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.
# Missouri Journal of Health, Physical Education, Recreation and Dance

## Volume 20

### 2010

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Volume 20 is Dedicated To

Lynn C. Stockman Imergoot
(1948 - 2009)
Kayaking: A Lifetime Sport for All Skill Levels

David Oatman and Christopher Oatman
Photographs of Christopher Oatman taken by David Oatman

This is the second of three articles addressing various components of the lifetime sport of kayaking. In the first article, which was published in the 2008 MOAHPERD Journal, the authors addressed a brief introduction to the history of kayaking, a discussion on the variety of kayaks that can be purchased or rented along with why one type of kayak should be chosen over another and the fundamental skills necessary to complete the Eskimo Roll. This second article will address the classifications of various types of whitewater, the fundamentals of reading a river for safe navigation and the fundamental skills needed to surf and boof a wave.

Whitewater Classification

Whether in a canoe or a kayak individuals need to be aware of the type of river they’re attempting to run and the varying conditions a river can show. For example, the height of the water level and the speed of the water, which is measured in cubic feet per second or “cfs” are two critical issues that must be accounted for. The various widths of the river and gradient or elevation drop of the water are two more things that must be considered before attempting to run a river. These are just four of the varying conditions or qualities which are universally defined as the International Whitewater Rating System. There are six types of water addressed in this system going from docile and calm water to virtually unrunnable white water. Many times a complete river will not be rated, but each individual rapid will be rated, so boaters must be sure to direct their attention to maps of the river itself. It has to be noted here that all rivers, regardless of their classification, can be dangerous with misinterpretation leading to serious injury and even death.

Class I: Easy. The water is moving with small disturbances, riffles or small waves on the surface. This class of river is low risk and there is not much danger to swimmers. This class of river usually results in an easy self-rescue.

Class II: Novice. Faster moving water with straightforward rapids. There will be few rocks, with medium waves and holes, which are easily avoidable by trained paddlers. There is an increased risk to swimmers and care must be taken. Passage is easy to identify.
Class III: Intermediate. Faster moving water that contains a variety of irregular waves, rock placements and sizes. Holes, currents and waves require advanced paddling skills. There are frequent complex maneuvers that require good control and skillful maneuvering. Eddies (calm water) will be easily accessible. While injuries are not common, swimmers could be at risk and could require help. Scouting any river at this level or above, that you’ve never seen, is advisable.

Class IV: Advanced. There will be strong fast moving water with powerful and turbulent, but predictable, rapids and currents with unavoidable waves. There are multiple obstructions within the waves that require complex maneuvers to get around. The paddler must have a strong Eskimo roll. Eddies will be almost non-existent and, where present, will require reliable, quick eddy turns and precise boat handling. Swimmers are at a moderate to high risk and will require help to be rescued. Self-rescue will be extremely difficult.

Class V: Expert. All of the characteristics previously mentioned in Class IV will be present, but runs will be extremely long with many obstructions and violent rapids. Large waves, holes and steep, congested chutes will be unavoidable. Reliable Eskimo roll required with proper equipment and extensive experience. Eddies may be non-existent or be difficult or impossible to reach. Scouting should be done, but views may not be accessible. Swimmers will have extreme difficulty and rescue is reserved for experts.

Class VI: Extreme and Unrunnable. These runs have almost never been attempted and are the ultimate extremes of difficulty. The results of errors are extremely severe and rescue could be impossible. If ever run, this level of water is for teams of experts only and only after extensive scouting, if possible and taking all possible precautions (Sayour & Huntsville).

Reading a River

Once the difficulty of the river and its rapids has been established, it’s time to get dressed and get on the river. Make sure you have all the necessary equipment (boat, paddle, helmet, personal flotation device, proper footwear and any emergency equipment you may need) and get going.

River boating is not as simple as it appears. You’ll need to keep your eyes down river planning your route. If the river is calm you can look a long distance down the river. However, if the river contains many rapids or if you’re in a rapid you should look at least 20 feet in front of you using the river’s forces to your advantage. Practice makes perfect, but according to Cheryl Hornung in “River Reading Basics”, there are several basics in river reading that, if remembered, will make the experience quite enjoyable and less tense.

