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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McSwegin Award Paper

Relationship of Anthropometric Measurements and Body Composition to Upper-Body Power in Baseball Players

Devon Myers

The purpose of this study was to explore the relationship among anthropometric measurements, body composition, and upper-body power in male athletes. Eleven NCAA Division II college baseball players were measured for 3 muscle circumferences, %fat, and Fat-Free Mass (FFM) via skinfold prediction. Upper-body power output was evaluated using an accelerometer from a Bench Press Throw (BPT) with a standard 45-lb barbell on a specially designed Smith machine. Peak power taken from 3 BPTs significantly correlated with FFM ($r = 0.64$) but not to any other measurement ($r = 0.22$ to $0.31$). Upper-body power appears to be related much more to a global aspect of total muscle mass (i.e., FFM) than to specific upper-body dimensions in male athletes.

Previous research has noted varying degrees of association between muscle size and strength. Arm and chest circumferences and Fat-Free Mass (FFM) have been shown to be highly related to one-repetition (1RM) bench press in untrained individuals (Mayhew, Ball, Ward, Hart & Arnold, 1991) and athletes (Mayhew, Bemben, Piper, Ware, Rohrs & Bemben, 1993a; Mayhew, McCormick, Piper, Kurth & Arnold, 1993b; Bale, Colley, Mayhew & Piper, 1994). When FFM is held constant by partial correlation, the relationship of regional dimensions such as arm and chest size to 1RM strength performances drops significantly.

Less information appears to be available concerning the relationship between anthropometric dimensions and muscular power. In a study on college football players, positive correlations were noted for body mass and FFM with power production (Mayhew, Piper, Schwegler & Ball, 1989). A confounding effect in those relationships was the fact that body mass is an integral part of the calculation of power when using the Margaria-Kalamen stair run power test. Confirmation of this was noted when measuring untrained men and women (Mayhew, Hancock, Rollison, Ball & Bowen, 2001). Unfortunately no regional anthropometric dimensions such as leg length or
leg circumference were measured to evaluate the impact of FFM on the relationship between those variables and anaerobic power. When anaerobic power has been assessed using vertical jumps performed on a force plate, body mass has often been included in the prediction equations indicating the positive effect of size on power generation (Johnson & Bahamonde, 1996; Sayer, Harackiewicz, Harman, Frykman & Rosensatein, 1999; Lara, Abian, Alegre, Jimenez & Aguado, 2006).

In recent years, the interest in FFM and its effect on athletic performance has grown. This growing interest has resulted from findings showing an increase in power based on an increase in FFM (Mayhew, Piper, Schwegler & Ball, 1989; Mayhew, Bemben, Rohrs & Bemben, 1991). In studies of young wrestlers, a significant, positive correlation was found between power and FFM (Mayhew, Bemben & Rohrs, 1992; Roemmich & Sinning, 1996). Discovering more about the relationship between LBM and power could be vital to athletes looking for ways to increase power and performance.

Earlier studies have shown there to be a probable relationship between an individual’s muscle girth and their absolute power (Wilmore, 1974; Mayhew, Piper, Schwegler & Ball, 1989; Mayhew, Bemben & Rohrs, 1992; Mayhew, McCormick, Piper, Kurth & Arnold, 1993b). If this relationship is substantial, athletes should be able to increase their power performance more efficiently by simply gaining more size in specific muscles. In order to determine the true relationship between anthropometric dimensions and power, however, the test should not be dependent on body mass as part of the calculation as in the Margaria-Kalamen test (Mayhew, Piper, Schwegler & Ball, 1989). Recent focus on the use of Bench Press Throws (BPT) as a measure of upper-body power may serve to eliminate the dependence on body mass and focus on the mass of an external object.

If the premise that increased FFM, and specifically greater individual muscle dimensions, are associated with greater power output, it would be beneficial to athletes and conditioning specialists to determine the magnitude of these relationships to evaluate the feasibility of increasing muscle size to produce more power. Therefore, the goal of this study was to explore the relationship between anthropometric measurements, body composition, and power output in male athletes using a BPT test.

**Methods**

**Subjects.** NCAA Division II college baseball players \( n = 11 \) volunteered to participate. The study was explained to the participants and a signed consent form was obtained prior to testing. This study was approved by the IRB for the protection of human subjects prior to data collection. Physical characteristics are shown in Table 1.

**Procedure.** Subjects were measured for standing height using a wall stadiometer. Subjects’ weights were also collected using a certified digital scale.
Table 1
Physical Characteristics Of Baseball Players (n = 11)

<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD</th>
<th>Range</th>
<th>Correlation with:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bench Press Power</td>
</tr>
<tr>
<td>Age (y)</td>
<td>20.2 ± 1.3</td>
<td>19.0 – 22.0</td>
<td>0.01</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>182.8 ± 5.1</td>
<td>175.0 – 191.5</td>
<td>0.04</td>
</tr>
<tr>
<td>Body mass (kg)</td>
<td>88.8 ± 13.4</td>
<td>74.8 – 119.3</td>
<td>0.51</td>
</tr>
<tr>
<td>Fat-Free Mass (kg)</td>
<td>78.4 ± 6.8</td>
<td>68.3 – 89.4</td>
<td>0.64*</td>
</tr>
<tr>
<td>Fat Mass (kg)</td>
<td>10.4 ± 7.4</td>
<td>5.4 – 30.0</td>
<td>0.34</td>
</tr>
<tr>
<td>%fat</td>
<td>11.0 ± 5.5</td>
<td>7.2 – 25.1</td>
<td>0.34</td>
</tr>
<tr>
<td>Arm CIR (cm)</td>
<td>37.0 ± 2.2</td>
<td>34.4 – 42.4</td>
<td>0.31</td>
</tr>
<tr>
<td>Forearm CIR (cm)</td>
<td>30.6 ± 1.3</td>
<td>28.8 – 32.9</td>
<td>0.54</td>
</tr>
<tr>
<td>Chest CIR (cm)</td>
<td>105.9 ± 7.6</td>
<td>97.0 – 120.8</td>
<td>0.22</td>
</tr>
<tr>
<td>Bench Press Power (W)</td>
<td>507 ± 45</td>
<td>431 – 568</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at p<0.05
**Significant at p<0.01

Muscle circumferences of the flexed arm and forearm, as well as the relaxed chest, were measured three times using a calibrated fiberglass measuring tape according to standardized procedures (Lohman, Roche & Martorell, 1988). Skinfold measurements were made at the chest, abdomen, and thigh sites using Harpenden calipers (John Bull, British Indicators, Ltd, England). Three measurements were taken at each location, and the average of each was summed. Body density was predicted using the sum of the three skinfolds with the Jackson-Pollock equation (1978) and converted to %fat using the Siri equation (Siri, 1961). Fat Mass (FM) was determined from Body Mass (BM) x %fat/100. FFM was estimated from BM minus FM.

Subjects were tested for upper-body power output using a BPT with a standard 20.4-kg barbell on a specially designed apparatus (Cormax 1000, Moorhead, MN). Peak bar velocity and power were recorded from an accelerometer (Myotest, Lausanne, Switzerland). Subjects were allowed one practice throw to acclimate themselves with the apparatus. They then performed three BPT ensuring both feet were firmly planted on the ground and the back remained in contact with the bench. Participants were given a 1-min. recovery between throws. The highest power output from the three throws was recorded. Participants were given no knowledge of their results during testing, and testing was isolated from other subjects not in direct participation.
Results

FFM was the only anthropometric variable that was significantly correlated with bench press power (see Table 1). However, bench press velocity was significantly correlated with BM, FFM, and forearm circumference (see Table 1). BM was significantly correlated with FFM ($r = 0.94$), FM ($r = 0.95$), %fat ($r = 0.93$), arm circumference ($r = 0.82$), forearm circumference ($r = 0.68$), and chest circumference ($r = 0.88$). Arm circumference was significantly correlated with forearm circumference ($r = 0.69$) but not with chest circumference ($r = 0.57$). Forearm circumference was not significantly correlated with chest circumference ($r = 0.52$). When the effect of FFM was statistically controlled by partial correlation, the relationships of power with anthropometric variables decreased and in some cases were reversed in magnitude (see Table 2). A similar pattern was noted for the partial correlations of bench throw velocity with arm, forearm, and chest circumferences when the effect of FFM was held constant.

<table>
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<td>Correlations Of Physical Characteristics With Bench Press Power Controlling For Fat-Free Mass And %Fat (n = 11)</td>
</tr>
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</table>

<table>
<thead>
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<th>Variable</th>
<th>Power (W)</th>
<th>Power: FFM</th>
<th>Power: %fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>0.04</td>
<td>-0.50</td>
<td>-0.19</td>
</tr>
<tr>
<td>Body Mass (kg)</td>
<td>0.51</td>
<td>-0.33</td>
<td>0.57</td>
</tr>
<tr>
<td>Fat-Free Mass (kg)</td>
<td>0.64*</td>
<td>-0.33</td>
<td>0.27</td>
</tr>
<tr>
<td>Fat Mass (kg)</td>
<td>0.34</td>
<td>-0.33</td>
<td>0.04</td>
</tr>
<tr>
<td>%fat</td>
<td>0.34</td>
<td>-0.27</td>
<td>0.05</td>
</tr>
<tr>
<td>Arm CIR (cm)</td>
<td>0.31</td>
<td>-0.22</td>
<td>0.05</td>
</tr>
<tr>
<td>Forearm CIR (cm)</td>
<td>0.55</td>
<td>0.23</td>
<td>0.46</td>
</tr>
<tr>
<td>Chest CIR (cm)</td>
<td>0.22</td>
<td>-0.64*</td>
<td>-0.13</td>
</tr>
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</table>

*Significant at p<0.05. aFFM was held constant by partial correlation. b%fat was held constant by partial correlation.

Linear regression analysis indicated that FFM produced a prediction of bench press power with a standard error of estimate (SEE = 36 W) that yielded a coefficient of variation of 7% (%CV = SEE/Mean x 100). A hierarchical linear regression in which selected anthropometric variables were added in sequential steps after including FFM revealed that the inclusion of chest circumference raised the multiple correlation to $R = 0.81$ but lowered the SEE only to 30 W (%CV = 6%). Interestingly, the regression coefficient for chest circumference after the inclusion of FFM was negative, indicating that a
smaller chest circumference contributed to a greater bench press power. This approach produced better results than when adding either arm circumference ($R = 0.66$, $SEE = 38$ W, $\%CV = 7\%$) or forearm circumference ($R = 0.67$, $SEE = 37$ W, $\%CV = 7\%$) to FFM for estimating BPT.

**Discussion**

This study demonstrated that the global dimension of FFM was a better indicator of bench press power than any single anthropometric variable or combination of variables. This supported previous work noted in various populations (Mayhew, Piper, Schwegler & Ball, 1889; Bale, Colley, Mayhew & Piper, 1994; Roemmich & Sinning, 1996). In the current sample, the findings suggest that an increase in explosive upper-body power in baseball players would result from an increase in overall muscle mass rather than concentrating on specific limb or chest dimensions. Recently, Szymanski et al. (2010) and Szymanski, Beiser, Bassett, Till & Szymanski (2011) found moderate correlations ($r = 0.46$ to $0.51$) between LBM and bat velocity which were not significantly different from the correlation between bench press power and FFM in the current study (see Table 1). Although absolute bench press strength may be correlated with body mass and FFM (Mayhew, Piper & Ware, 1999), it may be poorly correlated ($r = 0.21$) with bat velocity (Szymanski et al., 2011). Thus, it might appear to be premature to suggest resistance training to increase muscle size in the upper body under the assumption that baseball performance will improve. Moreover, concentration on upper-body muscle development in the absence of leg development might limit total body contribution to improvement in power (Szymanski et al., 2007; Till et al., 2011).

The current study did not measure bat speed or throwing velocity and hence no comment can be made on the relationship of a bench press throw to either of these performance factors. Furthermore, the current study did not determine the contribution of upper-body strength (i.e., 1RM bench press) to bat speed or throwing velocity. Szymanski et al. (2010) have noted a slight increase in the correlation between LBM and bat velocity ($r = 0.59$ to $r = 0.64$) following resistance training, which was similar to the improvement in correlation between bat velocity and 1RM bench press ($r = 0.56$ to $r = 0.65$). What is interesting in the current study is the fact that the relationships between bench press power and arm dimensions appeared to be reduced when FFM was held constant. This offered further support to the assumption that overall body size is more of a factor in BPT than are specific upper-body dimensions. However, this remains speculative due to the small sample size in the current study and the non-specific nature of the power measure relative to skills exhibited in baseball. It would be interesting to assess the relationship of the current bench press power technique to various specific baseball skills such as throwing velocity and batting performance.

Szymanski et al. (2010) noted that a rotational medicine ball throw was significantly correlated with bat velocity ($r = 0.60$) in high school players. Bat
velocity was also significantly correlated with LBM ($r = 0.61$) to a similar degree. However, the authors did not determine the effect of statistically holding constant the contribution of LBM to the correlation between rotational strength and bat velocity, making it difficult to assess the interaction among these variables. Szymanski et al. (2007) showed that increases in rotational medicine ball throw was moderately associated ($r = 0.45$) with increases in bat velocity angular. Missing from these studies was any analysis of hitting performance under simulated or game conditions.

In summary, this preliminary study suggests that players with larger LBM have the potential to produce more power in a linear upper-body movement. Left in question is the degree to which such power has any effect on batting performance or throwing velocity. Subsequent studies might focus on the degree of transfer from resistance and/or power exercises to on-the-field performance.

References


**DEVON MYERS** is an Exercise Science major with a pre-med concentration at Truman State University. He is a four-year starter for the Truman baseball team, holding the school record in number of hits. He plans to begin medical school in the Fall of 2013.
This is the third of a series of three articles addressing various components of the lifetime sport of kayaking. In the first article, published in the 2008 MOAHPERD Journal, the authors briefly introduced the history of kayaking, discussed the variety of kayaks that can be purchased or rented along with why one type of kayak should be chosen over another, and reviewed the fundamental skills necessary to complete the Eskimo Roll. Drawings were included to illustrate the Eskimo Roll. In the second article, published in the 2010 MOAHPERD Journal, the authors highlighted the various components of whitewater classification, the basics of reading a river for safe travel, the techniques of surfing a wave and the techniques needed to boof a wave. Photographs of one of the authors were used to illustrate the discussion of surfing and boofing a wave. In this third and final article, the authors address three major topics: the importance of choosing a paddle, personal flotation device (PFD) and helmet, basic paddling skills, and what to do now that you’ve learned the basics.

Paddles, Personal Flotation Devices (PFD’s), and Helmets

It was shared long ago, in the sport of alpine skiing, that the poles one uses are the least important pieces of equipment to the overall aspect of the sport. The same could be said on the choice of paddles in kayaking. After all, the paddle is just a stick with some wider blades on each end. How tough can the decision be? The answer lies in the skill level of the paddler. Just as the expert skier will have much more complex ski poles than the beginner, the advanced paddler will need a more complex and expensive paddle. As one can imagine, there are as many variations of paddles as there are people who pursue the sport and as there are manufacturers that produce the paddles.

According to Kayak Online, “Choosing a Kayak Paddle”, (www.kayakonline.com/choosing_a_paddle.html) and About.Com, “Your Guide to Buy the Right Kayak Paddle”, (http://paddling.about.com/od/gearequipment/a/Choose_Paddle.htm), there are three criteria for choosing a paddle: “the type of paddling you’ll be doing-touring or whitewater, your height and body strength and the width and length of your kayak”. Paddles can be made from a large variety of materials and the choice of materials again depends on the skill level of the paddler and the type of water he or she
will be paddling. Materials currently used in making paddles are “fiberglass, plastic, aluminum, graphite, Kevlar, carbon and wood” (www.kayakonline.com/choosing_a_paddle.html).

Paddle blades can be flat or curved, symmetrical or asymmetrical. Each type of blade performs differently in different types of water. Paddle shafts can be long or short, curved or straight. Obviously, the major criteria here is that it’s long enough to reach the water on both sides of the kayak without making the paddler lean to the right and left each time the blade goes into the water, thus unnecessarily tipping the boat. So, what’s the bottom line on paddles? Beginners should purchase the simplest and least expensive, yet productive paddle they can. As their skills advance, the paddler will understand the necessity of higher quality and styles of paddles.

Helmets and personal flotation devices (PFD’s) are critical to the safety of the paddler and should always be worn. As indicated in the previous articles, kayaking is a water sport where the questions are not if you’ll ever flip the boat over, but when and how often you will flip over and how you will be able to respond when the boat does flip and you find yourself upside down and underwater? In addition, as the reader may remember from previous articles, many whitewater kayakers intentionally flip the boat over to practice specific advanced skills. The key to responding has a great deal to do with what initially happens to the boater when the kayak flips. In shallow and whitewater situations, there are dangers lurking under the surface of the water: rocks, limbs, and sandy bottoms to the river and lakebeds. Helmets are designed to protect our skulls. Experienced kayakers will proudly display scars, nicks and gashes on the outside of their helmets knowing that those marks could have been on their heads.

According to About.Com, “The Anatomy of a Kayak Helmet”, (http://paddling.about.com/od/gearequipment/a/kayak_helmet_parts.htm) there are three critical parts to the helmet that must be considered: the shell, lining, and straps that are used to secure the helmet to the head. The shell should be of hard plastic, tough enough to withhold up under sudden contact with the rocks on the shallow river or lake bottom. Some helmets are designed to not only protect the top and sides of the head, but to cover ears with slats or holes over the ears so the paddler can still hear. Other helmets are simply “skull caps” and may be preferred by the paddler. Truly, the choice is up to each individual boater. The lining should have a series of high-density foam pads that would help absorb the shock imparted by a collision to the head. Finally, the straps needed to secure the helmet should come from the sides of the helmet around the front and back of the ears and secure under the chin with a buckling system usually made of rigid plastic. Obviously, there are a variety of helmets in many different styles and colors from which the paddler can choose. Note the boater in Figure 1 modeling a skullcap helmet, PFD and symmetrical paddle with a graphite shaft while boating in a whitewater kayak.

