoke contributes to 46,000 coronary disease deaths and 3,000 lung cancer deaths among otherwise healthy, non-smoking U.S. citizens each year. While these cases of premature mortality are certainly a concern, secondhand smoke has contributed to a number of preventable diseases such as respiratory tract injuries, cancer, and even heart disease, the number one killer in the U.S. (National Cancer Institute, 2007).
In efforts to reduce health risks associated with secondhand smoke exposure, many cities, states, and even entire countries have been proactive in implementing non-smoking ordinances (Americans for Nonsmokers’ Rights, 2010). Twenty-three states in the U.S. have already banned the use of cigarettes in public places (Americans for Nonsmokers’ Rights, 2010; Koh, Jossens, & Connolly, 2007). Such ordinances not only decreased overall cigarette usage, but have improved the overall health of the impacted communities (Rigotti, Regan, Moran, & Wechsler, 2003). For example, in Pueblo, Colorado, a 27% decrease in acute myocardial infarctions was observed during the 18 months after a smoke-free policy was enacted (Alsever et al., 2009). Two recent studies supported such reductions in heart attacks and suggested that cities which enact smoke-free ordinances see a 17% decrease in heart attacks over one year (Lightwood & Glantz, 2009; Meyers, Neuberger, & He, 2009).

Public policy efforts to mandate restrictions on smoking have remained controversial despite recent evidence that there is no safe level of secondhand smoke exposure (U.S. Department of Health and Human Services, 2010). Restaurants and bars have tried to accommodate both smoking and non-smoking patrons by attempting to use separate seating sections and ventilation systems (Dearlove, Bialous, & Glantz, 2002). The U.S. Surgeon General states that such ventilation systems may actually re-distribute secondhand smoke throughout a building instead of clearing it (U.S. Department of Health and Human Services, 2006). In 2005, the American Society of Heating, Refrigerating, and Air Conditioning Engineers reported that no ventilation will sufficiently eliminate the health risks of secondhand smoke exposure indoors and consequently there is no safe level of indoor secondhand smoke exposure.

Smoke-Free Legislation

Even with substantial scientific evidence that secondhand smoke contributes to morbidity and mortality, proponents of smoke-free ordinances still face significant legislative challenges (Dearlove, Bialous, & Glantz, 2002). The hospitality industry is most often the leading opposition to this legislation citing the fear of lost revenue. Tobacco companies have had a significant influence on the way the hospitality industry views smoke-free ordinances. A great example of this influence was documented in 1989 when Beverly Hills became the first city in California to go 100% smoke free in restaurants (Dearlove, Bialous, & Glantz, 2002). Shortly after this ordinance was enacted, a group called the Beverly Hills Restaurant Association (BHRA) claimed that sales were down 30%. In response to these claims, the city of Beverly Hills created smoking and non smoking sections to accommodate all patrons. It was later revealed that the BHRA was a public relations firm for the tobacco industry and that sales tax data showed no loss of revenue. The tobacco industry was impressed with the success of the BHRA and used it as a model in other states where smoke-free legislation was being proposed (Dearlove, Bialous, & Glantz, 2002).

Despite claims from the hospitality and tobacco industries, multiple studies have shown little to no losses, and in some cases, increases in revenue leading to increases in restaurant value (Alamar & Glantz, 2004; Glantz & Smith, 1994;
Glantz & Smith, 1997; Huang, De, & McCusker; 2004; Lemstra, Neudorf, & Opondo, 2008; Mandel, Alamar, & Glantz, 2005; Scollo, Lai, Hyland, & Glantz, 2003). During the two years immediately after implementation of a city-wide smoke-free ordinance in 1995, New York City’s taxable restaurant sales rose 2.1%, while statewide taxable restaurant sales decreased by 3.8% (Hyland, Cummings, & Nauenberg, 1999). Additionally, a cross-sectional survey of restaurant owners/managers indicated that the ordinance had no negative economic impact on the city’s restaurant business (Hyland & Cummings, 1999). After New York implemented a state-wide ordinance, there similarly was no impact on long-term viability of the state’s restaurant industry (Hyland, Puli, Cummings, & Sciandra, 2003). Other studies across the United States have conclusively indicated that smoke-free ordinances are not harmful to profits. The Minnesota Institute of Public Health (2008) examined four cities and three counties in which smoke-free ordinances had been enacted and results indicated that restaurant sales revenue were unaffected by ordinances. Similar results have been published regarding restaurant revenues in California and Texas (Huang, De, & McCusker, 2004; Stolzenberg & D’Alessio, 2007). Those cities which have been proactive in initiating the smoke-free ordinances have seen not only experienced no long term decrease in revenue, but increased morale among employees and most importantly a healthier community overall (Glantz & Smith, 1997; Huang, De, & McCusker; 2004; Lemstra, Neudorf & Opondo, 2008; Luk, Ferrence, & Gmel, 2006; Mandel, Alamar & Glantz, 2005; Pyles, Mullineaux, Okoli, & Hahn, 2007; Sciacca & Ratliff, 1998; Tang, Cowling, Stevens, & Lloyd, 2004).