- On a river bend, the fastest water will be on the outside of the curve with the slowest water on the inside of the curve.
• Rivers winding through farmlands are different from the raging rapids rushing over craggy rocks and through narrow hillsides.
• Channels are created as water bounces off obstacles and flows around them. In channels with deep water, a downstream “V” is formed as the currents meet in the channel. Rocks or shallow areas are off to the sides, which allow a safe channel down the middle of the downstream “V”.
• An upstream “V” is formed when the water runs into an obstacle (rock, log, etc) and is forced around it. When you see an upstream “V” go around it.
• A rock just above the surface forces the current to flow around it, creating a calm water area behind it. This calm water is called an “eddy” and the water actually flows gently up river.
• Eddies can be used by the boater to rest outside of the main current of water.
• As water flows over the top of a rock, which is just under the surface, it creates a small wave. This is called a “pillow” because of the smooth water pouring over the rock.
• A large obstacle in fast moving water which forces the water to drop steeply over it, causes a “hole” or “hydraulic”. Water and objects trapped in this “hole” recirculate continually and can trap or hold solid objects. These “hydraulics” are dangerous and should be avoided as they can easily capsize a boat. Only very experienced boaters can effectively and safely negotiate these areas of water.
• As water flows over a rock just under the surface in faster-moving water, it creates a standing wave or haystack just downstream. These waves are called “standing water” which neither move upstream or downstream. Boaters often surf these waves (Hornung).

Surfing a Wave

As previously indicated, surfing is a relatively common skill in kayaking learned in the early stages of one’s boating career. Surfing can be done facing upstream, facing downstream and side surfing. As with any skill in kayaking, the challenge differs based on the terrain that the skill is being practiced on. For example, a boater would need at least Class II water in order to surf and this would be a relatively easy task, even for the beginner. However, trying to surf in Class IV or V whitewater presents a much more formidable challenge of balance, power and strategy. Whiting defines surfing as “Using gravity to maintain an upstream-facing position on the face of a standing wave” (p. 40).

In order to surf safely and effectively the boater would need a “standing wave”. These come in all shapes, sizes, speed and power. This is dependent upon some of the factors discussed earlier in this article: speed of the water, width of the river, obstructions in the water, etc. A “standing wave” has
several parts. First, the lowest part of the wave and the part that is furthest upstream is called the “trough.” The next parts of the wave are the “shoulder” and the “face.” These parts are slightly downstream and slightly elevated from the “trough.” The highest part of the wave and downstream from the shoulder and face is the “peak” which is quickly followed by the final part of the wave called the “backside.”

Surfing is done on the “face” of the wave. According to Whiting, “For surfing to be possible, the force of gravity pulling you down the face of the wave must exceed those forces attempting to pull you downstream” (p. 34). If you ride too low in the trough, the hydraulics of the wave will actually pull you upstream and if you ride too high on the peak of the wave, the force of gravity will diminish and the wave will “spit you out” and you’ll head downstream. You must establish yourself on the face of the wave where there are equal forces of pulling you downstream and gravity pushing you upstream. If done properly, you can actually sit in one place while the fast paced river races by you.

The approach to the wave is the first step in surfing. Figure one demonstrates the boater paddling upstream in the “eddy” or the calmer water near the side of the river. In many cases, there will still be current so you’ll have to paddle hard. In figure one, the boater is shown paddling upstream in an attempt to reach the “trough” and “shoulder/face” area of the wave.

Once the boater reaches the desired area slightly in front of the wave, the second step is the “ferry” into the wave. Figure two shows that the boater has turned his boat to the left in the “trough” of the wave. This allows the
boater to effectively position the boat above the face so the current can carry
the boat onto the face where the boater positions the boat to surf either facing
upstream, downstream or side surfing (see Figure Three). The positioning
of the boat is done by effective use of the paddle, the leg braces inside of the
boat and the balancing of the boat by the boater.

Again, if the boater gets too high on the peak of the wave, the force of
gravity will be negated and the boater will be forced over the crest of the
wave and continue downstream. If the boater wishes, it is possible to “eddy-
out” to the side of the river and get in position to complete the same process
again. If not, the boater will continue downstream looking for more waves
to surf.

Figure Two

Figure Three

Boofing a Wave

Boofing, in whitewater kayaking, is a unique and yet exciting skill used by
more advanced boaters in class III whitewater or higher. Boofing can be done
while descending a wave or ledge, ducking behind a boulder or running a small waterfall. The term is used because of the sound that is usually created when the hull of the kayak makes contact with water at the base of the wave. There needs to be a good deal of speed developed as you come down the river. In developing this speed, the bow of the kayak is “raised”, in reality keeping it level to the water due to the speed of the boat, thus preventing a freefall down the wave. Using this technique keeps the bow of the kayak from being submerged by ensuring it lands flat when it hits the base of the wave. Figure four demonstrates the “boof” at the top of the wave. Notice the paddler is forcefully driving his paddle through the water pushing the boat forward creating the horizontal direction with the wave dropping from below the boat. If successfully completed, the boat will land flat on the water at the bottom of the wave and the boater will continue down the river.