Along with the helmet, the personal flotation device or PFD (also called a life preserver) is, without question, the most important piece of equipment a boater can wear. It’s an unfortunate fact of life in the boating world that numerous people die as a result of drowning each year in boating accidents. However, these tragedies appear to be fewer in number in the world of
kayaking because kayakers appear to know about and believe in the dangers of their sport and, consequently, don’t hesitate to wear PFD’s.

PFD’s come in a variety of shapes, sizes and configurations. Effectiveness, style and color appear to be the major factors in choosing a PFD. It must be able to hold the unconscious kayaker above the surface of the water, thus making them available for rescue. After that, the choices are purely cosmetic and left to the personal discretions of the boater.

![Figure 1](image)

**Basic Paddling Skills**

According to Wes Kisting in “Paddle Smarter” ([http://www.roguepaddler.com/tweak.htm](http://www.roguepaddler.com/tweak.htm)), there are five basic fundamentals needed to improve your skills as a paddler. First, **Rotate Your Torso**. While sitting inside the kayak, your legs will be braced against the pads on the inside of the boat, thus assisting in the balance of the boat in the water. While your legs are braced, the core of the body has a much better opportunity to rotate back and forth. As the arms are held straight in front of you and with the shaft of the paddle parallel to the water, one blade is lowered toward the water and the other lifted high above the head. The blade of the paddle is placed in the water and without bending the elbows you can begin paddling. This sequence brings up the second and third fundamentals of **Push and Pull** and **Minimize Stroke Lag**.

As the blade is dipped in the water with the right hand, there is a simultaneous motion of **pull** with the right hand and **push** with the left hand as the blade is moved through the water. As the stroke is completed, the left hand is now in front of the body and the right hand is next to the hip.
Quickly, by minimizing the stroke lag and with a slight rotation of the torso, the blade of the paddle in the left hand is quickly placed in the water and the same procedure is followed stroke after stroke.

Also, you should **Increase Your Angle** and **Relax Your Grip**. Notice the paddler in Figure 2 sitting upright, arms extended with elbows almost straight, with one blade of the paddle deep in the water and the other almost facing straight up into the sky, pushing and pulling. This technique promotes power in the propulsion of the boat through the rapid water.

![Figure 2](image)

Finally, gripping the paddle too tightly promotes fatigue in the forearms and shoulders along with unnecessary injuries. Keep the grip firm, but loose. Think that you’re gripping a tiny bird, holding it just tight enough to keep it from flying away.

**I Can Paddle! Now What Do I Do?**

Options for kayaking are limited only to ones imagination and skill level. For the authors, thoughts go immediately back to day trips down a large variety of rivers in Colorado, Missouri, Montana, Virginia and Wyoming. Most of these rivers were whitewater rivers (see *MOAHPERD Journal* 2010), which created tremendous memories of father and son spending time together. The adventures were well planned, knowing what rivers to float and, specifically, which portions of those rivers to float. In addition, the trip
was planned for the best place to begin the trip as well as end it, making sure to have a car parked and available for pick up at the end of the run. Great care was taken to plan for snacks and drinks for the day and to read up on topographical maps, Internet sites and State Department of Conservation maps, that addressed the complexity of the river sections, the speed of the rivers and the time it would take to float each portion of the river. Caution proved to be the best source of information to keep us out of harms way and off of Class V sections of the rivers.

Other options for kayaking trips include overnight excursions. As one can imagine, these trips take more planning than the day excursions. As with the day trips, boaters must be concerned about river characteristics and difficulty, where to begin and end the trip and availability of transportation to and from the rivers. Although most kayaks don’t have a lot of additional storage space, some do. With this in mind, in order to make an overnight trip successful and enjoyable, questions have to be answered and plans have to be made well before the trip. Will you be sleeping in a local hotel/motel at the end of a day’s paddling or will you be camping along the river in a tent with some sleeping bags? Will you be eating in restaurants/cafes near the river or will you be cooking your own food over a campfire or cook stove? Where will you find safe drinking water or will you be using a tested and qualified water purifying system? Will you be carrying all the extra equipment you’ll need in your own boats, have another boat being towed along behind or have someone else drive along the river path and deliver food and supplies to you at predetermined locations? What precautions will be made to address the presence of bugs and other animals? Will you need to take along incidentals like matches, flashlights, lanterns, toilet paper, cooking utensils, etc? What’s your plan to dispose of the trash that you’ll accumulate during your two to three day trip? As you can imagine, the questions appear to be limitless, but are narrowed down as boaters become more experienced in overnight trips.

Don’t let these questions dissuade you from making overnight trips along the river. Just know and understand that extra plans have to be made to make the trip a pleasant one. Wonderful memories of father and son times exist for one of the authors concerning overnight trips on Missouri rivers; memories that can never be replaced or erased. Memories led one son to grow up and show his own son the enjoyment of river running (Figure 3).

References
Kayak Online. “Choosing a Kayak Paddle”, (www.kayakonline.com/choosing_a_paddle.html)
Wes Kisting. “Paddle Smarter” (http://www.roguepaddler.com/tweak.htm),
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Preservice Teachers’ Beliefs about the Curricular Goals for Physical Education

Seidu Sofo, Daniel H. Beard, Annette Slattery, and Shewanee Howard

The purpose of this study was to examine preservice teachers’ beliefs about the curricular goals for physical education (PE). Participants included a purposive criterion sample (Patton, 2002) of 74 preservice teachers—made up of 40 preservice physical education teachers (PPETs) and 34 preservice classroom teachers (PCTs). An open-ended questionnaire served as the main data source. Data were analyzed using qualitative content analysis (Mayring, 2000; Patton, 2002). The inductive analysis yielded six categories: physical activity and fitness, healthy lifestyles, cognitive development, emotional well-being, social development, and motor skill development. The deductive analysis indicated PPETs’ ratings of curricular outcomes for PE differed from that of PCTs’. Teacher educators should guide PTs to align their beliefs to the curricular outcomes consistent with PE content standards.

In response to educational reforms in the 1980’s, the National Association for Sport and Physical Education [NASPE] (1995) developed the first ever national content standards for physical education. The seven standards were later revised to six standards (NASPE, 2004). The content standards define what K-12 students “should know and be able to do as result of a quality physical education program” (NASPE, 2004, p. 3). Missouri, like other states, developed state standards in line with the national standards (Missouri Department of Elementary and Secondary Education [DESE], 1996). The state later developed the physical education grade level expectations [GLEs] (DESE, 2007), to align with the Missouri “Show-Me Standards.” The GLEs are intended to achieve district objectives to meet the “Show-Me Standards.”

The critical role of teachers’ beliefs in teaching and teacher education has been well documented (Pajares, 1992). Some educators and researchers have called for a shift from teaching strategies and behaviors to teachers’ beliefs about the use of those strategies and behaviors (see for example, Richardson, 1996). The shift, according to Rovegno (2003), would allow researchers and teacher educators better understand why teachers teach the way they do. Furthermore, O’Sullivan (2003) argued that to influence
prospective teachers’ perceptions of teaching and learning, teacher educators need to address teachers’ beliefs. The tendency for teachers to rely on past experiences, according to Pajares (1992), makes the study of educational beliefs problematic because teaching and the teacher’s work is often not explicitly defined (Pajares, 1992). To exacerbate the situation, preservice teachers (PTs) enter teacher education programs with established beliefs about teaching and learning (Doolittle, Dodds, & Placek, 1993; Kagan, 1992; Lortie, 1975).

Inservice Physical Education Teachers’ Beliefs

Physical education inservice teachers’ beliefs about teaching have been documented with varied results. Some studies suggest consistency between teachers’ beliefs and their practice (Chen & Ennis, 1996) while others have reported inconsistent results (Kulinna, Silverman, & Keating, 2000). For example, elementary and secondary physical education teachers rated the development of motor skills as the highest curricular goal, followed by physical fitness and participation in physical activity (Lambdin & Steinhardt, 1991). In contrast, teachers in Kulinna and Silverman’s (2000) study rated physical activity leading to fitness as their top priority.

Preservice Physical Education Teachers’ Beliefs

Research suggests that preservice physical education teachers’ (PPETs) most frequent belief about the goals of physical education was to teach motor skills or activities (O’Sullivan, 2003; Placek, Dodds, Doolittle, Portman, Ratliffe, & Pinkham, 1995). Placek et al. (1995) added that PPETs also identified the development of physical fitness as a curricular outcome. According to Doolittle et al. (1993), PTs’ prior beliefs serve as “filters” to what they accept or reject, and suggested that some of those beliefs are difficult to change. In another study, Matanin and Collier (2003) reported that PPETs assimilated only parts of program messages on teaching physical education—content, teaching effectiveness, and planning. Alternatively, they rejected program philosophy on the assessment of student learning. Furthermore, PPETs were less likely to assimilate messages about classroom management and the purposes of physical education, due to their early experiences.

Sofo and Curtner-Smith (2010) examined the beliefs of a cohort of PPETs enrolled in a secondary methods course during a semester. Early in the semester, the PPETs believed the purposes of physical education were to teach students to: play games and sport, live active lifestyles, understand health and physical fitness, and learn social skills (Sofo & Curtner-Smith, 2010). However, these PPETs could not elaborate on how to achieve these purposes.

Kulinna, Brusseau, Ferry, and Cothran (2010) reported PPETs did not view curricular goals as equally important. They perceived physical activity to be the most important curricular goal for physical education, followed by self-actualization, motor skill development, and social development in that order (Kulinna et al., 2010).

Preservice Classroom Teachers’ Beliefs

Research on the beliefs of preservice classroom teachers (PCTs) about
the purposes of physical education is scarce (Tsangaridou, 2006). Limited research in this area indicates that well planned physical education methods courses could have a positive impact on PCTs’ beliefs (Sofo, 2008; Xiang, Lowy, & McBride, 2002). Xiang et al. (2002), for example, suggested that a field-based elementary physical education methods course positively impacted a group of PCTs’ beliefs, but not their dispositions toward teaching the subject. These results further indicated the PCTs believed the purposes of physical education were to develop the whole child, teach students to improve their physical fitness and live active lives, help them develop personal and social skills, and teach motor skills (Xiang et al., 2002).

While the Xiang et al.’s (2002) study noted that a college methods course did not positively impact PCTs’ disposition to teach physical education, Sofo (2008) reported a physical education methods course positively influenced PCTs’ attitudes and dispositions toward integrating movement into their future elementary classrooms. After taking the methods course, PCTs further suggested they felt more confident integrating movement with academic concepts in the first year of teaching because they had acquired the necessary knowledge and skills. More research is needed in preservice teachers’ beliefs about the important curricular goals for physical education.

**Purpose of the Study**

Although teachers’ beliefs have been used extensively in the literature, the construct has rarely been clearly defined (Pajares, 1992). Nespor (1987), for example, lamented despite the influence of beliefs on how individuals learn from experience, there is limited research on the structure and function of those beliefs. Furthermore, Rokeach (1968) explained that a belief system is based on three assumptions: intensity and power—some beliefs are held more strongly than others; central-peripheral dimension—some beliefs are more important than others; and the more central a belief, the more it will resist change. Thus, teachers’ belief systems was deemed appropriate as the theoretical framework for this study.

Tsangaridou (2006) asserted that despite the recent attention on teachers’ beliefs, “there is inadequate research on teachers’ beliefs in physical education” (p. 498). Recent studies in physical education have utilized different types of instruments in an attempt to better understand teachers’ beliefs. For example, Kulinna and Silverman (2000) and Kulinna et al. (2010) utilized Likert-type scales rather than the forced-choice type formats used in previous studies. However, just as the forced-choice format, the Likert-type scale introduces ideas and concepts which participants may not have contemplated (Sofo & Curtner-Smith, 2010). Because it is important to listen to prospective teachers (Kulinna et al., 2010), this study utilized open-ended questions to provide PTs the opportunity to better express their perspectives. While quantitative responses are standardized and easy to analyze, qualitative responses are more detailed and varied in content (Patton, 2002). Thus, unlike forced-choice formats, open-ended items allow participants to freely express their feelings and understanding of the issue being investigated. As Denzin (1978) lamented, too often social science researchers enter the field with “preconceptions that prevent them from allowing those studied to ‘tell it as they see it’” (p. 10).
Therefore, the purpose of this study was to utilize a qualitative approach to examine preservice teachers’ beliefs about the curricular goals for physical education. The following research questions guided the study: 1. What are PTs’ beliefs about the purposes of physical education? 2. Which physical education curricular outcomes do PTs perceive to be the most important? 3. Which physical education curricular outcomes do PTs perceive to be the least important?

Teachers’ beliefs influence their curricular decisions (Ennis, Ross, & Chen, 1992). Therefore, examining PTs’ perspectives may reveal new insights teacher educators may use to improve their professional preparation (O’Sullivan, 2003).

**Method**

**Participants and Setting**

Participants included a purposive criterion sample (Patton, 2002) of 74 PTs—40 PPETs (32 males and eight females) and 34 PCTs (three males and 31 females) at a regional university in Missouri. PTs’ class standing was the criterion used in the sample selection. Only PTs who were enrolled in or had already taken at least one physical education methods course were included in the study. In this paper, PTs refers to both PPETs and PCTs—that is when speaking of the group as a whole. The PTs in each group typically enroll in their first physical education methods course in the junior year. The investigators made it clear to the PTs that their participation in the study was voluntary and they may refuse to participate or discontinue their participation at any time without penalty or prejudice. The PTs were also informed that participation or lack thereof would in no way affect their grade in any course that they might be taking during the project.

The PPETs were at various stages of their teacher preparation program. They included four sophomores, 25 juniors, and 11 seniors. Thirty-six of the PPETs were Caucasian, with three African American, and one of Hispanic origin. The PCTs were enrolled in a junior level methods course that was aimed at teaching them how to integrate the Arts (movement, music, and art) throughout the elementary curriculum. PCTs included 24 elementary, six early childhood and four exceptional childhood education majors. Thirty-three of the PCTs were Caucasian while one was of Hispanic origin.

**Data Collection and Analysis**

Institutional Review Board (IRB) approval for the study was granted by the first three authors’ institution prior to data collection. In addition, each participant agreed to participate in the study by signing a consent form as required by the university’s IRB regulations.

An open-ended questionnaire was distributed to PTs during spring 2010, in their respective methods classes. The investigators sent the questionnaires home with participants who returned the completed questionnaires in sealed return envelopes the next class. The participants completed the questionnaire during the last week of classes. The questionnaire, in addition to eliciting demographic information, asked PTs the following questions:
1. In your opinion, what is the purpose of physical education? Please explain.
2. In your opinion, which physical education curricular outcomes should be emphasized the most in a school physical education curriculum? Please explain.
3. In your opinion, which physical education curricular outcomes should be emphasized the least or should not be included in a school physical education curriculum? Please explain.

Questionnaire Validation and Pilot Study
The earlier version of the questionnaire used in this study elicited information on: (a) the purpose of physical education, (b) physical education curricular outcomes that should be included in a school curriculum, (c) physical education curricular outcomes that should be emphasized, (d) physical education curricular outcomes that should be emphasized the least, and (e) physical education curricular outcomes that should not be included in a school curriculum. The questionnaire was sent to three PETE experts and two K-12 physical education teachers for content validity. Based on their comments, the second question was deleted, and the fourth and fifth questions were combined into one question.

The final version (3-item) of the questionnaire was pilot-tested with 11 PPETs and eight PCTs during spring 2009. Inductive analysis of the pilot data for research questions one and two yielded five categories: physical activity and fitness, healthy lifestyles, cognitive development, social development, and motor skill development. That for the third research question yielded three categories: competitive sports, dance, and physical fitness testing. Data were analyzed using qualitative content analysis (Mayring, 2000; Patton, 2002). Patton (2002) defines qualitative content analysis as “any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings” (p. 453). The analysis was completed in two phases: the inductive category development followed by a deductive category application.

Phase I: Inductive Category Development
The authors analyzed the data (open-ended questionnaires) inductively, allowing the categories to emerge (rather than a priori coding). The emergent coding allowed the authors to establish categories following some preliminary examination of the data (Stemler, 2001). The authors used the preservice teachers as the unit of analysis. The investigators analyzed PTs’ responses to one question at a time. First, they analyzed all 70 PTs’ responses to the first question— their views on the purposes of physical education. Then, the second question—their perspectives on which physical education curricular outcomes should be emphasized, followed by the third question.

The investigators followed the procedures recommended by Haney, Russell, Gulek, and Fierros (1998) in developing the inductive categories. First, the first and second authors independently read and re-read the completed questionnaires to come up with tentative categories. Second, the two coders shared the tentative categories with the other authors. Next, all the authors compared notes and reconciled the differences that showed up on the initial categories. This procedure served as a check and balance on each
member of the research team. One Physical Education Teacher Education (PETE) colleague did the peer debriefing for the investigators. At each stage of the analysis, the authors sent the tentative categories to the colleague for comments and to suggest any changes if necessary. The colleague returned comments without any suggestions for changes in the categories.

Phase II: Deductive Category Application

First, the investigators provided explicit definitions for each of the categories that emerged under the Inductive Category Development. Second, the first and second authors independently coded 12 randomly selected completed questionnaires using frequency counts. As Patton (2002) noted, qualitative content analysis does not need to exclude deductive reasoning. On attaining inter-rater reliabilities of 87.24%, 89.19%, and 92.31% for the first, second, and third questions respectively, the first author coded all 70 completed questionnaires, using frequency counts and percentages (see Tables 1, 2 and 3). The coding was completed over a period of five days. After coding 33 questionnaires, the first author conducted an intra-reliability check (on the third day of coding) using 13 randomly selected questionnaires. Upon obtaining intra-rater reliabilities of 88.46%, 90.63%, and 90.32% for the first, second, and third questions respectively, the first author proceeded to code the remaining 37 questionnaires.

Results

Quantitative Data

Purposes of Physical Education

The PTs made a total of 87 (PPETs) and 84 (PCTs) thoughts and perceptions about the purposes of physical education. As seen in Table 1, the highest percentage of both groups of PTs’ comments identified physical activity and fitness as a purpose of physical education, followed by healthy lifestyles. Alternatively, the lowest percentage of PPETs’ comments were in the cognitive and emotional development categories, while PCTs’ comments were in the motor skill development category.