**Purpose of the Study**

In recent years, the United States has experienced a dramatic increase in the number of smoke-free public facilities (National Cancer Institute, 2007). Unfortunately, many states are not following suit (American Lung Association, 2008). One such state that currently has no state-wide smoke-free indoor air policy is Missouri. In 2008, the American Lung Association gave Missouri the grade of “F” in four major tobacco control areas including smoke-free air. Several states across the U.S. are similarly failing to appropriately protect the health of the public in regards to clean indoor air. Although statewide legislation in many states is stagnant, many local cities and communities are attempting to pass regional smoke-free ordinances. The purpose of this study was to examine the attitudes of restaurant patrons regarding the proposal of a city-wide smoke-free ordinance. Specifically, this study sought to determine the beliefs of restaurant patrons on the health impacts of secondhand smoke exposure, as well as behavioral intentions regarding restaurant patronage in the event of smoke-free ordinance implementation.

**Method**

This study was approved by the Human Subjects Review Board at the participating university. Data collection took place within a Missouri city that currently has no smoke-free ordinance. Smoking is therefore allowed in public establishments such as restaurants, at the discretion of the business
The purpose of this study was to examine the beliefs of restaurant patrons regarding the health effects of secondhand smoke, as well as their intentions to continue dining out if a smoke-free ordinance were enacted. A survey was administered to customers in attendance at several local restaurants. In order to accurately convey the beliefs of restaurant customers, all participants were surveyed at establishments that offered food service.

Researchers contacted the owner/manager of eighteen restaurants in the local area to inquire about the possibility of surveying customers. In total, the owners/managers of ten establishments agreed to participate. Data collection sites included four locally owned restaurants, one private club with food service, and five corporate/chain restaurants. The sample of restaurants included seven establishments that allowed smoking and three that were smoke-free.

To reduce interference with the customer’s dining experience researchers surveyed customers while they entered or exited each restaurant. Approximately two hours were spent at each of the locations for survey administration. Data collection yielded a sample of 390 participants of which 22.3% ($n=87$) reported to be smokers (defined as having smoked a cigarette or other tobacco product within the past 30 days). The percentage of smokers in this study reflects closely the percentage of smokers in Missouri – 24.6% (Davis et al., 2009). The sample was 59.2% female ($n=231$) and 40.8% male ($n=159$).

Data were analyzed using PASW Statistics 18. Chi-square analyses were used to determine statistical associations between health beliefs, behavioral intentions, and smoking status. Significance level was set at $p=.05$.

Results

Beliefs Related to Secondhand Smoke Exposure

Significant differences existed between smokers and non-smokers among health beliefs of secondhand smoke exposure. Non-smokers were more likely to report a belief that secondhand smoke exposure has an impact on childhood asthma, lung cancer, cardiovascular disease, and respiratory infections (Table 1). Since smoke-free advocates are increasingly targeting parents for advocacy support, the researchers also analyzed differences in health beliefs among parents of children under age eighteen (28.2%; $n=110$) and those with no children under eighteen (71.8%; $n=280$). No significant differences were reported between the two parental groups in relation to health beliefs; however when analyzed independently, differences were observed between smokers and non-smokers in each parental group. Among non-smokers in the sample, 28.4% ($n=86$) reported to have children under eighteen compared to 27.6% ($n=24$) of smokers. Regardless of parental status, non-smokers were significantly more likely to believe lung cancer, cardiovascular disease, and respiratory infections were impacted by secondhand smoke. Parents with children under eighteen were significantly more likely to report childhood asthma being affected by secondhand smoke, however this difference was not observed among the participants who did not have children under eighteen (Table 1).
Table 1