![Kayaking](https://via.placeholder.com/150)

**Figure Four**

Kayaking involves many skills, which allows boaters of all skill levels to enjoy this tremendous sport for a lifetime. It is a sport that develops muscular strength and endurance in the upper body and core of the body. It also develops balance, agility, quick thinking skills and, as with many sports, kayakers can never reach perfection. They can always find rivers to give them new challenges. We would encourage you to go out, take a lesson and give it a try.
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“Whitewater Classification from American Whitewater”, http://www.huntsvillecanoeclub.org/classif.html

DAVID OATMAN is a professor in the Health, Physical Education and Recreation Department at Missouri State University in Springfield. His father, Olan Oatman, taught him the proper, safe and effective way to use a canoe on the river, but he and his son Chris (co-author of article) took it to another level in learning skills needed to navigate Class III and IV rivers in a kayak. His son is much better at the sport!

CHRISTOPHER OATMAN is an avid kayaker and illustrator. He’s already taught several people the basics of kayaking and has been successful in kayaking a large number of Class I to Class IV Rivers in Colorado, Missouri, Montana and Virginia.
Teach and Practice Golf by the Numbers

Matthew L. Symonds

This article explored relationships among seven key statistics for the 2007 top 30 money winning players on the PGA Tour. Eleven statistically significant relationships were uncovered. Of these, three moderately and two high correlations were interpreted. Three main categories were revealed: driving, scrambling, and putting. Further analysis of these categories resulted in the identification of specific practice opportunities for the recreational golfer as well as a framework for the development a basic golf instructional program for the physical education teacher.

Golf in the United States is big business. Annually, over 28 million golfers tee it up in the United States according to a USA Sports Participation study (2007). Of these golfers 15 million are over 18 years of age and play 8 or more rounds per year. Golfers spent over $24 million dollars on equipment and fees in 2002.

However, only 22% of golfers score better than 90 on an 18 hole, regulation length round according to the National Golf Foundation. Although golf equipment has benefitted immensely from new technology in recent years, little improvement in score has resulted for the average player. Fans are witnessing an exciting time in professional golf. Tiger Woods closes in on Jack Nicklaus’ record 18 major tournament titles. Phil Mickelson draws major support from fans. Younger players like Adam Scott, Camillo Villegas, Bubba Watson, and Anthony Kim have connected with fans and are a glance into what the future of professional golf holds. Furthermore, the parity that exists among professionals today is arguably unmatched in the history of golf.

Additionally, golf provides an opportunity for lifetime physical activity for millions of members of a society battling an obesity epidemic. According the American College of Sports Medicine (1991), approximately 37 continuous minutes of golf in a power cart and 20 minutes of golf carrying clubs is equivalent to one aerobic mile of activity, similar in energy expenditure to walking one mile. Basic golf instruction can take place with limited equipment and facilities in the elementary, secondary, and higher education physical education curriculum. By arranging instruction based on practicing basic fundamentals such as grip and alignment as well as short game skills that lower scores, instructors can help beginning golfers develop knowledge and abilities that can last a lifetime.
Modern sport relies heavily on the compilation and tracking of statistics (Coakley, 2004). Professional golf is no different. Throughout each season, the PGA Tour compiles a multitude of statistics outlining the performance of its players. While Quinn (2006) analyzed selected 2004 PGA Tour statistics in a *Teaching Statistics* article for the purpose of teaching correlation research concepts, little statistical analysis, interpretation and meaning of these statistics has been supplied to the average golfer about how his or her individual golf score can be improved or to the physical educator for the development of golf lesson plans. Through the exploration of correlation analyses on a selected group of professional golf statistics, both the physical education teacher and the average player can begin to establish a potential benefit by developing properly arranged lesson plans and practice sessions. In other words, teach and practice golf by the numbers.

Before analyzing results, it may be helpful to review some basic correlation analysis concepts. Correlation research is often employed to examine whether or not variables are related to one another and may not specifically address the question why the variables are related (Hyllegard, Mood, & Morrow, 1996).

Furthermore, correlation research establishes both the strength and direction of the relationship. In other words, the strength of the correlation coefficient ($r$) is determined by how close the result is to +1 or to -1. The closer the result is to $+1$ or $-1$, the stronger the relationship. The direction of the relationship is determined by whether the value is positive or negative. A positive sign indicates a high score on one variable relates to a high score on the other variable. A negative sign indicates that a high score on one variable relates to a low score on the other variable (Hyllegard, Mood, & Morrow, 1996).

For the purpose of this analysis, selected statistics of the leading 30 money winner’s for the 2007 PGA Tour season were examined. This article sought to uncover which, if any, statistically significant correlations existed among selected statistics and how these statistics can aid the physical educator or amateur golfer better organize lesson plans or practice sessions. Those data analyzed included the following statistics, retrieved and defined by PGA-Tour.com (2008):

- **Driving Distance** is defined as the number of yards per drive measured on two holes per round.
- **Driving Accuracy** is defined as the percentage of time a tee shot comes to rest in the fairway.
- **Greens in Regulation (GIR)** is displayed as the percent of times a player hit the green in the regulation number of shots. GIR is considered the first stroke on a par 3, second on a par 4, and third on a par 5.
- **Putts per GIR** is the average number of putts required to hole out per green hit in regulation.
- **Scrambling** is defined as the percent of time a player misses a green in regulation and records a score of par or better on a hole.
• Putts per Round is the average number of putts per round played.
• Scoring Average is the mean number of strokes recorded per completed round.