Physical Education Curricular Goals To Be Emphasized The Most

Participants made a total of 62 (PPETs) and 70 (PCTs) statements about the physical education curricular goals they believed should be emphasized the most. In Table 2, the PPETs and PCTs both identified physical activity and fitness as the most important curricular goal followed by healthy lifestyles. The lowest percentage of PPETs and PCTs’ comments were in cognitive development and social development respectively.

The PPETs were more likely than PCTs to identify physical activity/fitness, healthy lifestyles, motor skill, and social development as the curricular outcomes to be emphasized the most. Conversely, the PCTs were more likely than PPETs to identify cognitive development and emotional well-being as curricular goals to be emphasized the most.
Table 1

Frequency and Percentage of Preservice Teachers’ Perceptions About The Purposes of Physical Education

<table>
<thead>
<tr>
<th>Category</th>
<th>Physical Education Preservice Teachers</th>
<th>Classroom Preservice Teachers</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n = 40 )</td>
<td>( n = 34 )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( f )</td>
<td>%</td>
<td>( f )</td>
</tr>
<tr>
<td>Physical Activity/Fitness</td>
<td>42</td>
<td>48.28</td>
<td>43</td>
</tr>
<tr>
<td>Healthy Lifestyles</td>
<td>21</td>
<td>24.14</td>
<td>13</td>
</tr>
<tr>
<td>Motor Skill Development</td>
<td>17</td>
<td>19.54</td>
<td>4</td>
</tr>
<tr>
<td>Cognitive Development</td>
<td>1</td>
<td>1.15</td>
<td>11</td>
</tr>
<tr>
<td>Emotional Well-being</td>
<td>1</td>
<td>1.15</td>
<td>7</td>
</tr>
<tr>
<td>Social Development</td>
<td>5</td>
<td>5.74</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>100.00</td>
<td>84</td>
</tr>
</tbody>
</table>

1>2 = PPETs indicated a greater percentage of comments than PCTs
2>1 = PCTs indicated a greater percentage of comments than PPETs

Physical Education Curricular Goals To Be Emphasized The Least

The PTs made a total of 24 (PPETs) and 36 (PCTs) statements about the goals they believed should be emphasized the least or should not be included in the physical education curriculum. Table 3 indicates the responses for 22 PPETs and 29 PCTs. Four PPETs and two PCTs left this question blank. In addition, 18 PPETs and three PCTs indicated they could not think of anything that should be emphasized the least or should not be included in the physical education curriculum.

Data in Table 3 note that both the PPETs and the PCTs identified competitive games and sport as the least important physical education curricular goal. However, PPETs had a greater percentage of comments in this category than the PCTs. Alternatively, PCTs were more likely than the PPETs to identify physical fitness testing and square and folk dances as the least important physical education curricular goals.
### Table 2

**Frequency And Percentage Of Preservice Teachers’ Perceptions About The Curricular Goals Of Physical Education To Be Emphasized The Most**

<table>
<thead>
<tr>
<th>Category</th>
<th>Physical Education Preservice Teachers (n = 40)</th>
<th>Classroom Preservice Teachers (n = 34)</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Physical Activity/Fitness</td>
<td>32</td>
<td>51.61</td>
<td>27</td>
</tr>
<tr>
<td>Healthy Lifestyles</td>
<td>14</td>
<td>22.58</td>
<td>12</td>
</tr>
<tr>
<td>Motor Skill Development</td>
<td>13</td>
<td>20.97</td>
<td>12</td>
</tr>
<tr>
<td>Cognitive Development</td>
<td>0</td>
<td>0.00</td>
<td>5</td>
</tr>
<tr>
<td>Emotional Well-being</td>
<td>1</td>
<td>1.61</td>
<td>13</td>
</tr>
<tr>
<td>Social Development</td>
<td>2</td>
<td>3.23</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>100.00</td>
<td>70</td>
</tr>
</tbody>
</table>

1>2 = PPETs indicated a greater percentage of comments than PCTs  
2>1 = PCTs indicated a greater percentage of comments than PPETs

### Table 3

**Frequency And Percentage Of Preservice Teachers’ Perceptions About The Curricular Goals Of Physical Education To Be Emphasized The Least**

<table>
<thead>
<tr>
<th>Category</th>
<th>Physical Education Preservice Teachers (n = 22)</th>
<th>Classroom Preservice Teachers (N = 29)</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Competitive games and sport</td>
<td>21</td>
<td>87.50</td>
<td>18</td>
</tr>
<tr>
<td>Physical fitness testing</td>
<td>1</td>
<td>4.17</td>
<td>11</td>
</tr>
<tr>
<td>Square and folk dances</td>
<td>2</td>
<td>8.33</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>100.00</td>
<td>36</td>
</tr>
</tbody>
</table>

1>2 = PPETs indicated a greater percentage of comments than PCTs  
2>1 = PCTs indicated a greater percentage of comments than PPETs
Summary of Quantitative Data

Physical activity/fitness was the most frequently mentioned comment by all PTs as the purpose of physical education. The least mentioned purposes of this subject were in cognitive development (PPETs) and motor skill development (PCTs). While PTs identified physical activity/fitness as the most mentioned purpose of physical education, they also indicated it should be the most emphasized curricular outcome in a physical education curriculum. It is worth noting the PCTs in this study were more likely to view cognitive and emotional developments as important physical education curricular outcomes than the PPETs. Conversely, the PPETs were more likely to view social development as an important curricular goal than the PCTs. The PTs overwhelmingly identified competitive games and sports as the curricular outcomes to be emphasized the least. In addition, the PTs’ comments suggested physical education curricula should de-emphasize physical fitness testing and square and folk dances.

Qualitative Data

The purpose of this study was to examine preservice teachers’ beliefs about the curricular goals for physical education. The study examined their beliefs about the purposes of physical education, curricular outcomes they perceived to be the most or the least important. All names used in this paper are pseudonyms.

Purposes of Physical Education

The first research question attempted to determine PTs’ beliefs about the purposes of physical education. The inductive analysis yielded six categories: physical activity and fitness, healthy lifestyles, cognitive development, emotional well-being, social development, and motor skill development.

Physical activity/Fitness. The PTs in this study identified physical activity and fitness as a purpose of physical education. They believed that physical education should “help individuals know and understand the importance of being physically active and being fit” (Nick, PPET). Lori, a PCT, added that the purpose of physical education was “to educate students about the benefits of physical activity on the body . . . and developing physical fitness.” Furthermore, PTs’ commented that physical education should teach students how to stay active. As Lynn (PCT) noted, “For some students, their time in PE is the only exercise they get. PE can help keep them more physically fit and in shape.” For this group of PTs, physical activity and fitness knowledge, being active and physically fit should be the purposes of the physical education.

Healthy lifestyle. The PTs mentioned healthy lifestyles as another purpose of physical education. Their comments suggested students should learn not only about the importance of being healthy” (Don, PPET), but also “. . . how to live healthy lives” (Yvonne, PCT). Furthermore, in physical education, “Students need to learn the importance of being healthy and practicing it throughout their lives” (Nick, PPET).

Cognitive development. Data indicated PTs identified cognitive development as one purpose of physical education. Some asserted that the subject is to “educate students on cognitive thinking skills through physical movement”
(Larry, PPET). Other PTs reiterated the importance of physical education in the school curriculum. Similarly, Sarah (PCT) argued that “If a child doesn’t have the chance to develop physical skills, it can negatively affect their cognitive development.”

**Emotional well-being.** Data also indicated PTs viewed students’ emotional well-being as a purpose of physical education. They acknowledged the role of the subject in reducing stress, and teaching students to release excess energy in a meaningful manner. Joseph (PPET) stated, “It [PE] can help release energy and stress.” Diana (PCT) added, “The purpose of physical education is to promote healthy minds and bodies ... as well as releasing energy in a productive manner.”

**Social development.** PTs’ comments identified social development as a purpose of physical education. This category relates to student interactions in the physical education environment. Julie’s (PCT) comment illustrates this view, “It (P.E.) encourages positive social interactions through physical activity. It is also to promote socialization.” PTs’ comments also focused on the value of teamwork. Jim (PPET) stated, “The purpose [of PE] is to teach sportsmanship and teamwork. I also believe PE helps build community and helps create a teamwork environment.”

**Motor skill development.** The inductive analysis also indicates PTs identified motor skill development as one of the purposes of the subject. Lou (PPET) believed physical education should “... teach students a variety of activities and sports skills that the students can use.” The acquisition of the motor skills would, according to the PTs, “... get students involved in physical skills outside the classroom. Students will also learn life games that can be used for life” Lori, PCT).

### Physical Education Curricular Goals To Be Emphasized The Most

The second research question in this study attempted to examine the physical education curricular outcomes PTs perceived to be the most important. The inductive analysis indicated six categories—similar to those identified as purposes of the subject: physical activity and fitness, healthy lifestyles, physical fitness, cognitive development, emotional well-being, social development, and motor skill development.

**Physical activity/fitness.** In this area, data suggested “Emphasis [in PE] should be on physical activity” (Carl, PPET) for two reasons. First, other subjects offer limited movement opportunities. For example, Lauren (PCT) lamented, “Physical activity should be emphasized the most in a physical education curriculum, because the PE class is the only opportunity for movement that many children have in a day.” Second, children are increasingly becoming inactive. Consequently, as Jim (PPET) noted, “America is becoming more and more overweight and with video games, students aren’t getting enough physical activity.”

**Healthy lifestyle.** PTs identified healthy lifestyle as a curricular outcome to be emphasized in physical education. Commenting on the important curricular outcomes, Dave (PPET) stated, “It is important for children to be learning about healthy habits.” Students also need to “know how to get and stay healthy” (Lori, PCT). PTs made generic statements pertaining to this category, without indicating how physical education can contribute to
healthy lifestyles.

Cognitive development. Even though both groups of PTs indicated cognitive development was a purpose of physical education, only the PCTs identified it as a curricular outcome that should be emphasized. Sarah (PCT) commented, “It is important to have cognitive skills combined with physical movement.” Acknowledging the role of movement in the school curriculum, Lynn (PCT) stated, “Any way to reinforce classroom concepts with a P.E. class is a great way to teach and re-teach.” Interestingly, none of the PPETs in this study indicated cognitive development should be emphasized in school physical education.

Emotional well-being. Most of the comments in this category were made by PCTs; only one comment was made by a PPET. Larry (PPET) believed, “Teaching fun energy activities that give lifetime enjoyment as well as release excess energy” should be emphasized in physical education. Other comments also pertained to making activities fun for all students. Tina (PCT) expressed her views in the following statement, “If they [students] aren’t having fun, they won’t want to do any physical education.” The PTs believed engaging students in fun activities would enhance their emotional development.

Social development. PTs made very few comments under this category. Nonetheless, in physical education they believed, “Emphasis should be on teamwork” (Don, PPET). Some PTs noted the ability to follow rules is important in life and should be emphasized in physical education. Yvonne (PCT) wrote, “Students should learn how to follow rules in sports. What good sportsmanship is, because it will benefit them throughout life.”

Motor skill development. Both groups of PTs in this study believed motor skill development should be emphasized in physical education. However, PPETs’ comments tended to focus on sport skills while the PCTs focused on fundamental motor skills and lifetime activities. For example, Dave (PPET) stated, “I think that PE should focus on learning different skills applied to sports.” Similarly, Larry (PPET) indicated “PE activities should be concentrated around sports skills.” In contrast, Yvonne (PCT) added the emphasis should be on “Lifetime activities and locomotor skills because students often do not get enough exercise and sit at their desks all day.”

Physical Education Curricular Goals To Be Emphasized The Least

The third research question examined physical education curricular outcomes PTs perceived to be the least important. Findings were grouped into three categories: competitive games and sport, physical fitness testing, and square and folk dances.

Competitive games and sport. Both groups of PTs identified competitive games and sport as physical education content to be emphasized the least. Some of them argued that extreme competition could negatively affect students’ emotional well-being. Diana (PCT) explained, “… the thing that should be least emphasized or not included is competition. It just makes students who are not good feel worse about themselves.” Jen (PCT) agreed, “Games where students get eliminated should be excluded from the curriculum. These children who get eliminated from the game are usually the ones who need the most exercise.”

Physical fitness testing. In this area, the PTs especially PCTs, identified
physical fitness testing as a curricular outcome to be emphasized the least. They suggested the current form of physical fitness testing negatively impacts students’ emotional well-being. According to Joe (PCT), for example, “For some students, this [physical fitness tests] can be very stressful and take the enjoyment out of PE.” Similarly, Mallory (PCT) recounted, “I remember being so nervous and afraid of being made fun of if I didn’t do well.” The PTs’ comments suggested that making fitness testing fun would likely help students develop positive attitudes toward physical fitness. Overall, the PTs’ conceptions of physical fitness testing in the present form negatively impacts students psychologically.

Square and folk dances. Some of the PTs indicated square and folk dances should be emphasized the least. They believed dance should be a physical education elective. Luke (PPET) stated, “Dance should be an elective rather required in PE because there are other forms of aerobic fitness that don’t make students insecure.” Others identified dance as a least important curricular outcome because of prior negative experiences. Mary (PCT) commented, “I always hated square dancing in PE. I think it was mainly because of my teacher.” Thus, it appeared PTs’ early experiences influenced their conceptions of dance as physical education content.

Summary

The first research question attempted to determine PTs’ beliefs about the purposes of physical education. The inductive analysis yielded six categories: physical activity and fitness, healthy lifestyles, cognitive development, emotional well-being, social development, and motor skill development. PTs’ comments showed that physical activity/fitness was the most frequently mentioned purpose of physical education. The least mentioned purposes of the subject were in cognitive development (PPETs) and motor skill development (PCTs).

The second research question examined the physical education curricular outcomes PTs perceived to be the most important. The inductive analysis indicated six categories— similar to those identified as purposes of the subject: physical activity and fitness, healthy lifestyles, physical fitness, cognitive development, emotional well-being, social development, and motor skill development. While PTs identified physical activity/fitness as the highest rated purpose of physical education, they also indicated it should be the most emphasized curricular outcome in a physical education curriculum. It is worth noting that PCTs in this study were more likely to view cognitive and emotional developments as important physical education curricular outcomes than the PPETs. However, the PPETs were more likely to identify social development as an important curricular outcome than the PCTs.

The third research question examined physical education curricular outcomes PTs perceived to be the least important. Findings were grouped into three categories: competitive games and sport, physical fitness testing, and square and folk dances. Both groups of PTs overwhelmingly identified competitive games and sports as the curricular outcomes to be emphasized the least. In addition, the PCTs’ were more likely than the PPETs to identify physical fitness testing and square and folk dances at the least important curricular goals.
Both groups of PTs in this study did not identify valuing physical activities for self-expression, reflecting national content Standard 6, as a purpose of physical education. Standard 6 emphasizes key areas that will contribute to life-long appreciation and valuing of physical activity (NASPE, 2004).

Discussion

This study examined PTs’ beliefs about the curricular goals for physical education. It also surveyed which curricular outcomes PTs perceived to be the most or least important. The highest percentage of PTs’ comments identified physical activity/fitness as a purpose of physical education. The PTs also identified physical activity/fitness as the curricular outcome to be emphasized the most. This finding is consistent with those of Kulinna et al. (2010) and Kulinna and Silverman (2000), who reported that teachers rated physical activity leading to fitness as their top priority. Kulinna et al. (2010) have suggested teacher education programs and public health issues have provided the guiding force for health-related physical education beliefs. However, this finding differs from Placek et al. (1995) and Lambdin and Steinhardt (1991) who reported teachers ranked skill development as the highest curricular outcome. The PTs in this study ranked it as the third most important (both PPETs and PCTs).

Another important finding of this study is cognitive development receiving a very low rating as a curricular outcome to be emphasized in physical education. The PCTs ranked it fifth out of the six outcomes, while none of the PPETs’ comments identified it. Marginalization of physical education in the school curriculum is well documented. Smyth (1995), for example, reported student learning is not considered important in physical education by faculty and even by physical education teachers. Rather, the physical education teacher’s status was determined in his or her ability to control students and other non-instructional issues (Schempp, Sparkes, & Templin, 1993). During professional preparation courses and experiences, PETE faculty and cooperating teachers should encourage PTs to focus on learning to enhance students’ cognitive development in physical education. The findings in this study support previous research that PPETs’ own school experiences in physical education (Curtner-Smith, 1999) and school sport (Curtner-Smith, 1999; Dodds, Placek, Doolittle, Pinkham, Ratcliffe, & Portman, 1992) influence their beliefs about teaching physical education. While both groups of PTs in this study believed motor skill development should be emphasized in physical education, PPETs’ comments tended to focus on sport skills while the PCTs focused on fundamental motor skills and lifetime activities. As Lawson (1983) noted, many PPETs entered the physical education profession to enable them coach school sport, and were less likely to be influenced by their PETE program. Sofo and Curtner-Smith (2010) also reported that the value orientations of PPETs with strong coaching orientations were not affected by their methods course or early field experience. Thus, it is important that teacher educators help PPETs examine their educational beliefs, so they can alter those beliefs that are not consistent with national, state or local content standards.

The PTs in this study identified competitive games and sport, physical
fitness testing, and square and folk dance as curricular outcomes to be emphasized the least in physical education. Both groups overwhelmingly stated competitive games and sport negatively impacted students’ well-being, especially the low-skilled students. This finding is consistent with the National Association of Physical Education & Sport (NASPE) (2009) assertion that activities publicly identifying students as winners and losers should be discouraged. Moreover, competitive games and sport, especially elimination games, have the tendency to limit student participation (NASPE, 2009). All but one of the comments relating to the inappropriateness of physical fitness testing in its present form were made by PCTs. They believed fitness tests are stressful for many students, and activities should be fun and enjoyable (Kretchmer, 2008).