Percentage Of Adult Restaurant Patrons Who Believe Secondhand Smoke Exposure Increases Risk For The Following Health Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>All Participants (n=390)</th>
<th>With children age &lt;18 (n=110)</th>
<th>With no children age&lt;18 (n=280)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-smokers</td>
<td>Smokers</td>
<td>X² (p-value)</td>
</tr>
<tr>
<td>Childhood asthma</td>
<td>97.7%</td>
<td>92.0%</td>
<td>58.607 (.011)</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>98.3%</td>
<td>74.7%</td>
<td>90.533 (.001)</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>96.0%</td>
<td>57.5%</td>
<td>30.017 (.001)</td>
</tr>
<tr>
<td>Respiratory infections</td>
<td>99.3%</td>
<td>87.4%</td>
<td>104.119 (.001)</td>
</tr>
</tbody>
</table>

Intenions of Restaurant Patronage

Of primary concern to many restaurant owners is the potential loss of profits as a result of smoke-free ordinances. A total of 65.9% (n=257) of the sample population reported dining in restaurants on an average of 1-3 days per week. However, results indicate the majority of participants, both smokers and non-smokers alike, reported plans to continue restaurant patronage in the event of smoke-free ordinance implementation. Overall, 63.3% reported that their frequency of restaurant visits would not change. While 7.9% of the sample reported that they would dine out less frequently, 28.7% reported a plan to increase restaurant visits if a smoke-free policy was enacted in that particular establishment.

Non-smokers were more likely to report an anticipated increase in restaurant dining frequency in the event of a smoke-free ordinance (Table 2). While 28.7% of smokers reported an anticipated decrease, 36.0% of non-smokers indicated they were likely to increase the frequency with which they would patronize newly smoke free restaurants. Because non-smokers generally significantly outnumber smokers in most communities, this represents a potential for increase in restaurant business.

When asked about how secondhand smoke has affected their dining experiences, 87.8% (n=266) of non-smokers and 26.4% of smokers (n=23) indicated that they had been physically affected by smoke even while seated in the non-smoking section (X²=132.576; p<.001). This supports the 2005 American Society of Heating, Refrigerating, and Air Conditioning Engineers
Table 2

Anticipated Frequency Change Of Restaurant Visits Among Adults In The Event Of A City-Wide, Smoke-Free Ordinance Implementation

<table>
<thead>
<tr>
<th></th>
<th>Non-smokers</th>
<th>Smokers</th>
<th>$X^2$ (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All Participants (n=390)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticipate frequency to be unchanged</td>
<td>62.0%</td>
<td>67.8%</td>
<td>86.128 (&lt;.001)</td>
</tr>
<tr>
<td>Anticipate frequency increase</td>
<td>36.0%</td>
<td>3.4%</td>
<td></td>
</tr>
<tr>
<td>Anticipate frequency decrease</td>
<td>2.0%</td>
<td>28.7%</td>
<td></td>
</tr>
<tr>
<td><strong>With children age &lt;18 (n=110)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticipate frequency to be unchanged</td>
<td>58.1%</td>
<td>62.5%</td>
<td>23.876 (&lt;.001)</td>
</tr>
<tr>
<td>Anticipate frequency increase</td>
<td>38.4%</td>
<td>4.2%</td>
<td></td>
</tr>
<tr>
<td>Anticipate frequency decrease</td>
<td>3.5%</td>
<td>33.3%</td>
<td></td>
</tr>
<tr>
<td><strong>With no children age&lt;18 (n=280)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticipate frequency to be unchanged</td>
<td>63.6%</td>
<td>69.8%</td>
<td>62.874 (&lt;.001)</td>
</tr>
<tr>
<td>Anticipate frequency increase</td>
<td>35.0%</td>
<td>3.2%</td>
<td></td>
</tr>
<tr>
<td>Anticipate frequency decrease</td>
<td>1.4%</td>
<td>27.0%</td>
<td></td>
</tr>
</tbody>
</table>