The significance level was established at the 0.05 level. Analyses yielded 11 statistically significant correlations.

Findings

Mean scores and standard deviations were calculated for each of the selected statistics (see Table 1). While each correlation coefficient listed in Table 2 was found to be statistically significant, the strength of several relationships were found to be only moderate or low. Further discussion will center on those relationships that can be defined as either high or moderately high. According to Safrit and Wood (1995), correlation coefficients ranging from +/- .80 to 1.00 are defined as high. Moderately high correlation coefficients are said to range from +/- .60 to .79 (Safrit & Wood, 1995).

Table 1
Means and Standard Deviations of Selected Statistics of the 2007 Top 30 Money Winners on the PGA Tour

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Mean</th>
<th>SD</th>
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<tr>
<td>Driving Distance (yards)</td>
<td>290.69</td>
<td>7.74</td>
</tr>
<tr>
<td>Driving Accuracy (%)</td>
<td>62.68</td>
<td>5.84</td>
</tr>
<tr>
<td>Greens in Regulation (%)</td>
<td>64.94</td>
<td>2.37</td>
</tr>
<tr>
<td>Putts per GIR (#)</td>
<td>1.76</td>
<td>.02</td>
</tr>
<tr>
<td>Scrambling (%)</td>
<td>58.71</td>
<td>3.41</td>
</tr>
<tr>
<td>Putts per Round (#)</td>
<td>29.00</td>
<td>.53</td>
</tr>
</tbody>
</table>

The Long and Short of It

Driving Distance was shown to have a statistically significant relationship to Driving Accuracy ($r=-.760$, $p=.000$). Therefore, the farther a player hit his drive, the less likely he was to remain in the fairway. In 2007, the average driving distance for the top 30 money winners was 290.69 yds and the average accuracy for this group was 62.68% of fairways hit (PGATour.com). Yet, neither the longest driver on tour, Bubba Watson (315.2 yds) or the most accurate driver on tour, Jose Coceres (75.47% of fairways), were in the top 30 at the end of the season. In addition, only six of the top 30 longest drivers and five of the top 30 accurate drivers ended among the top 30 money leaders.
Get Up and Down from a Garbage Can

Driving Distance displayed a moderately high relationship to Scrambling \((r=-.66, p=.000)\). In other words, a longer drive by a player resulted in a lower scrambling percentage. As longer drivers tend to be less accurate, the positions in which longer drives come to rest could negatively impact a player’s ability to make par or better. The mean scrambling percentage for the top 30 players on tour was 58.71%. Scrambling played an important role in a player’s scoring average \((r=-.587, p=.001)\). Moreover, 7 of the top 10 and 13 of the top 30 money winners were among the top 30 scramblers.

Two Putt the Parking Lot

Putts per GIR were highly correlated to putts per round \((r=.811, p=.000)\). Obviously, the more putts a player has per GIR, the more putts he recorded per round. The mean number of putts per GIR was 1.77 and the mean number of putts per round was 29. The importance of putting reveals itself more prominently in two other relationships. First, as putts per round decrease scrambling percentage increases \((r=-.796, p=.000)\). In other words, good putting makes for good scrambling. Furthermore, as putts per GIR decrease, scoring is lower \((r=-.646, p=.000)\). Good putters shoot lower scores. Twelve of the top 30 money winners were in the top 30 putters per GIR.

### Table 2
Correlation Coefficients of Selected Statistics of the 2007 Top 30 Money Winners on the PGA Tour

<table>
<thead>
<tr>
<th>Relationship</th>
<th>(r)</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driving Distance vs. Driving Accuracy</td>
<td>-.760*</td>
<td>.000</td>
</tr>
<tr>
<td>Driving Distance vs. Scrambling</td>
<td>-.626*</td>
<td>.000</td>
</tr>
<tr>
<td>Driving Distance vs. Putts per Round</td>
<td>.484</td>
<td>.007</td>
</tr>
<tr>
<td>Greens in Regulation vs. Putts per Round</td>
<td>.598</td>
<td>.000</td>
</tr>
<tr>
<td>Greens in Regulation vs. Scoring Average</td>
<td>-.457</td>
<td>.011</td>
</tr>
<tr>
<td>Putts per GIR vs. Scrambling</td>
<td>-.587</td>
<td>.001</td>
</tr>
<tr>
<td>Putts per GIR vs. Putts per Round</td>
<td>.811**</td>
<td>.000</td>
</tr>
<tr>
<td>Putts per GIR vs. Scoring Average</td>
<td>.646*</td>
<td>.000</td>
</tr>
<tr>
<td>Scrambling vs. Putts per Round</td>
<td>-.796**</td>
<td>.000</td>
</tr>
<tr>
<td>Scrambling vs. Scoring Average</td>
<td>-.587</td>
<td>.001</td>
</tr>
<tr>
<td>Putts per Round vs. Scoring Average</td>
<td>.383</td>
<td>.037</td>
</tr>
</tbody>
</table>