Regarding square and folk dance, PTs relied on their prior experiences—mostly negative experiences—in rating this curricular outcome. Many physical education teachers do not teach dance because they have limited experience with this content (Graham et al., 2007). However, as Chen (2001) noted, creative dance has the potential to facilitate students’ inquiries and creative products. Furthermore, dance has the opportunity for self-expression (Rovegno, 2003), consistent with physical education national Standard 6 (NASPE, 2004). The marginalization of dance by the PTs in this study is worrying, because it is a content area that lends itself to interdisciplinary learning, especially children’s literature (Rovegno, 2003). PPETs shying away from dance results in the down-playing of a very popular activity outside of the school, and a real promoter of a healthy lifestyle. The PPET should be exposed to the dance program in a positive manner and hopefully be made to appreciate the impact it can have on students in the present and in the future.

Implications for Practice

The findings of this study suggest the need for teacher educators to help PTs examine their own beliefs, and include curriculum models and instructional techniques consistent with several educational beliefs (Ennis, 1992). This way, PTs would be well-prepared to provide balanced physical education programs to their future K-12 students.

Another important implication of this study for teacher preparation programs is to offer opportunities for coursework in diverse curricular decision making, consistent with PTs’ beliefs and also in alignment with K-12 student needs. That is, PTs should learn the different physical education curriculum models, and the teaching strategies that would enhance student learning in line with national, state, and local standards.

This study’s findings also suggest the need for PETE programs to examine PTs’ early experiences. Such an examination would allow teacher educators to guide PTs to align their beliefs to the curricular outcomes consistent with physical education content standards.

A major limitation of this study includes the small sample size, which was drawn from only one university. Another limitation of this study is the use of questionnaire as the main data source. However, the open-ended nature of the items allowed PTs to express their perspectives, without introducing
ideas and concepts to which they may not have contemplated.

This study makes some recommendations for future research. First, further research utilizing a combination of questionnaires and interviews would provide in-depth understanding into PTs’ beliefs and how those beliefs might influence their teaching later. Second, an investigation into the extent to which PTs’ beliefs about the curricular goals physical education match their practice during early field experience or student teaching is warranted. Evidence from this line of research would provide teacher educators with strategies on how to assist PTs to achieve important curricular goals in the field. Third, future research should examine how PTs’ beliefs about curricular outcomes change over time.

Conclusion

In this study, PTs were able to identify some key physical education curricular outcomes that are consistent with the NASPE (2004) standards. The results of the study also suggested the ratings of PPETs’ and PCTs’ ratings of these outcomes may differ in some aspects. For example, PPETs were less likely than PCTs to identify cognitive and emotional, and social development as purposes of physical education. It is problematic that PPETs and PCTs differ on points of emphasis pertaining to the important curricular goals in physical education. The difference can hinder interdisciplinary collaboration between physical education and classroom teachers. The findings further suggest PTs were sensitive to the emotional harm inappropriate physical education practices might cause students.

References


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Stretching is commonly done because a consistent regimen will improve one’s general health and well-being. As proponents of the activity, physical educators incorporate stretching into lesson plans, fitness specialists include stretching with workout plans, and athletic trainers and physical therapists include stretching as part of rehabilitation programs. All recognize that stretching is a good lifelong habit. In each situation, stretching is a process used to gradually increase the flexibility or range of motion (ROM) available from a given joint. At one time flexibility was a key component of American College of Sports Medicine guidelines. Recent guidelines, however, do not include stretching as a fitness component, largely because some researchers of late found a decrease in performance when activity immediately followed stretching of the involved muscles. In addition to improved flexibility, stretching has been prescribed for reducing delayed onset muscle soreness (DOMS), reducing injury risk, or as part of rehabilitation. The focus of this paper is to examine stretching for its purported benefits and detriments.

Stretching and Delayed Onset Muscle Soreness

Will stretching before or after activity reduce DOMS? While this is an apparently simple question, factors such as the timing of the stretch, the duration of the stretches, the nature of the cool-down routine, and the newness of the activity to the person may all influence the answer. Pre-activity stretching has not been found to influence DOMS (High, Howley, & Franks, 1989; Johansson & Lindström, 2007). More recently, a comprehensive review of the literature was done by Herbert, de Noronha, and Kamper (2007), who found neither pre-activity nor post-activity stretching to have an impact on DOMS. It seems as though stretching does little to diminish DOMS, regardless of the timing of the stretching with respect to the activity.

Stretching and Injury

Stretching and the subsequent increases in flexibility may or may not impact injury risk. Presently, injury risk is mainly focused on acute injuries rather than overuse injuries. It is difficult for researchers to establish that stretching or flexibility results in reduced injury risk, yet logically we want...
to believe in the idea. How might flexibility affect injury risk? Consider what additional flexibility can do. If the mover has an unexpected situation, the additional ROM available allows a slightly longer time to adapt, in some situations, this may be sufficient to avoid injury or decrease its magnitude. For example, if a runner unexpectedly steps on an unseen object, such as a small branch on the sidewalk, the ankle might experience a sudden inversion. Those with greater flexibility may use the additional ROM to react and adopt a strategy that minimizes—or perhaps eliminates—the forces the ligaments would ultimately need to stop the ankle inversion. Scenarios like this exemplify the time advantage of having greater flexibility and as long as the additional time can be used effectively the injury risk may be reduced or eliminated.

Can we really know that an injury has been avoided when it never happens? Sometimes, yes. Anecdotally evidence is supportive. Many athletes have attested to avoiding injury as a result of flexibility that was improved by stretching routines. From a formal research perspective, however, it is difficult to quantify what did not occur. Of course, epidemiological methods may be used, but cause-effect relationships cannot be established.

The main injuries to be avoided by good flexibility are related to overuse, muscle strains, or sprains. Some have concluded that no relationship exists between musculotendinous injuries and flexibility (Gleim & McHugh, 1997), while others have concluded that flexibility may help decrease injury risk (Anderson & Bourke, 1991; Bandy & Irion, 1994; Shellock & Prentice, 1985; Smith, 1994). More recently, Small, McNaughton, and Matthews (2008) completed a systematic review of stretching and injury and found that stretching may reduce musculotendinous injuries, but not overall injury rate. Similarly, several other researchers have found that increases in flexibility from stretching decreased the incidence of muscle strain (Bradley & Portas, 2007; Cross & Worrell, 1999; Verrall, Slovatichek, & Barnes, 2005). Many factors may confound studies such as these, including the types of injuries that are common to specific sports, positions of sports, the size of the players involved, and the consequences of the injuries. Several researchers have controlled for these factors and others. For example, Bradley & Portas (2007) found that for the soccer players they studied, intrinsic factors such as body size, limb dominance, and position were not influential toward injury incidence, but flexibility was. Verrall et al. (2005) found that stretching not only decreased injury rate, it also decreased the consequence of injury, that is, less competition was missed after injuries occurred when the participant had greater flexibility. So joints with greater flexibility may be less likely to be injured during vigorous activities (Anderson & Burke, 1991) and athletic performance may be enhanced (Gleim & McHugh, 1997; Bandy & Irion, 1994; Smith, 1994).

While flexibility may matter, depending on the context, the balance of flexibility may also be crucial. Balance in this case means either the balance between agonist and antagonist muscles or the balance between
dominant and non-dominant sides of the body. While little research has been completed on this idea, what has been done supports the idea of maintaining balance. Knapik, Bauman, Jones, and Vaughan (1991) found that female college athletes were more likely to incur lower extremity injury if strength or flexibility was imbalanced from right to left sides or if strength was imbalanced between agonist and antagonist muscles. Stretching to maintain the balance of flexibility may be more important for chronic, rather than acute injury. For example, stretching is often prescribed for those with low-back pain and plantar fasciitis.

There are some who question the value of stretching, but does the risk of poor flexibility outweigh the time needed to stretch? For physical educators the time used for stretching often means less time on other class activities. Physical educators and others, however, should also consider the potential long term benefits of stretching rather than just the short term view. Long term consequences of poor flexibility (and other factors) were examined by Mikkelson et al. (2006), who completed a 25 year follow-up study in which men with greater flexibility during adolescence were found to have a lower risk of neck tension when they were older.

**How to Stretch**

Stretching is generally defined as occurring when a joint reaches the end of the passive range of motion- generally this occurs when the muscle is relaxed and in its longest position. Stretching increases the ROM of a joint by increasing the flexibility of the connective tissue and tendons surrounding that joint and little change is believed to occur in the muscle itself. Understanding passive ROM and how it is different than active ROM is essential to understanding stretching benefits. A passive ROM is one that is achieved when the muscles are relaxed and an external force pushes or pulls the joint to the limits of the ROM. An active ROM is one that is achieved when the muscles contract to provide the force that pulls the joint to the ROM limit. In some instances, like extending the elbow, the passive limit of ROM and active limit of ROM are the same value in a healthy person. For flexing the elbow, as in many other motions, the passive limit of the ROM will be greater than the active limit of the ROM. In other words, you usually get more ROM from a passive stretch than an active stretch.

Ballistic stretching is stretching with a bounce (this was also called dynamic stretching in the past, but should be differentiated from the recent popularity of dynamic warm-up). The emphasis is that the person is attempting to increase the ROM of the joint by using momentum to stretch the tendons and ligaments. Stretching with a bounce results in an activation of the stretch reflex. The stretch reflex will result in an increase in muscle activity and tension for the muscle that is being stretched. This will result in greater impulse forces on the tendons and connective tissue that are being stretched. While appropriate for certain rehabilitative situations, it is generally
regarded as dangerous and ineffective for healthy individuals. Any activity that uses momentum to stretch the joint to the extremes of passive ROM will inherently have greater risk because when muscle tension does not stop the action, tendon and ligament tension will. The greater tension increases the likelihood of muscle strain, especially at the muscle tendon junction.

Dynamic warm-up, sometimes called dynamic stretching, by definition is not really a stretch. It is a warm-up that encourages movements with a ROM and speed that is similar or greater than what will be encountered in the activity for which the person is preparing. The crucial aspect of a dynamic warm-up is that the ROM is typically similar to an active ROM, not a passive ROM, and joint motion is stopped by muscle activity, not by tendon or ligament stretching. Dynamic warm-up has been shown to positively impact performance.

Static stretching is perhaps the most common stretching technique. It is common in physical education, sport performance, dance, and rehabilitation settings. Overall, it is an effective way to increase joint flexibility over time, but some may need different programs based on what activity they are performing (Zivnuska, Flickinger, McCluhan, Cain, & Bird, 2003) or based on their injury history. With static stretching the joint is placed at the end of the passive ROM in a slow and controlled manner. Once the end of the ROM is reached, there is virtually no movement. Even when done in a slow, controlled manner, a contractile stretch reflex may produce resistance to the stretch (McHugh, Magnusson, Gleim, & Nicholas, 1992). With time, the tension will subside and stress relaxation within the muscle will occur, usually within the first 15 seconds (McHugh et al., 1992). Those aware of this phenomenon may improve the impact of the stretch by adding a few degrees to the ROM at that time, but the use of biofeedback to improve the stretching impact in this manner has not been supported by research.

One key to success for static stretching is to reach the point of mild discomfort, but not pain. This can be difficult for some to achieve and time has an influence. The most common length of time recommended is 30 seconds (Bandy & Irion, 1994; Bandy, Irion & Briggler 1997; Magnusson, 1998). Most of the studies researching the “best” stretch duration used the hamstring muscle group and often the sit-and-reach test. Different muscles, joints, and contexts (e.g. injury rehabilitation), may achieve best stretch benefit with a different duration. However, no studies investigating the best stretch duration as a function of muscle group or joint has been done.

Multiple, short duration stretches have also been examined for effectiveness. Zakas (2004) found shorter, but more frequent stretching was as good as an equivalent longer stretch. Yet Roberts and Wilson (1999) found longer duration stretches improved passive ROM better than the equivalent duration of shorter stretches. In both of these studies, equivalence is based on total time of the stretch. For example, when total time is kept constant, a 30 second stretch may be compared to a pair of 15 second stretches, or to three stretches of 10 seconds, or to six stretches of 5 seconds. From a scientific
perspective, this is necessary, yet no research comparing three stretches of 30 seconds to three stretches of 10 seconds has been done. Perhaps this is because of practicality. Generally, 3-5 repetitions of 30 second stretches are recommended, but it is not likely that one would want to regularly do 12 stretches of 10 seconds for each muscle being stretched to match 120 seconds of stretching when 4 stretches of 30 seconds are done. Total time stretching to include the major muscle groups of the body at 4 repetitions of 30 seconds may also be more time than some are willing to do. However, to get improvements in flexibility, it may be necessary.

One method which inherently incorporates multiple repetitions is proprioceptive neuromuscular facilitation (PNF) stretching. This method is effective, but often requires a partner. PNF stretching takes advantage of the golgi tendon organ response to muscle tension and is commonly used in rehabilitation settings. While several PNF stretching methods are commonly used, they all work in the following way: place the muscle(s) to be stretched in their longest position; do an isometric contraction of the muscle to be stretched for 2-4 seconds, preferably with the partner resisting any motion; relax the muscle and apply force in the opposite direction for 5-10 seconds, preferably with the partner providing the external force; repeat the isometric contraction and relaxation steps 4 times. PNF stretching is considered by some to be more effective than static stretching, but little research supports this. From a practical standpoint, both static stretching and PNF stretching are beneficial for improving joint flexibility.

In addition to the method of stretching, stretch variations may also impact the muscle differently. Changing a stretch in a manner that lengthens one muscle and shortens others will allow a greater impact on the longer muscle. The influence is most prevalent in multijoint muscle situations and with muscle groups because of different individual muscle insertions. For example, Figure 1 shows a common way to stretch the hamstring muscle group. This stretch may be modified by laterally rotating (externally rotating) or medially rotating (internally rotating) the hip. When the hip is laterally rotated the semitendinosus and semimembranosus are longer and the stretch will impact them more. When the hip is medially rotated the biceps femoris is longer and the stretch will impact it more.

**Figure 1.** One example of a stretch for the three hamstring muscles (semitendinosus, semimembranosus, and biceps femoris)
More recently the potential acute positive and negative impact of stretching (static and PNF) prior to performance has been examined. Many movements and variables have been evaluated. In most studies, the method to evaluate the impact of stretch was completed in one or two sessions and required the subject to warm-up, perform the given task where the measurements were done, stretch (if they were part of the treatment group), then immediately perform the measured task again. When the tasks were performed the measures were usually related to the product of the movement (e.g., the speed, power, or force achieved) and could then be compared before and after the stretching. For now, just consider the impact of stretching on vertical jump performance.

Many have found the acute impact of stretching on vertical jump to decrease performance (Behm et al., 2006; Bradley et al., 2007; Church et al., 2001; Hough et al., 2009; Walter & Bird, 2009), while others found no acute impact of stretching on subsequent vertical jump performance (Knudson, Bennett, Corn, Leick, & Smith, 2001; Unick, Kieffer, Cheesman, & Feeney, 2005; Young & Elliott, 2001). Even though findings varied, many concluded that stretching immediately before vertical jumping had little chance of benefit and was potentially detrimental to performance and therefore should be avoided. When significant decreases in vertical jump performance were found, the effect sizes were very small. Other activities besides vertical jumping and other measures besides jump height and power resulted in similar results; sometimes there were significant decreases in the outcome variables following stretching, sometimes not. When there was an impact, it was not cumulative (Walter & Bird, 2009).

When research regarding this phenomenon was first published, there was speculation about what was leading to the decrease. One of the most common mechanisms to be hypothesized was that the decreases in performance after stretching were related to changes in musculoskeletal stiffness changes (Guissard, Duchateau, & Hainaut, 2001; Toft, Espersen, Kålund, Sinkjær, & Hornemann, 1989). But this idea was not supported by all (Goodwin, Glaister, Lockey, & Payne, 2009; Knudson et al., 2001; Nelson, Kokkonen, & Arnall, 1996). Other investigations to find biomechanical changes related to vertical jump performance reductions following stretching included topics on related kinematics (Knudson et al., 2001), flexibility (Behm et al., 2006), muscle activity (Hough et al., 2009), and ground reaction forces (Walter & Bird, 2009), but none found additional variables associated with the stretch impact.

Perhaps more interesting is the lack of consistency of acute stretching impact on performance. With some studies, the performance following the stretch decreased in a small, yet significant amount, with other studies the performance after stretch was unaltered. Not only was this true for the average change in performance, it was also true for individual participants.
Based on closer inspection of individual data, the performance decreased for some, stayed the same for some, and increased for some. Only one study examined the consistency of the impact of stretching on performance, and they found very poor reliability, meaning the stretch impact varied from test session to test session for the same participant (Bird, Hurst, Strohmeyer, & Mayhew, 2010). If the results are not reliable, they cannot be valid. More recently, Behm and Chaouchi (2011) performed a comprehensive review of the impact of static stretch on performance and found no detriment to performance, especially if the stretch was less than 90 seconds. They do not know if it depends on the level of athlete, elite or not. Additionally, they reported that dynamic warm-up activities had either no effect or perhaps a small improvement in performance. Similarly, Kay and Blazevich (2012) reviewed static stretching papers and found that stretching had no impact on performance, if the stretch was less than 60 seconds. While the initial thoughts were that stretching during a pre-performance routine would be detrimental, the lack of reliability for individuals and results no longer seems to support the idea. Because stretching is common as a pre-performance activity, additional research related to its potential influence on performance seems justified. Perhaps other variables are influenced by stretching and result in performance improvement or decline. Possible influences may include psychological, mechanical, physiological, or nutritional mechanisms that may be linked to changes in performance and the time stretching is augmenting any positive or negative changes in performance. For example, perhaps there is an interaction between stretching and stress or anxiety. The time spent stretching may result in decreasing stress or anxiety levels, but some days the change in stress or anxiety would be beneficial to performance and other days it would be detrimental to performance. For some it is an important component of the pre-performance routine and they are not likely to give up the relaxation benefits of the stretch. For others it is something they tend to avoid until there is a problem and stretching becomes part of the solution.