position that separate seating and ventilation does not effectively eliminate secondhand smoke exposure for those in a non-smoking section. Often smoke-free opponents use the argument that short-term exposure to secondhand smoke poses little to no health risk. While research has shown this to be untrue, the potential impact to restaurant profits should not be overlooked. A total of 75.2% ($n=228$) of non-smokers and 14.9% ($n=13$) of smokers in the sample reported that they have purposely avoided a restaurant because there was too much smoke in the dining area ($X^2=104.119; p<.001$). If smoking and non-smoking customers are purposely avoiding an establishment due to secondhand smoke, this could have a significant impact on profits. To combat the negatively framed messages about possible economic loss related to such ordinances, smoke-free advocates should promote the potential for revenue gain from non-smoking customers.

**Discussion**

Results indicate that non-smokers are significantly more aware of the health risks of secondhand smoke exposure which by their report impacts their dining frequency. Non-smokers were more likely than smokers to perceive health hazards as a result of exposure to secondhand smoke exposure, particularly childhood asthma, lung cancer, cardiovascular disease, and respiratory infections. Although health educators frequently target parents of young children while promoting smoke-free ordinances, both parents and those who do not have young children recognize the health risks related to secondhand smoke. Additionally, non-smokers are more likely to report being physically affected by secondhand smoke while dining in the non-smoking section of a restaurant. Non-smokers are also more likely to
avoid restaurants because of secondhand smoke exposure. Because 77.7% of the study population are non-smokers, this could potentially translate into significant profit gain for restaurant owners.

There is also an indication that no major decrease in restaurant patronage is anticipated if a city-wide smoke-free ordinance were implemented. Historically, studies conducted after smoke-free ordinance adoption have found no significant change in restaurant revenue (Glantz & Smith, 1997; Goldstein & Sobel, 1998; Huang, De, & McCusker, 2004; Sciacca & Ratliff, 1998). The results of this study lend support to these post-implementation analyses. However, almost every restaurant owner/manager spoken to informally during this study expressed some concern with a decrease in profits if a smoke-free ordinance was passed. According to the results of this study, not only should restaurant patronage not decrease, it may in fact increase due to many customers who have avoided or been affected by the current smoking policies allowing for smoking in restaurants.

As smoke-free advocates frequently defend against resistance to change based on potential profit loss, the results of this study have implications for the development of health education and advocacy messages. Smoke-free advocates often try to re-frame the argument into an issue of health as opposed to individual freedoms or rights. In doing so, business owners are targeted with messages of a healthier environment, healthier employees, and healthier customers. While improvements in public health are key outcomes of a smoke-free ordinance, health educators and advocates must realize that revenue is of greater concern to many business owners. The results of this study indicate the potential for increased profit, therefore smoke-free messages targeting restaurant owners should be framed to highlight this tangible benefit, in addition to altruistic and public relations benefits. Re-framing the normative beliefs of restaurant owners regarding smoke-free ordinances is a challenge; however, health educators and smoke-free advocates should seek to highlight the potential financial benefits in addition to the health benefits.

Previous studies have been conducted on the opinions, beliefs, and health outcomes of restaurant patrons, owners, and employees regarding smoking indoors; however, such studies have generally been conducted after the implementation of a smoke-free ordinance (Eisner, Smith, & Blanc, 1998; Tang, Cowling, Stevens, & Lloyd, 2004). While useful, such research does not provide insights into the beliefs of restaurant patrons in an environment where no ordinance is in place. The results of this study may be of benefit to community health educators who are currently advocating for smoke-free ordinance implementation. As communities explore the possibility of such ordinances, health educators and smoke-free advocates can strengthen efforts by positively framing advocacy messages to indicate that intentions of restaurant patrons do not indicate potential profit loss for business owners.