Note: *Moderately High Correlation, **High Correlation
Lessons for All Golfers

Through an analysis of the statistics of the best players in the world, four main lessons were identified. These highlights included:

Driving is Important
- If you are a long driver, it is likely you will not be as accurate. However, since longer drivers subsequently use shorter clubs on approach shots, some of the inaccuracy is offset. Long drivers should practice approach shots from non-fairway lies and trouble shots as they are more likely to use these shots on the course.
- If you are a short driver, be accurate. Short and crooked is a bad combination. Also, shorter drivers would benefit from spending time practicing longer approach shots. Since more greens in regulation equals better scores ($r=-.457$, $p=.011$), shorter drivers can work to offset lack of distance with accurate tee shots and accurate approach shots.

Focus on the Short Game, Scrambling, and Putting
- Spend time practicing scrambling skills. Getting up and down for pars and bogeys around the green are round savers. Players can improve scores by learning and practicing the types of shots that save strokes. Chips, pitches, high soft shots and better bunker play will help all players record better scores.
- Putt for dough. The analysis of good putting by the top 30 PGA Tour players demonstrates the benefits of putting practice. Not only were better putters better scramblers and better scorers, but were also higher ranked among the top 30 ($r=.446$, $p=.014$). If players think about the days on the course when they record better scores, much of that could be traced to good putting. Good putting can turn a poor ball striking day into a respectable score and a good ball striking day into a personal best.

Ideas for the Classroom

The basic lessons learned from analyzing the statistics of the best players in the world can also be applied in the physical education setting. In a relatively short period of time – as little as five class periods, depending on period length and class size – a basic golf instruction program can be included. Note with the exception of some necessary introductory information, the majority of the skill focus is in two areas: fundamental skills, like the grip and stance needed for all shots, and a focus on chipping, pitching, and putting. Each of these lessons is consistent with Missouri and NASPE Standards for Physical Education. Here are some ideas for the physical education classroom.

- Basic rules, etiquette, and safety considerations. With proper classroom set-up (indoor or outdoor) and instructions, students can practice swings and shots in a very safe environment. With access to a computer
lab or as a homework assignment, students can be directed to a variety of web-sites to explore the history, rules, and etiquette of golf.

- Focus on fundamentals. Teach students proper grip and alignment. Many full swing and ball flight errors result from an improper grip and unorthodox set-up. A solid foundation increases the likelihood of an athletic full swing and solid contact. For beginning golfers consider using a 9-iron or pitching wedge and practice mini swings, a chipping motion, using a tennis ball or restricted flight training balls. Hula hoops, clothes baskets, and wading pools make excellent targets. Choose target size and ball type based on the rate and ability of students. Consider developing a lead-up game with a variety of targets set up a different distances. Grouping students in foursomes on a nine-hole tennis ball chipping course allows as many as 36 students to move through the game while keeping score for one another or as a team.

- The putter. Again, basic putting fundamentals are important such as grip and alignment. Inexpensive, indoor/outdoor carpet remnants provide teachers an opportunity to create a putting game for students. Awards can be given for longest putt, fewest putts per round, or improvement. These remnants can be used indoors on days when weather is inclement or outdoors to establish a “green” for a short golf course.

- The full swing. While continuing the focus on fundamental skills, the full swing can be practiced using a variety of restricted flight training balls. Again, utilizing a 9-iron or pitching wedge restricts the distance the ball can travel and reduces the number of clubs needed to teach the unit. Depending on available facilities, some types of practice balls allow for more flexibility with drills and games. Grouping students with a partner provides a peer-evaluation opportunity to double check basic fundamentals. Consider providing each student with a simple checklist to evaluate peers (See Figure 1).

- Skills Challenge. The instructor can develop a variety of stations that allow students to use the skills they have practiced. Putting, chipping, and full swing stations along with terminology, rules, and etiquette games allow students to demonstrate their learning from the lessons and provides for a variety of assessment opportunities. In addition, students can critique video clips of famous professionals like Tiger Woods using the same rubric they used to assist their partner. A variety of video clips are available at web-sites such as YouTube.com.