Conclusions

Stretching remains a good lifelong habit and should be encouraged by physical educators and other fitness professionals. Regularly performed, it should result in improved flexibility, but is not likely to decrease delayed onset muscle soreness. Whether it occurs prior to activity or after activity is less important than whether it occurs at all. If it occurs before activity a proper warm-up should occur. Many believe that stretching after activity has less risk because the muscle is warm and pliable. Stretching may decrease injury risk, but there is not sufficient evidence to completely support how this may happen. Stretching that maintains the balance of flexibility between right and left sides, and agonist and antagonist muscle groups, may be as important as improving flexibility for decreasing injury risk for some. By itself, stretching
prior to activity is not likely to impair subsequent performance. It may be that stretching before activity may help or hinder performance when coupled with other extrinsic or intrinsic factors, but additional research is needed to find these factors. Independent of performance issues, for some stretching is an important part of the pre or post performance routine and should be maintained. Physical educators and fitness professionals should be advocates of stretching.

References


Smith, C.A. (1994). The warm-up procedure: To stretch or not to stretch. A


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Strategies to Address the Obesity Epidemic and Unintended Consequences

Timothy Makubuya

With the increasing obesity rates in children, most notably in the recent decades, physical educators, therapists, coaches, trainers, and physicians are all scrambling to combat childhood obesity through exercise and physical activity prescriptions. Yet, with ever-changing environments, professionals find it extremely challenging to moderate what is becoming the world’s most pressing health setback. Involvement in sport, recreation, and physical activities is by far what most exercise specialists would recommend. At the same time there is research pointing out that some practices originally intended to address reduction of childhood obesity rates can actually work in the opposite direction. The unintended consequence can be poor nutrition and decreased physical activity among others. Obesity as it turns out is related to many environmental factors and presents a far more complex challenge for society than often realized.

This paper first reviews the economics of obesity and the risks to those who are obese. Then, the shortcomings of some strategies meant to decrease obesity rates are discussed along with the role educators can play in maximizing helpful outcomes and avoiding unintended negative outcomes.

The Economics of Obesity

It is absolutely clear that the world’s economy is rapidly falling as the cost of health care in most countries including the United States rises and becomes completely unaffordable for increasing numbers of citizens. McCormick, Stone, and Team (2007) note that obesity imposes a significant human burden of morbidity, mortality, social exclusion and discrimination. There is also a significant healthcare cost associated with treating obesity and its direct consequences, and social care costs are higher for the obese. Higher levels of sickness and absence from work among the obese reduce productivity and impose costs on businesses. Obesity also imposes other costs. Many people are not in employment as a direct result of obesity, either on health grounds or for other reasons, even discrimination in the workforce. Thus, any pertinent effort by health and physical educators in the schools and communities not only to engage but also teach and sensitize the citizenry would help balance
national budgets. Even future health care costs are higher for persons who have an increased waist circumference, which suggests that there may be a potential for significant resource savings through prevention of abdominal obesity (Haggard, Olsen, Søgaard, Sørensen, & Gyrd-Hansen, 2008).

The relationship of immune responses to healthy weight needs more research. Sheridan et al. (2011) notes that influenza is a significant public health threat, killing an estimated 250,000 to 500,000 people worldwide each year. More than one in ten of the world’s adult population is obese and more than two-thirds of the U.S. adult population is overweight or obese. Yet, no studies have compared humeral or cellular immune responses to influenza vaccination in healthy weight versus overweight and obese populations despite the clear importance to public health.

It is possible that obesity has a negative impact on the effectiveness of flu shots. Beck, Karlsson, and Sheridan (2010) reported that obesity in mice impaired the animals’ ability to fight influenza infections and increased the percent dying from influenza, compared to lean mice with the same infections. In 2010, her team showed that obesity seemed to limit the ability of mice to develop immunity to influenza. Also, the fatality rate was higher in obese mice – none of the lean mice died, but 25 percent of the obese mice died. This suggests but does not prove that vaccines may not be as effective in obese and overweight as in healthy weight humans. Physical educators could additionally advocate for programs to combat and regulate obesity, especially in the most vulnerable age groups, on these grounds.

**Unintended Consequences**

Some times the best-intentioned strategies for reducing obesity overall and childhood obesity in particular have an unintended consequence. Unintended consequences might arise from an inability to control all facets of a strategic program or from the complexity of the issue as it exists in an environment with many facets and factors.

The U.S. Department of Agriculture formulated a number of policies that were originally intended to combat obesity but end up failing. The food assistance program for needy families restricts what can be purchased, but due to malpractices people have found different ways to manipulate the benefits to purchase unhealthy snacks for their infants, children, and families. In the long term this program has backfired as a solution to providing food assistance. Some of the food that is purchased under the Supplemental Nutrition Assistance Program (SNAP) is not healthy but is cheap, thereby increasing the health risks when risky practices were originally targeted.

Physical educators with large numbers of school children benefiting from these food assistance programs can seek to intervene for better outcomes. Teachers can discuss with students the disadvantages of unhealthy snacks and processed foods. Balancing calorie consumption with expending energy
through physical activity can also be discussed. Teachers can encourage participation in after school physical activity or sport programs.

Video games and electronic activities are popular today but contribute to the many hours children and youth are sedentary rather than active. A strategy that has been used to address this is the development of exergames. Exergaming appears to hold promise as a method for increasing physical activity among inactive children and might be a possible intervention for childhood obesity (Fogel, Miltenberger, Graves, & Koehler, 2010). Recent findings indicate that children who are intrinsically motivated to play an exergame tend to report high exertion, which may in turn promote physical activity. Boys seemed to be more physically active than girls when playing exergames.

However, Daley (2009) notes that although studies have produced some encouraging results regarding the energy costs involved in playing active video-console games, the energy costs of playing the authentic versions of activity-based video games are substantially larger, highlighting that active exergaming is no substitute for real sports and activities. He further states that a small number of exergaming activities engage children in moderate-intensity activity, but most do not. Only 3 very small trials have considered the effects of exergaming on physical activity levels and/or other health outcomes in children. Evidence from these trials has been mixed with positive trends for improvements in some health outcomes in the intervention groups noted in two trials. Exergaming might be beneficial if supplementing regular authentic game play, but an unintended contributor to sedentary behavior if substituted for more active play. Therefore physical educators should help children who enjoy video games establish a good balance of activities.

While engaging in physical activity is an obvious strategy in fighting the obesity epidemic, teachers, coaches, and parents need to establish good balance in activity programs. More is not always healthier. Just like adults, children and youth can suffer overuse injuries, so moderation in training, especially with highly motivated young athletes, is paramount. Variation of activities as opposed to focus on a single activity at a young age is also a healthy approach that minimizes overuse injury. Overweight youth can be more susceptible to some injuries, for example, impact from running activities, so moderation should always be the motto for teachers.

In promoting participation in sports, even as a means to address the obesity epidemic, some parents, teachers, and coaches can overlook the unintended consequences of attempting to achieve a body weight that is ideal for participation in the sport but not necessarily healthy. For example, some football participants might believe it is advantageous to add even fat weight to perform well at certain positions, while wrestling participants might attempt unhealthy ways to reduce body weight and water to compete in a certain weight class.
Conclusion

There are many, many valid reasons for addressing overweight and obesity in youth today. Individuals benefit from maintaining a healthy weight and society benefits with reduced health care costs. The causes of obesity, though, are many and they are complex. Strategies developed to reduce overweight and obesity can have unintended consequences. Some sound as if they would be effective but they do not achieve the original goal. Teachers, coaches, and parents as well as those establishing public policy should consider the possible results from programs. It is easy to assume the answer to the obesity epidemic is simple when it is more often complicated. The overall health and well-being of children and youth participants should be first and foremost when guiding them toward achievement of a healthy weight.

References


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Advocating for Your School’s Health and Physical Education Program

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“If you can’t make them see the light, then make them feel the heat.”
– Ronald Reagan

As health and physical education professionals, we are committed to advancing our field by sharing the expertise and skills we have to benefit the society in which we live. For example, we have used our technical knowledge about the harmful effects of smoking and second-hand smoke to bring an end to school-sponsored smoking areas. In doing so, we compared the risks associated with smoking to the actual practices that were in place in our work environment. This is but an illustration of action that can be, and has been, taken when an incongruity between health knowledge and actual practice was shown to exist. Someone spoke up, someone suggested that policies be changed, and efforts were made to build a coalition of support for the health-enhancing change.

This simply is advocacy in action. Though growing in complexity, the aim of advocates is to educate thoroughly with accurate information and materials, build political support for changes in policies and practices, and assist in the implementation of changes. This is a skill that any professional can use and one that allows you to speak as a supporter of the well-being of children and the community. As health and physical education teachers, we are accustomed to presenting our views to multiple audiences, and doing so convincingly. It is similar to team-building skills used every day in our collaborative learning activities at any level. If you have never served in an advocacy position before, the information contained here will help you to be comfortable with the skills and strategies you will implement. The only decision you need to make is to whether or not you place great value on your profession, your ability to motivate and inspire children to be successful, and how important it is for you to live in a healthy community. Should these be important to you, success will be seen in your efforts.

The purpose of this article is to introduce health and physical education teachers to the knowledge and skills to effectively share information about their programs and its benefits in ways that will advocate for children’s health and the health of the community. The efforts will, hopefully, result in consistent, appropriate choices being made that serve as protective factors.
for individual and community health. Given the extent of the resources presented here, you will have access to the necessary tools and skills to support your advocacy efforts. If we, as professionals, value the contributions that health knowledge and appropriate health-enhancing behaviors have for individuals, schools, communities, and society, it is important to develop the skills to incorporate advocacy as an important professional responsibility.

**Getting Started – Advocacy Basics**

Community members and students should view teachers of health and physical education as professionals who form healthy lifestyle behaviors in all students each day. Whether or not we are cognizant of the need to advocate for healthful and active environments, as well as truly quality programs that impact learners, the school, and the community, the overall result seen in the minds of decision-makers is critical to the continuation of quality programs and our positive, healthy impacts on students. To influence those decision-makers, we need to consider how effective we have been in demonstrating positive outcomes in our teaching, and how critical to public health and economic stability it is to provide students with the 21st Century Skills that lead to career-readiness and healthy lifestyle behaviors as stipulated in the National Health Education Standards (American Cancer Society, 2007) and the National Physical Education Standards (NASPE, 2004). If you are new to the concept of advocacy, the following links can help you build a solid conceptual foundation:

1. [http://www.sophe.org/AdvocacyToolkit.cfm](http://www.sophe.org/AdvocacyToolkit.cfm) - Toolkit to be used for advocacy – when opened, click on Advocacy 101 slides.


3. [http://www.cthealthpolicy.org/toolbox/how_to_use.htm](http://www.cthealthpolicy.org/toolbox/how_to_use.htm) - An introduction to the topic as well as a decision tree strategy to assist with problem-solving

Advocacy is simply the practice of promoting a concept or a product. What we are promoting as health and physical educators, though, is fundamental to the well-being of the individual, the school, the community, and the society. Foremost, we are advocating for the time and resources necessary to provide high-quality, results-oriented instruction to school children, while also incorporating opportunities for all in the community to participate in activities that promote health and well-being. As professionals, it is our responsibility to continually work to advance the conditions under which our programs and systems operate. What does this look like in the practice of health and physical education, and how would a health and physical
educator get started? The following articles can serve as a starting point:


4. Advocacy in Action: Tips & Techniques. Make it a priority as you head back to school. Authors: Sims, Sandra; Bert, Greg; Constantinou, Phoebe; Dowd, Karen; Source: Strategies: A Journal for Physical and Sport Educators, Volume 23, Number 1, September/October 2009, pp. 1-40

Building Your Case with Data

To develop a template for advocacy techniques and strategies, it is first necessary to collect solid data relating to the actual achievement of all students in your program. In this new age of demonstrated results, it is said that “Data Drives Decisions”. A strategy must be implemented to collect data that truly represents important indicators of lifestyle behaviors that are mastered by students. The research-based benefits of health, physical activity, and physical education as well as position statements from national professional organizations can help you build your case:

1. http://www.aahperd.org/naspe/advocacy/governmentRelations/toolkit.cfm - A National Association for Sport and Physical Education resource that includes printable educational documents


For example, school districts and teachers have traditionally kept solid records of physical fitness test achievement data. Having the grade-by-grade data profiles is the first step in an accountability process. There are many ways to use the data to demonstrate “value-added” results from involvement in your program. Interpreting the aggregated data can be a way to show that, for example, while the rate of overweight and obese students is rising, your program has been able to actually reduce the percent of students classified as overweight and obese during each school year. Further, data from the first fitness testing period at the beginning of the school year can be used to design primary intervention programs for those students who are above the 85th percentile of the Centers for Disease Control and Prevention’s BMI Weight-to-Age charts and to design secondary-level intervention programs for those students who are above the 90th percentile of the charts. This use of data could then demonstrate that the time allocated toward and the resources provided to your program do, actually, make a difference in the healthy lifestyles of your students.

Further, as has been demonstrated in a California study (Children Now, 2011), statewide data indicates that students who meet most or all of the healthy levels for physical fitness components also achieve higher standardized test scores in other content area fields. Similar findings were reported in the large Texas Youth Fitness Study (Texas, 2012). In this year-long study of K-12 school children, physical fitness and academic achievement indicators were significantly correlated. In addition, the greater the number of healthy fitness zones achieved in the six-factor Fitnessgram®, the better the academic achievement at all grade levels. Also, among the schools that achieved the state’s top ranking of Exemplary, the vast majority of students possessed healthy levels of cardiovascular fitness; whereas, in the schools listed as Academically Unacceptable, only about 40% of the students achieved cardiovascular fitness. Among the six factors in the fitness battery, cardiovascular fitness was shown to have a higher effect on academic achievement than the other factors. Higher fitness levels were also associated with higher levels of school attendance and lower levels of disciplinary actions. In summarizing the results of this study, State Senator Jane Nelson stated, “This [sic] data confirms what we have always thought to be true -- that there is a strong correlation between a student’s fitness and their scholastic success. These results provide yet another incentive to reverse the health trends we are seeing among our youth. We need to move forward on this issue as if lives depend on it -- because they do!”
This same relationship was recently demonstrated in a three-year Physical Education for Progress grant study in Missouri’s Ferguson-Florissant School District (Ferguson-Florissant, 2010). Those students who achieved the ‘healthy fitness zone’ in all fitness component areas not only achieved higher scores in Math and Communication Arts tests, but also attended school at a rate higher than those who did not achieve healthy fitness zones in any of the components; and the same was true in relation to student behavioral instances. This is but one example of how student achievement can be used to build a case for demonstrating that healthy and active children attend school at a higher rate, a factor in the state formula for providing assistance to local school districts. Given the data described above, it would be a simple task to compute the increase in state aid that would come to a school district if there would be an increased emphasis on enhancing the health and physical activity levels of children.

Given the extensive documentation of the effect of proper amounts and proper types of physical activity in enhancing academic achievement, the implementation of enhanced programs of health and physical education should be a primary intervention to increase student achievement in all content area subjects. Documentation includes:


Even more evidence can be found by going to any search engine and doing a search for “physical activity and academic achievement.” There will be literally thousands of entries on this topic. Therefore, it cannot be concluded that there is a lack of evidence to make a case for stronger support for health education and physical education programs. What will be necessary then will be to summarize the findings and develop an “executive summary” to share with the intended targeted audiences. To strengthen your case, however, it is necessary to collect, analyze, and state the relationship of physical activity and achievement measures in your local school district.

**Strategy Development**

Given the weight of evidence that is found at the national level, teachers then need to develop strategies for advocating for quality programs including the enhancement of the school health environment and the health
culture in the community. Once again, it is possible to obtain support from national sources, not only from the national health education and physical associations, but also from federal agencies such as the Centers for Disease Control and Prevention. Every health and physical education teacher can either download or order a copy of the Youth Physical Activity Guidelines Toolkit (2010) by going to www.cdc.gov/HealthyYouth. Under the heading of publications, you can download a copy for instant use or order the toolkit for no charge. Included in this toolkit are separate slide show presentations to be used in promoting youth physical activity to school groups, families, and communities. Other tools and toolkits can be used, too:

1. http://www.pe4life.org/program-support-services/advocate-for-your-program/ - Templates to help advocate for your program


There are many resources provided by national associations and health-promoting foundations and agencies that provide documented evidence that investments in promoting healthy and activity behaviors in youth may be one of the most cost-efficient means of creating the foundation for the healthy lifestyle behaviors. Given the escalating economic effects of non-communicable diseases (e.g. diabetes, heart and cardiovascular diseases, mental and emotional disorders, bone health issues), the promotion of effective and result-oriented primary prevention programs found in schools can be a major factor in reducing rising health care costs and premature death. Many of these sources also provide state-specific data that allows for comparisons between statewide data and national data.

Get Involved at Your Local Level

Whereas everyone realizes the heavy workload that goes into the daily teaching-learning process, teachers, thus, find difficulty in doing all the “extra” activities that could be undertaken to develop and support quality and effective programs. Yet, there may be a variety of daily activities that can create a groundswell of support for local programs. First, we must realize the opportunity we have to advocate to local leaders, stakeholders, and decision-makers. Every member of the school board, local city council, or elected official either has had or currently has neighbors, children, or relatives attending your local school. If we as educators can clearly define a set of positive results that occur as an outcome of the educational process (we establish verifiable health-enhancing lifestyle behaviors), then we should
be able to present the evidence in a variety of settings. Providing time in content area staff development programs to analyze district data and draft summary reports would be a necessary first step in creating locally-based reports relating to the effectiveness of your programs. Second, we can ask for regular time to be allotted during staff meetings for discussions relating to increasing physical activity time during the school day to enhance focus and attention, to use physical activities that integrate content areas lessons, and to improve the healthy environment of the school. Third, teachers can use their school-based communication systems to provide weekly activity promotion guidelines, describe steps parents can take to promote activity and healthy behaviors at home, and constantly maintain a health promoting position that documents ways in which encouraging healthy behaviors may lead to a higher quality life and a longer lifespan.