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**Jeremy Barnes**, Ph.D., is a faculty member in the Department of Health, Human Performance, and Recreation at Southeast Missouri State University. **Ryan Humphries** is a recent graduate and **Eric Henry** is a current undergraduate student in the Health Management program at Southeast Missouri State University.
MOAHPERD Research Abstracts 2010
November, Lake Ozark, MO

Pat McSwegin Research Award Winner
Bench Press Strength Gains from 2-and 3-Day per Week Free Weight and Machine Weight Resistance Training in College Men
James Crone; Faculty Mentor: Jerry Mayhew
The purpose of this study was to compare the interaction of training frequency, initial strength level, and training mode on 1RM bench press improvement in college men. Untrained men were selected based on strength level (low, n = 90; high, n = 90), randomly divided into 2d/wk and 3d/wk groups to train on free weights (FW, n = 30), supine vertical press machine (SVP, n = 30), and seated horizontal press machine (SHP, n = 30). Each group was measured for 1RM on their specific training device before and after 12 weeks of training using similar linear periodization resistance training programs. A days x mode x strength level MANOVA indicated no significant differences for the maximum interaction effect for age, height, weight, BMI, or 1RM; the only significant difference was for strength level 1RM. Following training, there was a significant strength level x mode interaction, indicating that SHP and SVP made greater gains than FW. Groups equated for initial strength may make greater gains training with machine weights than with free weights.

Effect of Aerobic Weight Bearing and Non-Weight Bearing Exercise on Blood Pressure
Leah Reimnitz, Garret Powell, Lori Griffin, Rachael Douglas, Jerry Mayhew, & Jeanne Mitchell, Truman State University
The purpose of this study determined the effects of aerobic weight bearing (WB) versus non-weight bearing (NWB) exercise on blood pressure (BP). College-aged males and females of varying fitness levels were randomly assigned to perform stationary cycling (SC, n = 5) or stair walking (SW, n = 5) for 5 min. Following a 3-min. rest period, baseline BP was obtained, and subjects began light intensity exercise (RPE = 11). A post-exercise BP was measured immediately after exercise termination. The relative changes in BP from baseline to post-exercise for SW (SBP = 11.8%, DBP = 5.5%, PP = 17.0%) were not significantly different from SC (SBP = 6.3%, DBP = 0.4%, PP = 13.8%). Although differences were nonsignificant, percent changes of systolic and diastolic BP in the SW group were greater than the SC group. This trend indicates that WB exercise might increase BP components to a greater degree than SC. This may be true in light of the fact that WB aerobic exercise requires more oxygen delivery and venous return, thus increasing BP more in the W group. Harder working tissues require more oxygen delivery, thereby increasing stroke volume, as indicated by increases in pulse pressure. This study has application to cardiac rehabilitation as it may influence exercise prescriptions.

Comparison of Subjective Perception of Effort Versus Objective Physiological Measures During High Intensity Workouts of Different Modalities
T. Krejci, D. Deamos, J. Prater, T. Ratzky; Faculty Mentor: Steve Burns University of Central Missouri
A debate exists over which workout is most intense. Through research and data collection, we hope to produce results which will answer this debate among coaches. The purpose of this research project is to compare four different high intensity 3
minute workouts consisting of running up stairs, running on a track, jumping in place, and water exercise. Subjects were 12 students (6 males and 6 females), ages 18-24. These individuals were tested to see the differences between subjective responses to the workout versus objective physiological responses. Subjects performed a dynamic warm up and 1 of 4 trials with at least 1 day separating each trial. Blood lactate was determined by finger stick and recorded every 3 min. following exercise bout. Heart rate was recorded prior to and immediately after exercise. RPE was also recorded immediately after workout. Results are shown below in table 1.

Table 1. Subjective and Objective Means±SD.

<table>
<thead>
<tr>
<th>Workout</th>
<th>Post ex La* (mmol/dl)</th>
<th>5-min Post La* (mmol/dl)</th>
<th>HR (bpm)</th>
<th>RPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track run</td>
<td>9.2±3.8</td>
<td>9.4±2.8</td>
<td>190.6±9.0</td>
<td>15.1±1.7</td>
</tr>
<tr>
<td>Stair Climb</td>
<td>10.9±3.5</td>
<td>12.6±3.9</td>
<td>186.3±16.5</td>
<td>15.8±1.6</td>
</tr>
<tr>
<td>Jumping</td>
<td>7.3±4.3</td>
<td>4.9±2.8</td>
<td>169.8±21.6</td>
<td>12.2±2.3</td>
</tr>
<tr>
<td>Swimming</td>
<td>8.9±2.5</td>
<td>7.7±2.5</td>
<td>156.4±17.5</td>
<td>13.7±2.1</td>
</tr>
</tbody>
</table>

*La = Blood Lactate concentration

Even though the stair climb was subjectively perceived to be the hardest, objective measures did not support this finding. Not one specific workout was most intense, but swimming revealed the lowest means in heart rate and RPE.