- The Field Trip. Most public golf courses have a genuine interest in junior golf. Since young golfers are the future patrons of area golf courses and practice facilities, many facilities will work with teachers to develop an outing where students can further practice what they have learned in class. This may provide students the opportunity to hit real golf balls on a driving range, putt to real holes on a putting green, and practice the skills they have learned. Another good option for a field trip is a miniature golf course.
The possibilities for including golf in the physical education curriculum are unlimited. An introduction to basic golf skills in the physical education class may introduce the game to the next Bobby Jones, Jack Nicklaus, Annika Sorenstam, or Tiger Woods. In the final analysis the statistics of the best golfers in the world revealed that every golfer would be well served by practicing short shots – chips, pitches, and putts with scoring clubs – just like the pros do. Coincidentally, these are the shots most easily included in the physical education classroom and/or practiced by the recreational golfer with even limited time and access to equipment and facilities.

Figure 1
Sample Peer Assessment Checklist

| My Partner’s Name: __________________________________________ |
| My partner is using the proper grip |
| My partner’s clubface is aligned to the target |
| My partner’s feet are aligned parallel to the target |
| My partner’s ball flight was: |
| High | Low |
| Straight | Right | Left |
| Write a positive comment about your partner: |

References


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Elementary School Students’ Level Of Physical Activity During Recess

Julie Hasken and Megan Temme

National guidelines recommend accumulation of at least one hour of moderate to vigorous physical activity each day for students. Since school recess provides scheduled periods of time to accumulate some of these much-needed minutes of moderate to vigorous physical activity, the purpose of this study was to determine the proportion of elementary students in a rural, northeast Missouri school district who were physically active at the intensity level recommended by the national guidelines during their recess periods. A modified version of the System for Observing Play and Leisure Activity in Youth (SOPLAY) was used to collect observational data on the number of students, their gender, and their physical activity intensity levels in defined areas of the playground during recess. Overall, the majority of students seemed to meet the guidelines for moderate to vigorous physical activity levels during recess, but the addition of more open play space and more game equipment may help move many from the moderate to more highly active levels. It is recommended that school districts increase the amount of recess time as their school schedules permit to help students meet national guidelines for accumulated physical activity time.

National guidelines for child health recommend the accumulation of at least one hour of physical activity each day, in multiple bouts of moderate to vigorous levels, lasting 10 minutes or more (Council on Physical Education for Children/National Association for Sport and Physical Activity, 2001). Moderate to vigorous physical activity during school recess, unstructured play time with the opportunity to engage in physical activity and movement during the school day, may provide some of this activity time. Recess, in general, provides students with many health and learning benefits including: improved cardiovascular fitness, increased muscle strength, better weight control, and learned exercise habits that may carry over into adulthood. In addition to providing periods of physical activity, recess contributes to the development of creativity, social skills, self-responsibility, concentration, and stress reduction. Students are less fidgety and more attentive when recess is timely implemented; and the longer the delay in recess, the less attentive the students become (Pellegrini, Huberty, & Jones, 1995). Recess also allows for
free-play to provide an opportunity for students to build a hierarchy of social order (Hartle et al., 1994).

Nationally, average total scheduled elementary level recess time is 27.32 minutes per school day (National Center for Educational Statistics, 2005). Although national guidelines recommend that students’ physical activity bouts reach moderate to vigorous intensity levels during elementary recess, 59% of the time students participated in physical activity and only 21% of that was vigorous activity (National Center for Educational Statistics, 2005). The first six to seven minutes of recess is the most physically active period of time for students. The rate of activity decreases, though, after those initial minutes (Pellegrini & Davis, 1993). At recess, in general, boys are more physically active than girls, physical activity levels decrease as a function of age, and students tend to participate in more vigorous physical activities when playing in more spacious environments (Pellegrini & Smith, 1993). In addition, when students were given game equipment during recess, they would often display higher physical activity intensity levels (Verstraete, Cardo, De Clercq, & De Bourdeaudhuij, 2006).

National guidelines recommend accumulation of at least one hour of moderate to vigorous physical activity each day for students (Council on Physical Education for Children/National Association for Sport and Physical Activity, 2001). In Missouri, most students reported participating in at least 20 minutes of physical activity three days per week in physical education class, recess, or outside the school day (Costa, 2008). Approximately 25% of Missouri 5th graders, however, were unable to meet the minimum levels of fitness as determined by the Healthy Fitness Range Assessment (Office of Social and Economic Data Analysis, 2005). Since recess provides scheduled periods of time to accumulate these much-needed minutes of moderate to vigorous physical activity, the purpose of this study was to determine the proportion of elementary students in a rural, northeast Missouri school district who were physically active at the intensity level recommended by the national guidelines during their recess periods.