Fourth, teachers and groups of colleagues can form an advocacy group whereby members make themselves available for public presentations and consulting activities. These activities can be directed toward policy setting initiatives found in the community, the county, or the state. In considering the potential effect on state legislators, for example, we must also remember that our representatives and senators often have school-aged children or family members with school-aged children. The more we advocate at the local level, the more likely we are to affect every member of the state legislature. This could be further strengthened by inviting elected officials at all levels to local events and presentations that highlight the achievement of students in your school’s health and physical education programs. From federal to state to local levels, advocacy efforts include many types of communications with decision-makers:


2. Locate and contact federal, state and local officials by entering your zip code: www.congress.org

3. Track bills and look up legislator information in Missouri: http://www.senate.mo.gov/ and http://www.house.mo.gov/

4. http://clpi.org/nuts-a-bolts/advocacy-tactics - Data, coalitions, the legislative process information


Every health and physical education teacher and every program benefits by gaining adequate support for quality programs, in terms of time devoted to the program, funds available for program resources used in teaching and
learning, and support in terms of program relevance. For example, joining forces with concerned parents is another strategy that was implemented in a school district in the Phoenix, AZ area (Lee, 2012). On a school-wide basis, the district recruited and trained a large group of highly-involved parents to act as health advocates to promote school policies that positively affected their children’s’ This model could be used in any/every school at little or no cost, and could further be strengthened by enlisting the support of community public health officials who could add their professional expertise to the efforts. However, it cannot be expected that such levels of support would be provided without strong evidence of achievement and the effect your program has on increasing student readiness for learning and school connectedness.

**Daily Advocacy**

As a daily advocate for children’s health and well-being, and for quality programs that have built-in accountability and intervention systems, each health and physical education teacher must be aware that the most important focus in an advocacy program is to educate children using health-enhancing methods. Time and effort during every class meeting in health and physical education should include an advocacy emphasis. This should be a multi-dimensional focus in each class. One focus should be on emphasizing and promoting those daily healthy living behaviors that serve as protective factors in a health-enhancing lifestyle. Second, a focus should be directed toward developing students’ advocacy skills (National Health Education Standard 8), thereby equipping children at all age levels to be effective advocates for health-enhancing policies, standards, and environments within the school, their home, and the community.

A natural audience to consider is how we can then extend the focus of our teaching to include other teachers, staff, and administrators within the district. During each staff meeting, the health and physical education teachers should request a small block of time to present information that would be of benefit to all. An effective tool to use as an introduction, to make the topics meaningful to all colleagues, would be to request that each complete the Real Age Test, an extensive health-risk behavior analysis tool that shows the relationship between health risk behaviors practiced by the person and their expected lifespan in years. To access this tool, go to [www.realage.com](http://www.realage.com). Once colleagues receive a printout describing their health risk age, you can then target subsequent presentations with current information about dietary behaviors, weight control and energy balance, stress management activities, nutritional and dietary behaviors, safety practices, and a wide variety of other health issues. Another example of an advocacy activity with this group is to review and adopt the Missouri Eat Smart Guidelines (MOCAN, 2008), stressing the importance of adopting the Guidelines at the Exemplary Level. As the content area expert in health and wellness, you should then serve as a
mentor to colleagues in helping to improve their personal lifestyle and in the attention they give to the health-enhancing behaviors of children.

As we constantly advocate to children in every class, and to colleagues through staff meetings and informative electronic messages, the same advocacy efforts can be directed toward parents. This is most naturally brought into parent-teacher conferences, PTA/PTO meetings, and by utilizing the school website to communicate regularly with parents. Additionally, by scheduling special events for families, such as parent/child cooking classes, activity time, and other health-related activities, parents can be the most important advocates for the health of their children. Many organizations have materials specifically designed to educate and empower parents by providing accurate information to help them develop health-enhancing skills in their children. Failure to use this audience effectively can serve to diminish the effectiveness of all other advocacy efforts.

Conclusion

A necessary and critical professional attribute is the firm and absolute conviction about the worth of the your ‘product’ (healthy and active lifestyle development). In society today, we must realize that we have the product that can not only be effective in remediating a host of lifestyle-caused diseases, conditions, and economic difficulties, but can also be the program that prevents such occurrences. Because our health and physical education programs can be highly effective in achieving a higher rate of school attendance and school connectivity, a lower rate of behavioral problems, and improved academic success in every content area, we need to promote this information to students, to school staff and administration, and to the public. In promoting the nationally recognized, research-based benefits of full participation in high-quality programs designed to build healthy and active lifestyle behaviors, we need to support these claims with locally-collected data. To effectively promote our product, we need to provide evidence that supports our claims and the goals of our local programs.

As there is a demonstrated need within society to produce healthy and active people, the time has never been better to trumpet our triumphs. Health and Physical Education provides the necessary health-related information and health promotion activities that unite the school, the parents, and the community in efforts to promote the healthy and age-appropriate development of children. Advocacy efforts, especially local advocacy, strive to create a community where the environment supports the goals of our programs. Should we be successful in presenting credible information and promoting programs and services to all who may benefit, support for our programs, in terms of time allotments, resources, and recognition as a core subject area will increase. Should we choose not to devote time and effort to the initiatives described here, we cannot expect to be supported by school
officials, parents, or the community. As professionals who can profoundly affect the future lives and careers of young people, advocacy efforts need to be an essential skill and function of every health and physical educator in the state.

References


Lee, Michelle Ye Hee. (March 15, 2012), Phoenix-area parents join kid health program. The Arizona Republic


Texas Youth Fitness Study. Retrieved from: http://mggca.org/...studies/Texas%20Youth%20Fitness%20Study/

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This article explores some of the issues facing  k-12 physical education. It opens with a brief discussion of the relationship between physical activity and academic achievement. It then transitions into a discussion of what teachers can do to improve their k-12 physical education curriculum. The article concludes with a brief discussion of what physical education might look like in the future.

In today’s society people are inundated with suggestions of what not to do in order to stay healthy. These suggestions include: do not stay up too late, do not stay out in the sun too long, do not smoke, and do not eat too much junk food. One thing people are told to do is to exercise. As widely known, exercising can help prevent life threatening disease, stroke, and obesity, and can increase muscular strength and bone density, balance blood lipids, and grow new capillaries in our hearts (Shaw, 2004).

The US Department of Health and Human Services (2008) recommends that school aged children get 60 minutes of daily moderate to vigorous physical activity. Schools provide a unique venue for children and youth to meet the physical activity recommendations, as they serve nearly 52 million students (National Center for Education Statistics, 2009). Therefore, it is time to examine the k-12 physical education curriculum to ensure students are receiving the best possible educational experience.

Let’s begin by describing the current model for a typical school. Students are asked to sit in desks for eight hours a day. Depending on the school, they may get a 15-minute recess break and physical education every other day. No Child Left Behind legislation has added more pressure to districts and has resulted in a rigorous push to increase math and reading scores by 2014 (U.S. Department of Education, 2008). The natural reaction of many leaders in education is to spend more time and more money on the core subject areas in an attempt to boost the test scores of American students. The time and resources that educators continue to eliminate from physical education, recess, and athletic practices have been to no avail as the United States continues to fall behind other countries academically. Satcher (2005) pointed out that physical activity can lead to improved academics and test
scores even when it reduces class time in other areas. In the same report, daily physical education was shown to improve concentration, student attitudes toward school, and daily attendance. John Medina, author of *Brain Rules* stated, “Cutting of physical exercise - the very activity most likely to promote cognitive performance - to do better on a test score is like trying to gain weight by starving yourself” (2008, p. 25). In this current model, students are not receiving the exercise their bodies and brains crave. This failure to stimulate brain function may be leading to a lack of learning.

It may be time to change the k-12 school day structure and provide students with increased movement throughout the day. Not only can movement and vigorous physical activity make a school day more interesting to a developing mind, numerous studies have shown that vigorous physical activity and sport participation can help to close the achievement gap by helping the brain to function at a higher efficiency (Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Ratey & Hagerman, 2008). Fox, Barr-Anderson, Neumark-Sztainer and Wall (2010) reported a significant correlation between middle and high school students who were consistently physically active at a vigorous level and an improved grade point average (GPA). The study also showed that the largest increases in GPA were consistent with the students who spent the most time exercising at a vigorous level. As Medina put it, “Physical activity is cognitive candy” (2008, p. 22).

In an experiment at an Illinois high school, the physical activity goal was so vigorous that participants were asked to stay between 80 and 90 percent of their maximum heart rate (Ratey & Hagerman, 2008). In this physical education class researchers used a fitness-based approach to keep the students moving and heart rate monitors to keep records and create motivation for the students. This particular school out-performed most surrounding schools on ACT, math, and science scores even though they did not spend as much money per pupil as did similar schools (Ratey & Hagerman, 2008). This is an example of one school fighting against the odds, fighting against the finances, and finding academic success through the use of fitness based education.

So what does the fitness based physical education program look like? It provides students choices of lifetime fitness activities so they can find something which they enjoy. It assesses students on effort rather than on skill and uses technology along with small-sided sports to ensure students are working in their target heart rate zones (Ratey & Hagerman, 2008). This fitness-based approach to learning can also impact classrooms. Classroom teachers can implement brain breaks, allow students to walk on treadmills during lectures, or allow for recess twice a day (Medina, 2008).

There are 52 million children, from kindergarten through 12th grade, who attend public and private schools in the United States. If they all had an opportunity to experience fitness based instruction in both physical education and the classroom, the next generation of adults may be healthier, happier, and smarter (Ratey & Hagerman, 2008). It is time for a change!

The remainder of this paper will discuss current issues in the k-12 physical education curriculum and this paper then concludes with a recommendation for physical education for the future.
Student Interests in Physical Education

It is true that physical education is not a typical class within a school building. The classroom environment, the structure of class activities, the instructor evaluation, and the classroom itself used in physical education are different than other school classes. Therefore, it is only natural for students’ interests in, and views toward, physical education to be unique when related to other courses.

Scantling, Strand, Lackey, and McAleese (1995) found that senior students were generally pleased with the physical education classes offered at their schools and 52% indicated that if they had more time they would take more physical education. Even though student interest in physical education was apparent, 73% of students had abstained from taking elective physical education classes. The main reason for this lack of enrollment was that students viewed classes in other subject areas to be more important for college with a second reason being that they did not like physical education. The later fact is a disturbing finding and should be an incredible motivator to improve practices in physical education.

Improvement can begin by simply looking to students. Students want to feel as though they are in control of their learning. If they do not feel in control, or if the task seems too difficult, students may resist participation (Chen, 1998). This point is especially important in physical education where we want students to be actively learning. In order to make sure students are receiving the best possible physical education experience, their interests and enjoyments need to be taken into account. This can be done by conducting a survey and incorporating student opinions into curriculum design.

Surveys have revealed that middle and high school students prefer traditional team sports and that students do not enjoy participating in activities specifically designated for fitness, especially running (Barney & Deutsch, 2011; Luke & Sinclair 1991; Strand & Scantling, 1994). These results do not necessarily correlate with best practices in physical education and if teachers want students to enjoy physical activity for a lifetime, they need to find ways to combine best practices and student interest. Strand and Scantling (1994) suggested starting a semester with traditional team activities preferred by students and then add other more nontraditional activities based on student interest at certain levels. In this way, students are able to enjoy their favorite activities and still benefit from new experiences. Another suggestion is to incorporate fitness activities into team sports to make fitness more enjoyable for students (Barney & Deutsch, 2011).

There have also been issues within physical education classes that have affected the interests of students and influenced their level of class involvement. Many classes have been stuck in the physical education stone-age as generations of teachers have copied the practices of their predecessors. Little thought had been given to fitness and the needs of current students as traditional team sport activities made up the bulk of physical education curricula (Stand & Scantling, 1994). Medina stated “We don’t pay attention to boring things” (2008, p. 71). If students perceive the current curriculum to be boring, they are not going to learn. What is even more alarming is if students become bored in physical education class, they associate boredom
with physical activity and can be turned off to specific activities for life (Chen, 1998). As a physical educator, one’s goal should be to keep students active for a lifetime, not to turn them off to physical activity. With this goal in mind, teachers need to consider the students’ interests along with best practices when deciding on curriculum. Barney and Deutsch commented, “If students develop positive attitudes towards physical activity they will have a greater chance of developing and maintaining an active lifestyle” (2011, p.13). It is a physical educator’s responsibility to relay that message to students in hopes of them understanding how important physical education classes really are to their futures.

Contemporary Curriculum Models

With the need to update many physical education curricula across the country, keeping student interests in mind, and focusing on creating lifelong interests in physical activity, four curriculum models have emerged. Fitness Education, Sport Education, Teaching Games for Understanding, and Personal and Social Responsibility are the leading models that have been guiding physical education through a much needed change (Darst, Pangrazi, Sariscasany & Brousseau, 2012).

The Fitness Education Model is a concepts-based strategy in which students are taught in-depth information on how various fitness activities affect a person’s health and well-being. This is achieved through the use of lectures, labs, experiments, and other means usually reserved for traditional classrooms. These fitness concepts are then put into practice during physical education activities. This focus on the “how’s” and “why’s” of physical fitness, coupled with physical activities, are meant to give students a base of cognitive knowledge and physical experience to lead them toward a physically active lifestyle. The belief is that if students better understand the importance of fitness based activities, they will have the ability, and motivation to generate a life-long personal fitness plan (McConnell, 2010).

The Sport Education Model aims to fully engage students in a sporting experience that heightens their value of sports (van der Mars & Tannehill, 2010). The goal of this model is to help students become proficient and knowledgeable enough with skills, strategies, and procedures of a sport that they will feel comfortable becoming involved in an out-of-school league. To achieve this level of fluency, more time is dedicated to each sport, and students take a more active and controlling role in their experience. Students are guided through a process where they construct teams, play games, create schedules, officiate games, and plan skill practice. This complete sporting experience is meant to produce students who are competent, literate, and enthusiastic about sports and the many roles and competitive levels a person can play within a sport.

The Teaching Games for Understanding Model focuses on the use of strategies and tactics in problem-solving situations (Mitchell & Oslin, 2010). The role of the instructor is to put students into unfamiliar situations within a game context. This can be done by changing rules of a game, adding or taking away equipment, and changing players on a team. The idea is for students to develop their decision-making skills by overcoming these purposeful
obstacles all while staying within the rules of the game. This model of physical education is meant to force students to use their imagination as they concentrate on strategies and tactics to overcome challenging situations.

The Personal and Social Responsibility Model aims at teaching students how to be productive members of the class while interacting appropriately (Parker & Stiehl, 2010). This is only accomplished if all students are involved and engaged. Students must be provided with choices during class, be given a chance to practice making choices, and they need an opportunity to reflect on the choices they have made.

Many students are brought up in surroundings that do not teach them to take responsibility for their actions. By implementing a class structure in which students are encouraged to complete tasks successfully as an individual, and as part of a larger group, the students can learn the value for themselves along with an appreciation for teamwork. This teaching model makes students accountable for activities within the class. That kind of shared control can be very empowering to students who are being asked to change their personal and social culture.

These four modern physical education curriculum models have all received a significant amount of support from the physical education community. Each model is not ideal for every teaching circumstance, grade level, or community. Given the vast difference in the teaching models, they collectively give any physical education curriculum a solid base from which to build.

Evaluating Physical Education Curriculum

Regardless of the physical education curriculum model schools decide to implement, effectiveness of curriculum needs to be addressed. Curriculum should be designed to meet the needs of students and help them achieve the standards and goals set forth at the state and national level. Conducting a curriculum evaluation can ensure that physical education programs are meeting the needs of students, teachers, and the entire department. Let’s take a look at the what, when, how, and why of curriculum evaluation (Lucursia, 2010).

Why is evaluation important?

There are several reasons to conduct an evaluation including ensuring goals for the program are being met and to judge student satisfaction. A good evaluation will ask the questions, what do we intend to do, how well are we doing it, and are we meeting the needs of all of our students? Of course, every student will not like every planned activity, but implementing a variety of activities will address the needs of every student at some point in the curriculum.

Evaluations should also lead to program improvement and give accountability to physical education curriculum. The information obtained through the evaluation may lead teachers to add new activities, revamp policies and procedures, or adjust class sizes and frequency of class sessions. In an era of accountability, teachers are held accountable for everything they do. Conducting a well thought out evaluation helps to justify the money
spent on physical education and validates the time and resources needed to provide a quality program (Lund & Tannehill, 2010).

What makes for a good evaluation?
A good evaluation will be objective, thorough, systematic, and include all viable sources of information. Valid and reliable data are an important part of the evaluation process but professional judgments of the teacher or writing team should guide the final decisions on how the evaluation will be put into practice. Remember, a self serving agenda will not produce a quality evaluation.

When should an evaluation be completed?
Different evaluations can be completed at any point depending on the objective of the evaluator (Lund & Tannehill, 2010). Preformative evaluations are conducted before the implementation of new programs or activities. For example, a school may be thinking about adding new cardio equipment to the fitness room. A preformative evaluation would look at how that could be done efficiently and cost effectively.

Formative evaluations are conducted while the program is being implemented and assess if the program is achieving success. Formative assessments evaluate where the program currently is, and what changes need to be made while there is still time to make them. And finally, summative evaluations are done at the conclusion of the program and are a way to measure success.

How should an evaluation be conducted?
There are many different ways to formally evaluate physical education programs. The National Association for Sport and Physical Education (NASPE) developed the Physical Education Teacher Evaluation Tool and the Stars Program, the Center for Disease Control and Prevention (2010) developed Physical Education Curriculum Analysis Tool (PECAT), and the Four Phase Curriculum Review Model was inspired by the work of Saylor and Alexander (Lacusia, 2010; Lund & Tannehill, 2010). Regardless of the method used, an evaluation needs to assess the goals of the program and determine the degree to which the goals are being met.

Indirect measures can also be examined to determine program effectiveness. Examining factors such as participation in after school programs, enrollment in elective classes, attendance and participation of students, grades, and student fitness levels can all give good indications of program effectiveness.