Differences in Athletes and Non-Athletes Quantity and Reasons for Consumption of Energy Drinks
Brooke M. Rugger, M.J. Kang, Jazmin R. Williams, & Ellen P. Russell; Faculty Mentor: Jerry Mayhew

Energy drink (ED) consumption has gained popularity among college students. The purpose of this study was to compare ED consumption patterns and reasons behind their usage among collegiate athletes and non-athletes. Truman State University students (209 non-athletes and 185 athletes) completed a survey designed to assess reason for and patterns of ED consumption. The survey had participants rank usage (1 = never to 5 = always) for such items as counteracting insufficient sleep, increasing energy, enhancing endurance performance, enhancing strength during resistance training, mixing with alcohol, and staying alert while studying. Results revealed a nonsignificant difference ($X^2= 0.19$, $p>0.05$) between non-athletes (53%) and athletes (47%) in utilizing ED. Based on the percentage, more athletes consumed ED to increase energy (6.7%), and more non-athletes consumed EDs to mix with alcohol (11.1%). We conclude that energy drink use of college athletes is no more extensive than that of nonathletes.

Effect of Three-Week Perfect Push Up Workout on Percent Body Fat, BMI, and Muscle Mass in College Males
Andrew Piotter, Greg Daum, Jorden Bax; Faculty Mentor: Jerry Mayhew, Truman

The purpose of this study was to evaluate the effectiveness of the Perfect Push Up device. College men (n = 13, age = 18.9 ± 2.4 y) were assessed for weight, flexed arm circumference, chest circumference, triceps skinfold, arm-to-arm bioelectrical impedance analysis (BIA) percent fat, leg-to-leg BIA, arm cross-sectional area (CSA), arm and leg lean body mass (LBM), and maximum number of regular push-ups
performed. Subjects trained every other day for 3 wks. following the Perfect Push Up workout routine. After training, the following measurements were found to be significant: chest circumference increased by $1.32 \pm 1.88$ cm, leg BIA decreased by $1.73 \pm 1.73\%$, arm CSA increased by $2.23 \pm 3.46$ cm, and maximum number of push-ups performed increased by $11.15 \pm 4.83$. The Perfect Push Up routine appears to improve muscular endurance while reducing upper body fat and increasing muscle mass.

**Effects of Auditory Distraction on Fine Motor Skill Performance**  
*Seth Donaldson, Taylor Elwell, Camden Stockton, Kyle Veazey*  
Fine motor skills appear at risk for substantial impairment from different types of auditory interference, especially in a college student population. This study examined the effect of semantic interference, tonal interference, and silence on fine motor skill performance. A group of 25 college students at Truman State University (10 males, 15 females, mean age $19.74 \pm .764$) completed the task of inserting a stylus into a series of holes that decrease in diameter. One of the three auditory distractions was randomly selected to be played during the completion of the task. Results revealed no significant difference in percent penalty in regards to the type of auditory distraction [$F(2,24)=.464$, $p=635$]. Fine motor skill performance was found by this study to be unaffected by different types of auditory distraction.

**Relationship Of Leg Strength Tests To Performance Drills In College Football Players**  
*M.J. Kang & Kyle Veazey; Faculty Mentor: Liz Jorn & Jerry Mayhew*  
The purpose of this study was to examine the relationship of lower body strength measures to running and jump drills in college football players. Fifty-six NCAA Division II varsity football players performed 1-RM test on back squat (SQ) and power clean (PC). In addition, they completed the following drills: pro-agility shuttle (PA), 3-cone drill (3CD), vertical jump (VJ), and standing broad jump (SBJ). PC was not significantly related to any of the performance drills ($r = -0.06$ to $0.17$). SQ was significantly related ($p<0.05$) to PA ($r = 0.35$), 3CD ($r = 0.35$), and SBJ ($r = -0.36$), but not to VJ ($r = -0.25$, $p = 0.08$). All performance drills were highly related to one another ($r = -0.70$ to $0.89$), while SQ and PC were only moderately related ($r = 0.48$). Factor analysis isolated vertical jump, pro-agility shuttle, and squat as the best tests from among all measures.