**Methods**

**Sample**

Two hundred fifty-five students in a stratified cluster sample of grade 3 to 5 classrooms from a rural, northeast Missouri elementary school (544 students; 47.0% free/reduced lunch) were observed for 10 school days (2wks, Monday-Friday) during their regularly-scheduled recess periods in spring 2009. A little more than half (130/255, 50.1%) were female, and almost all (229/255, 90.0%) were white, mirroring the demographics of the district (Missouri Department of Elementary and Secondary Education, 2007).

**Instrument**

A modified version (recording only area of the playground, activity level,
and number/gender of the students) of the System for Observing Play and Leisure Activity in Youth (SOPLAY) was used to collect observational data on the number of students, their gender, and their physical activity intensity levels in defined areas of the playground during recess. Content validity and feasibility of the instrument has been established through the use of heart rate monitors. Using time-sampling techniques, individual physical activity levels were recorded and coded as observers periodically scanned pre-determined areas. The instrument allowed for physical activity comparisons over time and in different settings (McKenzie, 2006).

Analysis

Descriptive statistics (sum of raw counts) were used to summarize the proportion of students and their physical activity intensity levels in each defined area of the playground. The Chi-Square test was used to report differences between physical activity levels based on gender and defined area of the playground. In addition, inter-rater reliability between the observers was determined by using Cohen’s Kappa. The inter-rater reliability between two observers was found to be Kappa = .892, \( p < .001 \). The data was also determined to have a normal distribution using Shapiro-Wilks test for normality.

Procedure

After institutional IRB approval, the researchers received permission to conduct the study from the school principal, and consent letters were sent to the parents of the students in the classrooms that would be observed during their recess. The parent consent form was to be returned only if the parent did not want their child participating in the study. Three parental consent forms indicated that they did not wish their child to participate in the study. Since not including those students in the study would result in the loss of confidentiality for the student, the observers stood 15 feet from all play areas. The students were asked to give their assent via a written form. Following the SOPLAY model (McKenzie, 2006), the elementary school playground was established as the target area for the 10-day observation during the recess periods (lunch recess 11:15am-11:25am; afternoon recess 2:45pm-2:55pm). The target area was then divided into four scan spaces:

- **Scan Area 1**: Contained a merry-go-round, climbing toys/monkey bars, and some other small playground toys.
- **Scan Area 2**: Contained swings, a Geodome climber, and a complete playground system containing ladders and slide.
- **Scan Area 3**: Contained a smaller swing set, basketball hoops, and open grass area.
- **Scan Area 4**: Contained a black top area with painted foursquare squares.
Since the scan areas were divided by geographical location and not by equipment, areas were not equally likely to elicit vigorous play. Observers used the SOPLAY recording form to note the number, gender, and activity level of students in each scan area for 10 minutes. Physical activity intensity level was defined and reported as: Sedentary, Walking, or Very Active:

**Sedentary Level:** Students who were sitting on the merry-go-round, holding onto monkey bars with no movement, leaning on objects such as the building walls or stationary playground equipment, or sitting were reported as Sedentary.

**Walking Level:** Students who were walking, moderately swinging on swings, or minimally participating in foursquare or the monkey bars were reported as Walking.

**Very Active Level:** Students who were running, intently participating in foursquare, the monkey bars, or basketball, and swinging with force were reported as Very Active.

### Results

**Proportion of Students and their Activity Levels in Each of the Scan Areas**

Over the course of the 10 school days (two weeks), the number of students observed in each scan area and their physical activity intensity level was recorded for 10 minutes and totaled (Table 1). Most students (761) were observed in Scan Area 1, followed by Scan Area 4 (621), Scan Area 2 (516), and then Scan Area 3 (481).

In Scan Area 1 which contained a merry-go-round, climbing toys/monkey bars, and some other small playground toys, a little more than half (388/761, 51%) of the students observed were recorded as Sedentary. In Scan Area 2 which contained swings, a Geodome climber, and a complete playground system containing ladders and slide, most (363/516, 40%) of the students observed were recorded as Walking. In Scan Area 3 which contained a smaller swing set, basketball hoops, and open grass area, most (218/481, 45%) of the students observed were recorded as Very Active. In Scan Area 4 which contained a black top area with painted foursquare squares, most (262/621, 42%) of the students observed were recorded as Walking.

Scan Areas 1 and 2 were significantly more likely ($X^2 = 11.056, df = 2, p = .01$) than Scan Areas 3 and 4 to have students observed and recorded as Sedentary.