After evaluations have been completed, results need to be analyzed. Educators need to determine which goals are being met by students and the degree to which students are meeting state or national standards. An action plan should be developed to address any areas of concern that are found, and a timeline should be followed to address these areas in a systematic fashion. After completing this process, results are shared with the administration, the school board, and other teachers. Program evaluations should be completed on a regular basis and the results should be used to improve programs. One must remember that improvement means change and if programs want to get better, change needs to happen (Lund & Tannehill, 2010).
Physical Education in the Future

Successful physical education programs can take many shapes and have several different goals. With school leaders concentrating on “core subjects”, physical educators must progress with a vision of the future in order to stay current for the long-term. That vision should include areas such as technology, community involvement, teacher education, and curriculum.

Physical education in the future may very well include space-age equipment such as electronic projection flooring where court lines can be changed with the push of a button, or equipment with sensors to judge the correctness of a performed skill. To get to that point however, there are some current technologies that can be implemented. Physical activity can be monitored at lower levels by the use of pedometers while heart rate monitors and accelerometers can be used at appropriate age levels to measure physical exertion (NASPE, 2011).

Students growing up in the 21st century are learning and growing in a time where everything is done by the use of technology and access to that technology is instantaneous. To build physical activity into the real world of students, the physical education movement needs to be a part of social networking, it needs to be interactive, and smart phone apps should be available for student use. The same can be said for physical education teachers. Teachers need to make use of new technology as well and have lessons, videos, instruction models, and assessment tools at their fingertips. Technology is heavily involved in the future of all aspects of education; physical education needs to be at the forefront of the transformation.

One way to get greater participation and support for local physical education programs is not just to teach the students, but to also involve the entire community. Lifelong physical activity habits start forming at a young age and it is important for physical education programs to form a positive connection with students, families, and community members, before, during, and after school. With obesity rates on the rise, it is vital for students to see their role models engaging in physical activities.

To continue to progress in the areas of technology and community involvement, teacher development programs must have the same vision to prepare new professionals for their vocation. Developing a certification process for cooperating teachers would ensure that students get placed with teachers who are current with the development of the physical education field (NASPE, 2011). This certification will not only help future teachers, but existing teachers as well.

If future physical education programs will be conducted differently, they will need updated curricula. This could be done site by site, or school districts could collaborate to become larger agents of change within each school. The focus of these revamped curricula should be student needs and interests and less linked to the traditional physical education model. These new curricula should be posted as examples for other schools so communities can see the progress being made in the discipline of physical education.

Valuing students’ interests, evaluating curriculum, allowing contemporary curriculum models be the guide, and looking to the future will start and/or keep physical education thriving in our schools. “Superior physical education
programs responded to society’s needs, expectations, and demands. And, physical education will continue to do just that” (Stier, 1994, p. 4). With the advocacy of positive and successful programs, decision-makers will have to view physical education as a necessary partner to traditional classes. All of our nation’s students deserve that physical benefit and the academic affect.

References


National Association for Sport and Physical Education. (2011). *PE2020*


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Energy Drinks and Rating of Perceived Exertion
Trevor Swaine and Steve Burns, University of Central Missouri

Introduction: As more energy drinks stock the shelves, questions arise about how they affect the body, especially during exercise. Purpose: The primary purpose of this study was to determine how energy drinks affect a person’s Rate of Perceived Exertion blood pressure and heart rate during extended, steady-state exercise. Methods: Participants were 10 active (6+ hours of physical activity per week), male, UCM students, ages ranging from 19-25. All subjects completed a placebo (caffeine free diet Mountain Dew) and experimental trial (monster energy drink). One-hour after administering the drink participants completed 1 hour of steady-state cycling on a Monark 828 ergometer. Heart rate was monitored throughout the exercise with a Polar Heart Rate monitor, while every 15 minutes, the RPE of each participant was recorded using the Borg’s Scale. Blood pressure was taken before the digestion period and immediately following the exercise. The distance the participants traveled was tracked using the Monark 828 ergometer and recorded after completion of the exercise. Results: The subjects displayed an average HR of 125.8 ±19.8 bpm during the placebo trial and 133.9 ±25.6 bpm during the Monster trial with a T-Test value of 0.125. The average change in blood pressure showed no notable difference between the two trials. In the Monster trial, the average distance traveled demonstrated a slight increase from 30.59 ±3.9 km in the placebo trial to 31.19 ±4.4 km with a T-Test value of 0.304435 while the average overall RPE declined from 14.0 ±1.63 from the placebo trial to 13.8 ± 2.25) in the Monster trial with a T-Test of 0.002) Conclusion: These results indicate that Monster energy drinks will allow for a higher work output (determined by the increase in the average distance the subjects travelled while the duration remained constant) during exercise, while decreasing the user’s feeling of exertion. An increase in heart rate is also possible, however; there is no evidence to suggest that it will cause a change in blood pressure. This is important for physically active individuals willing to trade off the probability of a higher heart rate during a steady-state exercise, for the possibility of an increased work output with a feeling of less exertion.

Key Words: Rate of Perceived Exertion, Blood Pressure, Average Heart Rate, Work Output, Monster energy drink, Placebo, Steady-state exercise
Testing Performance and Physical Activity Level between Two Health Majors

Jessie Stout, Tara Gunderson, and Nikia Bell

Foundations for Exercise Physiology

Stephen Burns

Introduction: Physical activity is crucial to maintain a healthy body. Most people know that they should be getting at least thirty minutes of physical activity a day, and no one should know this better than health majors.

Purpose: The purpose of this research project was to compare two health majors (Exercise Science and Physical Education) on performance on the presidents’ challenge test and current daily physical activity level.

Methods: Twenty students (ten students from each major), ages 18-25 participated. At subjects completed the presidents’ challenge test consisting of push-ups in a minute, running a mile, sit and reach for flexibility and sit-ups in a minute. Scores were compared, and ranked by percentile. Each participant also wore a pedometer daily for seven days to determine number of steps. The participants were also asked to rate themselves on how fit they perceive themselves being, on a scale of, 1 being out of shape to 10 being physically fit.

Results: The results indicated Exercise Science majors had higher averages in three out of the four tests in the president’s challenge test. Sit-ups and push-ups had an average of 47± 9, and 34 cm being the average sit and reach length. While Physical Education majors performed greater in the one mile run test, with an average of 7 minutes and 31 seconds, compared to Exercise Science with an average of 7 minutes and 81 seconds. But when it came to who was more active, (number of steps) Physical Education majors’ greatly outnumbered Exercise Science majors with 750, 717 steps taken for the P.E. major, while Exercise Science had 535, 823. Exercise Science had a higher average rating of how physically fit they perceive themselves to be, with a 7, and P.E. having an average ranking of 6.2.

Conclusions: The conclusions were (1) Exercise Science majors performed superior on the presidents’ challenge physical test (2) Physical Education majors had a higher total average of steps taken for the seven day period, meaning their level of physical activity was greater, and (3) Exercise Science perceive themselves more physically fit compared to P.E. majors. One major did not completely dominate over the other. Both majors are good examples of students that take their majors seriously and really do “practice what they preach” when it comes to being physically fit.

Key Words: Exercise Science, Physical Education, presidents’ challenge test, physical activity

Acceleration of the Leg and Muscle Recruitment Pattern in Barefoot and Shod Runners

Sara Yunghans, Katie Pitts, & Michael Bird, Truman State University, Kirksville, MO.

Barefoot running is an increasingly popular modification to cardiovascular
exercise. Injury may be reduced in barefoot runners due to decreased peak acceleration. A possible explanation for decreased peak acceleration in barefoot runners is a change in muscle activity in the leg. **PURPOSE:** The purpose of this study was to determine if the peak acceleration and muscle recruitment patterns differ between barefoot and shod runners. **METHODS:** Five barefoot and five shod runners were matched based on height, weight and 5K times. Electrodes were placed on five muscles of the subjects’ legs as well as a 3-axis accelerometer. After a warm up, subjects ran at 85% of their best 5K times for 30 seconds. EMG and accelerometer data was collected. **RESULTS:** Muscle activity of the tibialis anterior during the breaking phase was the only statistically different variable between barefoot and shod runners. **CONCLUSION:** Muscle activity of the tibialis anterior was likely due to the dorsiflexion that the tibialis anterior performed in shod runners in order to heel strike. Although no other relationship was statistically significant, a trend in the acceleration data was noticed that may be more significant with a larger sample size. This information could be used in future research in determining the benefits of running barefoot or shod.

**Comparison of Pushing and Pulling Strengths in College Wrestlers**

*Brittany Beeler and Colton Schmitz*

*Faculty mentor: Jerry Mayhew and David Schutter*

Recent research has suggested that the push:pull ratio for the upper body should be approximately 1.00. However, the pushing and pulling exercises were not performed in the same biomechanical plane. The purpose of this study was to compare the pushing and pulling strengths of college wrestlers prior to and in the middle of the competitive season. Division II college wrestlers (n = 18) performed maximum repetitions on a seated horizontal shoulder press and a seated horizontal pulling machine. If the subject could perform more than one repetition with the maximum weight stack, a curvilinear prediction equation was used to estimate 1RM from repetition weight and maximum repetitions. Test order was randomized and a minimum of five minutes recovery was given between tests. A push:pull ratio was calculated from maximum values. Paired t-test indicated that pull strength decreased significantly by mid-season (305 ± 58 vs 287 ± 41 lbs, p = 0.04), while push strength remained relatively constant (269 ± 50 lbs vs 271 ± 49, p = 0.79). This caused the push:pull ratio to increase slightly from pre-season (0.89 ± 0.13) to mid-season (0.94 ± 0.07). Body mass was significantly correlated with both push (r = 0.57) and pull strengths (r = 0.60) but not to the push:pull ratio (r = -0.07). These results suggest that college wrestlers may show decreased strength in an arm pulling motion across the competitive season which had an impact on the push:pull ratio. The rational for the strength decrease is not clear at this time and warrants further investigation.
Celebrity Golf Tournament: Strategic Marketing Plan  

**Natalie Bird, Lexi Webb, Dr. Paul Choi (Advisor), Missouri Western State University, Department of Health, Physical Education, and Recreation**  

The rapid growth of the sport industry has created a strong demand for competency-based management. Primary concern for sport marketers/managers is to apply key marketing concepts and strategies within collegiate and professional sport contexts and to manage recreation enterprises. In an effort to raise awareness about the Western golf programs at Missouri Western State University and raise money for The First Tee, the Missouri Western State University Celebrity Golf Tournament was created. The purpose of this project was to utilize knowledge and skills in sport marketing to implement a service-learning project in the community. The Tournament Organizing Committee had three main goals: (1) make a profit of at least $5,000 to donate to The First Tee; (2) have at least 25 teams participate in the event; and (3) bring The First Tee National School Program to a St. Joseph elementary school. Each of these goals not only involved in the community, but also built the youth golf programs in the community. The community of St. Joseph would greatly benefit in a number of ways from this event. For instance, children will have the opportunity to learn the game of golf to benefit for a lifetime by bringing The First Tee National School Program to an elementary school. The development of the project by the tournament committee, the findings for the community partners, and the strategic marketing plan for the golf tournament will be shared.

Behavioral Choices and Wilderness Opinions among Wilderness Users  

**Sarah Campbell, Dr. Paul Choi (Advisor), Missouri Western State University, Department of Health, Physical Education, and Recreation**  

Recreation choice behavior influences people’s experiences by what they want to seek from recreation (McFarlane & Boxall, 1998). Behavior therefore serves as an indicator of the needs which initially inspires participation. In wilderness management, it is important to understand the behavioral factors that influence wilderness visitors’ opinions about wilderness. Therefore, this study was designed to explore how behavioral choices affect people’s opinions on wilderness use at the Mark Twain National Forest (MTNF) in Missouri. It was hypothesized that visitors with different behavioral characteristics would affect their perceived values of wilderness. The methodology for this study includes a previously used questionnaire, The Wilderness Values Test, developed from Clark and Kozacek (1997). Behavioral choices at the MTNF are categorized into day outings and overnight staying. This serves as an indicator of the types of recreational participation different visitors are likely to prefer.

Demographic information revealed similarities and differences between visitors with different behavioral characteristics. Visitors enjoyed hiking/backpacking the most followed by fishing/hunting, horseback riding, and rock climbing. In relation to wilderness setting preferences, 65.2% enjoyed...
day outing while 52.2% had overnight trip. The results of the ANOVA test indicated that wilderness visitors’ perceived values of wilderness were not different whether respondents took the wilderness trips for day outings or overnight staying. They had similar behavioral characteristics to visit wilderness at MTNF. This study assisted wilderness managers in finding the appropriate balance between providing quality recreational opportunities for wilderness visitors and preserving wilderness in Missouri.

Prevalence of Exercise Dependence in Exercise Science Majors versus Non-majors
Jessica M. Cashion, Eden J. Elfrink, Jennifer N. Havicon, and Chico M. Orlando
Faculty mentor: Christopher Lantz
Body dissatisfaction has been defined as the discrepancy between an individual’s perceived current body size and their ideal body size. This could affect an individual’s subjective sense of body satisfaction which has been linked to exercise dependence as well as other important life choices such as career decisions. This raises the question of whether Exercise Science (ES) majors would have a greater tendency towards exercise dependence than non-ES majors. Thus, the purpose of this study was to compare the prevalence of exercise dependence in ES majors versus non-ES majors. Academic majors for the non-ES majors were chosen based on their non-science course curriculum. Questionnaires containing the Exercise Dependence Scale-21 were distributed, 76 were returned, and 16 were excluded due to incompleteness. In ES (n=36) 3 dependent cases were found versus none in non-ES (n=24); the three cases were all female. A Fisher Exact Probability Test \[P(58)= 0.209, p > 0.05\] and a Mann-Whitney U-Test \[Z(58)=0.150, p > 0.05\] revealed exercise dependence was not significantly different between ES and non-ES majors. A possible explanation for the lack of difference between ES majors and non-ES majors may be that many of the ES majors were preparing for careers in medical areas such as physical therapy rather than in a more exercise-oriented profession. Further investigation in a more traditional exercise-based college curriculum might produce different results.

Reliability of Isoinertial Bench Press Power Measurements in Untrained Women
Sadie Dahle and Erin Small
Faculty mentor: Jerry Mayhew
The purpose of this study was to assess the reliability of isoinertial upper-body power measurements in untrained women. Ten college women (age = 19.8 ± 1.3 y, weight = 70.3 ± 11.4 kg) performed five trials in a supine isoinertial bench press throws on a specially designed Smith machine. The Smith machine allowed a linear vertical path with a hydraulic bar catch at the peak of a bench press throw. Following a standardized warm-up, each subject performed five throws with a bar weight of 20.7 kg. Throws were
separated by three minutes rest. Maximum vertical velocity, force, and power were determined for an accelerometer attached to the bar support structure. Repeated measures ANOVA determined there were no significant differences across trials for power (p = 0.19), force (p = 0.59), or velocity (p = 0.67). The intraclass correlations for power (ICC = 0.967), force (ICC = 0.964), and velocity (ICC = 0.908) were all significant (p<0.001). The maximum percent variation across trials for power (15 ± 8%), force (5 ± 4%), and velocity (12 ± 5%) were moderately to highly correlated (r = 0.24 to 0.80). Upper-body power production was unrelated to height (r = -0.08) and weight (r = -0.31). This pilot study indicates that untrained women are capable of producing reliable isoinertial bench press power variables with no apparent learning effect pattern.

Comparison Between Perceived and Desired Height and Weight and Activity Level Among Undergraduate Exercise Science and Non-Exercise Science Majors

Alyssa Duffy, Truman State University, Kirksville, MO
Faculty mentors: Jerry Mayhew and Jana Arabas

The purpose of this study was to evaluate self-reported perceived and desired height and weight of undergraduate students in two major categories. Thirty-three subjects were randomly surveyed from Exercise Science (ES, n = 19) and Non-Exercise Science majors (NES, n = 14). All subjects completed a survey detailing perceived and desired height and weight, academic major, and daily duration for aerobic exercise and strength training. Results from a 2x2 repeated measures ANOVA showed that there was no significant difference between majors when comparing perceived and desired height and weight. However, both groups indicated a significantly greater desired height (68.3 ± 4.6 ins) than reported height (67.6 ± 4.1 ins) and significantly lower desired weight (154.7 ± 38.6 lbs) than reported weight (159.7 ± 35.3 lbs). The difference between desired and perceived heights and weights resulted in a significantly lower desired BMI (23.1 ± 3.7) than actual BMI (24.4 ± 4.0). Independent t-tests indicated that ES performed significantly more aerobic training per day (46.6 ± 26.4 mins) than NES (27.5 ± 14.8 mins). However, the difference between the groups for strength training per day was nonsignificant (ES = 26.1 ± 17.1 mins vs NES = 20.4 ± 24.8 mins). The results of this study suggested that while academic major may not influence the difference between perceived and desired height or weight, most participants generally desired to be 1% taller and weigh 3% less than reported. In addition, ES perform 69% more aerobic exercise and 28% more strength training per day than NES.

Effects of Muscle Fatigue on Endurance Resistance Training

Bradley Gieske, Matthew Bell, Sara Cassabaum, and Christian Smith
Faculty mentor: Dr. Chris Lantz

Muscle fatigue may be caused by many factors and result in reduced force-
generating capacity. Overtraining is a condition which may lead to a state of chronic fatigue and hamper the positive adaptation to resistance training. The purpose of this study was to determine the effect of five successive days of muscle endurance exercise capacity on work performance. Ten moderately trained college students (9 M, 1 F) performed a single set of 15 maximum repetitions (15RM) in a free-weight bench press at the same time of day on each of five successive days. The weight utilized by each participant was approximately 66% of their 1RM. A standard warm-up of 10 push-ups and several upper-body stretching exercises were performed before each test. A repeated measures ANOVA revealed a progressive decrease across the week, reaching significance by Thursday (14.6 ± 1.4). There was a further nonsignificant decrease on Friday (13.9 ± 1.2). Thus, performance decreased linearly (r = 0.95) across the week, reaching a maximum between Monday and Friday of 16% (±13%). No significant relationships were found between the decrease in repetitions and the average amount of sleep, confidence in performance, and hours of previous strength or endurance training per week (r = -0.48 to 0.29). This study revealed that consecutive days of an endurance resistance exercise may lead to progressive decreases in repetitions over consecutive days.