**Types and Frequency of Injuries in an NCAA Division II University**  
*Sara Yunghans, Katie Pitts, Tess Poelker, Truman; Advisor: Dr. Jerry Mayhew*  
Determining the frequency of specific injuries within a sport leads investigators to establish which sport is the most high-risk. **Our purpose was** to determine the frequency of injury relating to sports at Truman State University, Kirksville, MO, an NCAA division II institution. **College students**, 48 women (height=$66.7 \pm 2.5$ in, weight=$150.5 \pm 23.8$ lbs, and age=$20.0 \pm 1.0$ years) and 131 men (height=$73.0 \pm 3.2$ in, weight=$211.4 \pm 40.0$ lbs, and age=$20.0 \pm 1.2$ years) were surveyed. The survey included the following list of injuries: concussion, sprain, fracture, muscle strain/pulled muscle, torn muscle, torn ligament, dislocation, severe bruise, severe cut, and other. The frequency of each injury was calculated. The greatest frequency of each injury, except severe cuts and severe bruises, occurred in football. Men’s swimming ran the highest risk of developing an injury in 5 out of the 10 types of injuries. Muscle strains and sprains were the most frequently occurring injuries, while torn muscles were the least frequent. In conclusion, football and swimming have a higher frequency of injury than other sports at Truman State University and baseball and softball have the lowest frequencies. Additionally, sprains and muscle strains were the most common injury among the athletes. Improvements in equipment, practice protocols and safety standards can be made in response to these data.
Nutritional Habits Of On-Campus College Students  
**Sara E. Yunghans & Katherine R. Pitts; Faculty Mentor: Liz Jorn**  
The purpose of this study was to investigate the nutritional habits of on-campus college students. Eighty students (M=30, F=50) completed a questionnaire which focused on eating choices, exercise habits and nutritional knowledge. Results of the study indicated that 42.5% of the subjects ate breakfast daily, 30% were choosing 100% whole wheat bread, and 45% were drinking soda on a regular basis. While there was not a significant difference between the consumption of fruits and vegetables for males and females, an independent *t*-test showed that males were choosing fast food type options significantly more than females (*t*=2.6, *p*<0.05). Subjects also stated that more nutrition education might be beneficial, particularly focusing on portion sizes. Results of this study may be of interest to on-campus health departments and instructors of lifetime health and fitness classes.

Comparison of Muscle Activity When Using Free Weights vs. Elastic Resistance  
**Phi Ho, Autumn McEachern, & Michael Bird, Truman**  
The purpose of this study was to compare muscle activation differences between free weights and elastic resistance in a tricep exercise. Twenty subjects participated (12 male, 8 female, age: 20.55 ± 1.05 yrs, height: 1.74 ± 0.09m, weight: 27.34 ± 13.68kg). Surface EMG electrodes were attached to the bellies of the long and lateral head of the triceps and the posterior deltoid. An electrogoniometer was attached at the elbow. Subjects performed ten repetitions of a tricep kickback. Five were performed using a 5 pound dumbbell and five with Theraband of equal resistance. To control for fatigue, order of resistance type was randomized and a 2 min. rest interval was provided. Data was collected using a Delsys EMG system at a sampling rate of 1000Hz. Data was rectified and filtered using a low pass Butterworth routine. Elbow extension data was split into thirds and the values for each third were integrated. Paired *t*-tests were used to compare integrated muscle activation for each third of the ROM across each resistance type. A Bonferroni corrected alpha level of 0.017 was used. There were no significant (*p*>0.017) differences in muscle activation in the lateral head of the tricep, long head of the tricep, or the posterior deltoid when using Theraband versus dumbbells when performing a tricep kickback. For these muscles there is no difference in muscle activation when using either dumbbells or Theraband, meaning therapists can use either resistance type during therapy. However, deeper muscles involved in controlling the movement may differ in activation.