Relationship Of Waist And Hip Circumference To Predicted Aerobic Capacity In College Men And Women

Katie Harvey and Torri Gray

Faculty mentor: Jerry Mayhew

Previous epidemiological investigation has shown waist-to-hip ratio (WHR) is a significant predictor of the potential for developing chronic diseases. More recent evidence suggests that waist circumference alone may be as good an indicator of chronic disease potential. Identifying individuals with significant predisposition via circumference measurements might preclude the flowering of any chronic disease in later years by an aggressive alteration in negative circumference measurements. The purpose of this study was to evaluate the correlations of waist and hip circumferences and body composition measures with aerobic capacity in young adults. College men (n = 100) and women (n = 96) volunteered to be assessed for waist (WC) and hip circumferences (HC), waist:hip ratio (WHR), body mass index (BMI), %fat, and lean body mass (LBM). Body fat was estimated from gender-specific, generalized skinfold prediction equations. Each subject performed a single-stage, 6-min submaximal ergometer test to predict VO$_2$max. In men, body mass (r = 0.34), BMI (r = 0.22), and LBM (r = 0.35) were significantly and positively correlated with absolute VO$_2$max, while WC (r = 0.13), HC (r = 0.14), and WHR (r = 0.05). Relative VO$_2$max was significantly negatively correlated with body mass (r = -0.23), BMI (r = -0.25), WC (r = -0.31) and HC (r = -0.35) but not WHR (r = -0.12). In women, all measures except WHR (r = 0.17) were significantly and positively correlated (r 0.33 to 0.45) with absolute VO$_2$max, and negatively and significantly correlated with relative
VO\textsubscript{2max} \((r = -0.26\) to \(-0.38\) except WHR \((r = -0.05\). While the W:H ratio was not a significant predictor of absolute or relative VO\textsubscript{2max}, hip circumference was moderately negatively correlated with relative VO\textsubscript{2max} in both genders.

**Relationship between Individual’s Past Experience and Motivation in Recreation Activities**

**Jasmine Wilson, Dr. Paul Choi (Advisor), Missouri Western State University, Department of Health, Physical Education, and Recreation**

Individual’s past experience such as Experience Use History (EUH) represents an indicator of the extent and type of information available to the individual obtained through participation in differing circumstances (Lime, Schreyer, & William, 1984). EUH represents the behavioral manifestation of differing motivations for participation (Lime, Schreyer, & William). Therefore, an individual’s past experience can reflect their motivation toward recreation activity. This study was designed to investigate how individual’s past experience level affects the factor structure of motivation for recreation activities. It is hypothesized that if an individual has more experience with recreation activity, he/she is more likely to be motivated than an individual with less experience.

A total of 97 recreationists participated in this study. Convenience sampling was used to measure the relationship between respondents’ past experience and motivation. In order to test individuals’ past experience, investigators categorized the EUH into four groups: novices, beginners, experiencers, and veterans. For motivation factors, wilderness trip motivation instrument was used with a minor modification (Williams, Schreyer, & Knopf, 1990).

The results of the ANOVA test indicated that individuals with different past experience had different motivation factors such as escape stress and people, self-awareness, enjoy nature, and recreation activities. However, Scheffe’s post hoc tests showed that respondents’ motivation factors were not differed whether recreationists have less or more past experience with recreation activities. It appears that recreationists with different past experience shared similar motivation factors for recreation activities. This study provided insight for the recreation industry into means for retaining participants and improving their level of motivation.

**Students’ Perception of the Main Causes of Freshmen Weight Gain**

**Sarah Mogus and Katherine Rolston**

Faculty mentors: Jerry Mayhew & Liz Jorn

The transition to the first year of college may produce many changes that can result in weight gain for many individuals. While body composition changes during the first semester have been documented, little information exists on why students believe they gain weight. Therefore, the purpose of this study was to determine students’ perceptions of the main causes of freshman weight gain. Fifty-four freshmen university students \((M = 19, F = 35)\) completed a survey to determine their perception of weight
gain during the first semester and their lifestyle behaviors before and after attending college. Subjects were grouped by gender and weight gainer and losers. Potential causes of weight gain such as caloric intake, physical activity, alcohol consumption, stress, and sleep habits were explored on the survey. Additional open-ended questions allowed participants to offer personal information concerning weight gain. Gender by Weight Gain groups (2 x 2) ANOVAs indicated significant differences in number of desserts eaten (p=0.003) and caloric intake (p = 0.042) between genders. The only group that did not increase in dessert intake was males that did not gain weight. A significant difference in amount of sleep (p = 0.001) was noted between those that gained weight and those that did not. The average amount of sleep decreased similarly for males and females both gainer and nongainer, going from an average of 7.8 to 6.6 hrs/night. Stress levels increased for females that did not gain weight (12.5%) but increased much more for those that did gain weight (53.3%). However, males that did not gain weight saw a larger increase in stress level than did males that gained weight. In summary, an increase in dessert consumption, caloric intake, stress, and a decrease in sleep appear to be what freshmen believe are the main causes of weight gain during their first semester. Because the survey was based on the students’ perception, the values may not reflect actual occurrences and may indicate that freshmen are unaware of actual changes that may occur during their first semester. Further research might combine body composition analysis with student opinion to focus to document the major causes of freshman weight gain.

Relationship Of Anthropometric Measurements And Body Composition With Upper Body Power

Devon Myers, Jerry Mayhew, Exercise Science Department, Truman State University, Kirksville, MO

A bench press throw routine has been widely accepted as a method of assessing upper body power. However, little thought has been given to the contribution of anthropometric measurements and fat-free mass (FFM) to bench throw velocity or height. A change in FFM, or specifically the individual’s muscle dimensions may significantly affect the relationship with upper body power. **PURPOSE:** To explore the relationship between anthropometric measurements, body composition and power output in male athletes using a bench press throw test. **METHODS:** Eleven NCAA Division II college baseball players (age = 20.2 ± 1.3 yrs, height = 182.8 ± 5.1 cm, body mass = 195.3 ± 29.5 lbs) were measured for muscle circumferences of the flexed upper and lower arm as well as the chest. Percent fat and FFM were predicted from skinfold measurements of the chest, abdomen and thigh using the Lohman equation (1981). Subjects were tested for upper-body power output using a bench press throw (BPT) with a standard forty-five pound barbell on a specially designed apparatus (Cormax 1000). Peak bar velocity and power were recorded from an accelerometer (Myotest). Subjects
were required to wear athletic clothing during their testing time and their height and weight were taken prior to participation in BPT. Participants were briefed on the function of the BPT machine and allowed one practice throw to acclimate themselves with the apparatus. They then took part in three BPT, ensuring both feet were firmly planted on the ground. Participants were given a one minute recovery between throws, during which time the bench press machine and accelerometer were reset. The highest power output from the three throws was recorded. **RESULTS:** Upper-body power performance did not show a significant correlation with any of the anthropometric measurements (see Table 1). Of the three measurements taken, lower arm circumference was closest to reaching a significant correlation \( (p = .081) \). FFM was the best variable in predicting BPP, showing a positive, statistically significant correlation \( (r = 0.641, p = .034) \). **CONCLUSION:** Upper body power as measured from BPT appears to be much more significantly related to FFM rather than upper body circumference measurements in male athletes. **PRACTICAL APPLICATION:** FFM values may be used to estimate upper body power, ignoring anthropometric measurements as a determinant. **TABLE 1. Relationship of anthropometric measurements and FFM to upper-body power**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Pearson Correlation</th>
<th>Significance (Two-Tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFM</td>
<td>11</td>
<td>0.641</td>
<td>0.034</td>
</tr>
<tr>
<td>Upper Arm CIR</td>
<td>11</td>
<td>0.307</td>
<td>0.359</td>
</tr>
<tr>
<td>Lower Arm CIR</td>
<td>11</td>
<td>0.548</td>
<td>0.081</td>
</tr>
<tr>
<td>Chest CIR</td>
<td>11</td>
<td>0.216</td>
<td>0.524</td>
</tr>
</tbody>
</table>

**Effect Of Virtual Active Technology On Heart Rate In Female Collegiate Soccer Players**

*Janee’ Patton, Sarah O’Donnell, Amy Kelly, Guy Danhoff*, and Mark Engelhardt*, Health & Sport Sciences Division, Missouri Baptist University, St. Louis, MO*

The purpose of this investigation was to determine the effect of Virtual Active™ technology on heart rate in collegiate female soccer players. Five participants in this study were asked to complete a total of two, ten minute runs at 5.0 mph on a commercial treadmill by Matrix Fitness. The athletes completed two separate runs with a five minute warm-up at 3.0 mph and 0 grade incline and ended the test with a five minute cool-down. During this test, a polar strap heart rate monitor was used to measure resting heart rate as well as heart rate every two minutes during exercise. During the second test, the athletes were allowed to engage the Virtual Active technology which included viewing an interactive, cinema quality, video based cardio workout as the resistance level will adjust to match the terrain shown in the video. A dependent t-test was used for data analysis. Results are summarized as...
follows, with Heart Rate in beats per minute (bpm) with data presented as means, p < 0.05 alpha level.

<table>
<thead>
<tr>
<th>Exercise Time</th>
<th>Without Virtual Active</th>
<th>With Virtual Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resting</td>
<td>78.0</td>
<td>81.0</td>
</tr>
<tr>
<td>2:00 min.</td>
<td>150.6</td>
<td>145.4</td>
</tr>
<tr>
<td>4:00 min.</td>
<td>154.4</td>
<td>151.2</td>
</tr>
<tr>
<td>6:00 min.</td>
<td>159.4</td>
<td>155.4</td>
</tr>
<tr>
<td>8:00 min.</td>
<td>162.8</td>
<td>159.2</td>
</tr>
<tr>
<td>10:00 min.</td>
<td>166.4</td>
<td>163.8</td>
</tr>
</tbody>
</table>

Since the number of subjects was small, there were no significant differences found between the heart rate measurements even though a linear decrease in heart rate was shown with Virtual Active. Results suggest that further studies are needed to demonstrate the effect of Virtual Active technology on heart rate in exercisers.

* denotes faculty research sponsor

Comparison of Perfect Push-Up and Regular Push-Up Exercise Programs on Muscular Endurance, Body Fat, and Muscle Mass in College Males

Andrew Piotter, Greg Daum, and Jorden Bax, Truman State University, Kirksville, MO

Faculty mentor: Jerry Mayhew

The purpose of this study was to compare the effectiveness of the Perfect Push-Up exercise device against regular pushups while performing the same exercise program. College men (n = 37, age = 19.9 ± 0.8 y) were assessed for weight, flexed arm circumference, chest circumference, triceps skinfold, arm cross-sectional area (CSA), arm-to-arm bioelectrical impedance analysis (BIA) percent fat, leg-to-leg BIA, and the maximum number of regular push-ups performed. Lean body mass (LBM) was computed from %fat values. Subjects trained every other day for three weeks following the Perfect Push-Up workout routine using the special push-up device (PPU) or regular push-ups (RPU). A control group (CON) performed only pre-and post-training testing. After training, the increase in the maximum number of push-ups performed was significantly greater for RPU (15.6 ± 10.1) than for CON (5.9 ± 7.3) but not significantly different from PPU (11.2 ± 4.8). PPU was also not significantly different from CON. None of the changes in the other variables were significantly different among the groups. PPU made significant increases in chest circumference, arm CSA, and LBM. RPU had significant increases in arm and chest circumferences, and arm CSA and a significant reduction in triceps skinfold. A regular push-up exercise routine appears to be superior for changes in muscular endurance and body composition measurements compared to a specially designed push-up device.
Comparison Between Perceived and Desired Height and Weight and Activity Level Among Relationship Between Backward Overhead Medicine Ball Throw and Power Measured from Two Lifting Methods A Prediction of Isometric Back Lift Strength from Anthropometric and Body Composition Components in Young Men and Women Teresa Poelker and Laura Swaters
Faculty mentors: Jerry Mayhew and Jana Arabas

Chronic back pain might be a major affliction of the many older adults. Anecdotal evidence suggests that weaker back extension muscles may be at the root of the problem. Therefore, it might be informative to determine if back strength is associated with specific body structure or composition. The purpose of this study was to assess the accuracy of predicting isometric back lift strength in college men and women using simple anthropometric and body composition parameters. College men (n = 189) and women (n = 124) were measured for 4 skeletal widths (biacromial, bi-iliac, elbow, and knee widths), lower-body muscle circumferences (hip, thigh, and calf), and 5 skinfolds. Standing isometric back extension strength (ISO) at a hip angle of 135 degrees was measured with a dynamometer. The sum of each of these unique dimensions were entered into a step-wise multiple regression analysis along with gender to predict ISO (R = 0.82, SEE = 21.7 kg, CV = 18%). Removing the gender factor reduced the prediction accuracy (R = 0.70, SEE = 27.1 kg, CV = 23%). A randomly selected cross-validation sample (M = 39, F = 28) indicated acceptable prediction accuracy for the gender equation (ICC = 0.88, 15% of the sample with <5% error) as well as the non-gender equation (ICC = 0.85, 25% of the sample with <5% error). These results indicated that isometric back lifting strength can be predicted in young men and women using a combination of skeletal widths, muscle circumferences, and skinfolds.

The Determination Of The Most Dangerous Sport On Campus Based On Survey Data
Megan Chittum and Christine Ulses, Truman State University, Kirksville, MO

PURPOSE: This study aimed to identify the injury rates experienced by varsity athletes of different sports at Truman, and to determine the relative overall risk level of each sport.

METHODS: Truman varsity athletes on the women’s volleyball, women’s softball, men’s soccer, women’s soccer, and football teams were given a survey to identify previous injuries obtained while participating in their respective sport at the University. The surveys included questions indicating what sport the athlete played and for how long. Additionally, the survey included the type of injuries experienced (categories included concussion, sprain, fracture, muscle strain, torn muscle, torn ligament, dislocation, severe bruise, sever cut, and other) how long they persisted, the pain level experienced, and the rehabilitation plan followed.
RESULTS: The overall injury rate per athlete was determined by calculating the total number of injuries per team divided by the number of athletes that participated in the survey on that team. The results indicated that women’s softball had the highest rate of injuries with an average of 2.8 injuries per player. Next was women’s soccer with 2.75 injuries per player, then were women’s volleyball and football with 1.43 injuries per athlete, and last was men’s soccer with 1.2 injuries per player.

CONCLUSION: Out of the sports surveyed, it can be determined that Truman softball was the most dangerous sport on campus for the 2010-2011 season because it had the highest number of injuries per player.

PRACTICAL APPLICATIONS: The results of this study can be used by the University to identify which athletes are at the greatest risk for injury, the most common injuries and possible methods of how to prevent those injuries.

The Effect of the Multidimensional Structure of Motivation to Visit Wilderness
Brandon Witthar, Dr. Paul Choi (Advisor), Missouri Western State University, Department of Health, Physical Education, and Recreation

The motivations of wilderness visitors can be identified by segments of users that prefer different experiences (Shafer, 1969). Individual’s experience level is one component of commitment to a recreation activity. Therefore wilderness visitors’ experience may contribute to different motivations. Since there has been little study to clearly discover how motivation factors influence wilderness visits, this study investigated the effect of motivation structure among wilderness visitors at the Mark Twain National Forest in Missouri.

A total of 97 individuals (63% male and 37% female) who have had wilderness visits participated in this study. In order to test motivational factors to visit wilderness, Trip Motivation instrument was employed (Williams, Schreyer, & Knopf, 1990). Average age was 31.6 (SD=16), and most of respondents were Caucasian (93%). Out of many wilderness sites, respondents have visited Hercules-Glades the most followed by Devils Backbone, Bell Mountain, and Piney Creek.

A principal component analysis with a direct oblimin rotation scheme was performed to discover the pattern of the factor structure in the relationships among motivation variables. Motivation factors identified in the recreationists’ analysis indicated the presence of a four factor model made up of 23 items including (1) escape stress and people, (2) self-awareness & companionship, (3) enjoy nature and recreation activities, and (4) active exploration. By using this information, wilderness managers at the MTNF are able to identify changes that need to be made to accommodate current and future visitors. The implications of this finding for exploring motivation effects on wilderness management are discussed.
The Effects of 5 Hour Energy on Heart Rate and the Rate of Perceived Exertion

Principle Investigator: Camden Levett Co-Investigators: Jason Dolph, Aaron Conklin, Erik Lindquist, Stephen Burns

Introduction: Athletic people are targeted by the 5 Hour Energy supplement. There is an interest of this research team to investigate the performance enhancing aspects of this product to see if they are beneficial to cardio-based exercise.

Purpose: To see how HR and the RPE are affected during exercise by ingesting the 5 Hour Energy supplement before exercise.

Subjects: 5 males and 5 females. Average male height: 182 cm ± 5cm. Average male weight: 72.7 kg ± 6 kg. Average female height: 167 cm ± 5cm. Average female weight: 61.3 kg ± 4 kg.

Procedure: Each subject participated in two trials, one with 5 Hour Energy administered prior to resting period and one without. There was a 48 hour washout period between each visit. Trials consisted of a ten minute walk/jog on a treadmill set to a 5% grade at 4.0 mph. HR was recorded prior to exercise and every minute during exercise. RPE was measured on a 6-20 point Borg scale and recorded every minute. HR was determined by taking the prior to exercise heart rate and adding it to the 10 HR recordings during exercise.

Results:

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<tr>
<th></th>
<th>With 5 Hour Energy</th>
<th>Without 5 Hour Energy</th>
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<tbody>
<tr>
<td>Average Subject  HR</td>
<td>157.9 bpm.</td>
<td>163.5 bpm.</td>
</tr>
<tr>
<td>Average Subject  RPE</td>
<td>9.1</td>
<td>10.7</td>
</tr>
</tbody>
</table>

Conclusion: When put to a medium-intensity cardio endurance test 5 Hour Energy proved to assist in lowering RPE and dropping HR. While these findings pertaining to heart rate are contradictory to our hypothesis, the prediction of a lower rate of perceived exertion was proven to be correct.
Guidelines for Contributing Authors

*Editors, 2012*

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