Effect of Competition on 40-yd Dash Performance in College Men and Women  
**Caroline E. Squires, Grace K. Culler, & Kimberly D. Elsea; Faculty Mentors: Chris D. Lantz & Jerry Mayhew**  
This study investigated the effects of competition on 40-yard dash time relative to gender. Twenty Exercise Science students (10 Males; 10 Females) were electronically timed in individual 40-yard sprints. Following rest period, subjects were matched according to gender and dash time. The pair then completed a second 40-yard sprint. Overall results showed significantly faster sprint times when running against a competitor (*t*(18)=2.688, *p*= 0.015] compared to running individually. More specifically, males ran significantly faster in the paired trails than when performing individually (*t*(8)=4.429, *p*=.002), however females times between the two conditions did not differ significantly (*t*(9)=1.125, *p*=0.290). It appears that competition may facilitate performance in males but not females. Future research should explore competitiveness in order to more fully understand these differences.

Effect Of Caffeine Consumption On 40-Yard Dash Performance  
**Stephanie Schultz, Dani Steele, Jennifer Hawkins, and Richie Schumacher; Faculty**
**Mentor: Chris Lantz, Truman**
The purpose of this study was to determine the effect of caffeine on 40-yd dash performance relative to caffeine tolerance and training volume. Twenty Exercise Science students completed a 40-yd dash under caffeine and placebo conditions. The caffeine dose was 6 mg/kg of body weight for each individual and the placebo was a sugar pill. Sprints were timed electronically and were performed 50 minutes after ingesting either the placebo or caffeine. A paired samples $t$-test revealed no significant difference between the 40-yd dash times with and without caffeine ($t(19) = 2.084$, $p > 0.05$). Separate independent $t$-tests revealed no significant differences between subjects classified as low or high caffeine tolerance individuals ($t(17) = 1.817$, $p > 0.05$) or between subjects classified as having a low- or high-volume training background ($t(18) = 1.212$, $p > 0.05$). These results support previous studies that showed little effect of caffeine on short-term, explosive muscular performance.

**Evaluation of a Velocity Throwing Program in Collegiate Baseball Pitchers**
*Kyle Veazey & M.J. Kang, Truman; Faculty Advisors: Liz Jorn & Jerry Mayhew*
The purpose of this study was to evaluate the effect of a 3-week velocity throwing program on the ball speed of a group of Division II collegiate baseball pitchers. Eleven varsity pitchers completed five progressive steps of the specific velocity training program 3 times per week for 5 weeks. Maximum velocities were recorded via a radar gun for each pitch. Results revealed no significant difference ($p>0.05$) in pitching velocity between torque positions 1 (66.1 ± 3.7 mph) and 2 (66.1 ± 3.3 mph), but significant differences ($p<0.05$) among torque positions 3 (72.4 ± 4.3 mph), 4 (74.0 ± 3.7 mph), and 5 (75.9 ± 3.6 mph). There were no significant trials effects across the 3 weeks and no significant trials x torque position interaction. The short duration of the program may not have allowed sufficient time to produce increases in pitching velocity at each torque position.

**Optimal Recovery Time For Postactivation Potentiation In Vertical Jump**
*Mike Reese, Logan Terry, William Jenkins, & Matt Kiblinger; Faculty Mentors: Chris Lantz & Jerry Mayhew*
After completing a bout of heavy resistance training, such as squatting, the involved muscles experience both fatigue and potentiation. Previous research has yet to show agreement on optimal recovery time required between heavy resistance exercise and successive muscle performance in explosive activity. The purpose of this study was to determine the effect of recovery time following a bout of heavy resistance exercise on vertical jump performance. Seven collegiate male athletes performed countermovement vertical jumps at 0, 4, 8, and 12 minutes following the heavy resistance exercise. The resistance exercise consisted of three sets of varied repetitions at 50, 70, and 80 % of their one-repetition maximum squat. A repeated-measures ANOVA found no significant difference among the vertical jumps following the four recovery periods ($F(3,36)=0.61$, $p=0.68$). Countermovement vertical jump performance may not be significantly enhanced following bouts of heavy resistance training regardless of the rest period used following potentiation exercise.
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Editors, 2011

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