Moderate to vigorous physical activity intensity levels (Walking to Very Active) of students were observed most often in Scan Area 3 (349/481, 72%), followed by Scan Area 2 (363/516, 70%), Scan Area 4 (378/621, 61%), and then Scan Area 1 (373/761, 49%).
**Table 1**

**Total Counts and Proportion of Students and their Activity Levels in Each of the Scan Areas during the Observation Period**

<table>
<thead>
<tr>
<th>Area</th>
<th>Total Count</th>
<th>Sedentary</th>
<th>Walking</th>
<th>Very Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area 1</td>
<td>761 students</td>
<td>388/51%</td>
<td>299/39%</td>
<td>74/10%</td>
</tr>
<tr>
<td>Area 2</td>
<td>516 students</td>
<td>153/30%</td>
<td>205/40%</td>
<td>158/30%</td>
</tr>
<tr>
<td>Area 3</td>
<td>481 students</td>
<td>132/27%</td>
<td>131/27%</td>
<td>218/45%</td>
</tr>
<tr>
<td>Area 4</td>
<td>621 students</td>
<td>243/45%</td>
<td>262/42%</td>
<td>116/19%</td>
</tr>
</tbody>
</table>

**Proportion of Students and their Activity Levels in Each of the Scan Areas by Gender**

As seen in Table 2, most girls (402) were observed in Scan Area 1, followed by Scan Area 4 (331), Scan Area 2 (245), and then Scan Area 3 (210). In addition, most boys (361) were observed in Scan Area 1, followed by Scan Area 4 (290), and then Scan Area 2 and 3 (271 each).

In Scan Area 1 which contained a merry-go-round, climbing toys/monkey bars, and some other small playground toys, a little over half (215/402, 53%) of the girls and most (173/361, 48%) of the boys observed were recorded as Sedentary. In Scan Area 2 which contained swings, a Geodome climber, and a complete playground system containing ladders and slide, many of the girls (96/245, 39%) and boys (109/271, 40%) observed were recorded as Walking. In Scan Area 3 which contained a smaller swing set, basketball hoops, and open grass area, most (86/210, 41%) of the girls and most (132/271, 49%) of the boys observed were recorded as Very Active. In Scan Area 4 which contained a black top area with painted foursquare squares, most (143/331, 43%) of the girls observed were recorded as Sedentary, and most (123/290, 42%) of the boys observed were recorded as Walking. Overall, in all of the scan areas, boys were significantly more likely ($X^2 = 6.171$, df=1, $p=.05$) than girls to be observed and recorded at the Very Active physical activity level.
Moderate to vigorous physical activity intensity levels (Walking to Very Active) of girls were observed most often in Scan Area 3 (145/210, 69%), followed by Scan Area 2 (166/245, 68%), Scan Area 4 (188/331, 57%), and then Scan Area 1 (187/402, 47%). In addition, moderate to vigorous physical activity intensity levels (Walking to Very Active) of boys were observed most often in Scan Area 3 (204/271, 75%), followed by Scan Area 2 (197/271, 73%), Scan Area 4 (190/290, 65%), and then Scan Area 1 (186/361, 52%).

Table 2
Total Counts and Proportion of Students and their Activity Levels in Each of the Scan Areas during the Observation Period by Gender

<table>
<thead>
<tr>
<th>Total Count: Area 1</th>
<th>Gender</th>
<th>Sedentary</th>
<th>Walking</th>
<th>Very Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls (402)</td>
<td>215/53%</td>
<td>159/40%</td>
<td>28/7%</td>
<td></td>
</tr>
<tr>
<td>Boys (361)</td>
<td>173/48%</td>
<td>140/39%</td>
<td>46/13%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Count: Area 2</th>
<th>Gender</th>
<th>Sedentary</th>
<th>Walking</th>
<th>Very Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls (245)</td>
<td>79/32%</td>
<td>96/39%</td>
<td>70/29%</td>
<td></td>
</tr>
<tr>
<td>Boys (271)</td>
<td>74/27%</td>
<td>109/40%</td>
<td>88/33%</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Count: Area 3</th>
<th>Gender</th>
<th>Sedentary</th>
<th>Walking</th>
<th>Very Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls (210)</td>
<td>65/31%</td>
<td>59/28%</td>
<td>86/41%</td>
<td></td>
</tr>
<tr>
<td>Boys (271)</td>
<td>67/25%</td>
<td>72/26%</td>
<td>132/49%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Count: Area 4</th>
<th>Gender</th>
<th>Sedentary</th>
<th>Walking</th>
<th>Very Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls (331)</td>
<td>143/43%</td>
<td>139/42%</td>
<td>49/15%</td>
<td></td>
</tr>
<tr>
<td>Boys (290)</td>
<td>100/35%</td>
<td>123/42%</td>
<td>67/23%</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Since recess provides scheduled periods of time to accumulate much-needed minutes of moderate to vigorous physical activity, the purpose of this study was to determine the proportion of elementary students in a rural, northeast Missouri school district who were physically active at the intensity
level recommended by the national guidelines during their recess periods. The highest proportion of students was observed during recess in an area with just a merry-go-round and climbing bars, and most students were recorded participating at the Sedentary physical activity level in this area. This area contained limited equipment, and a level of physical strength and fitness was required to play successfully on the climbing bars. The students seemed content to just ride on the merry-go-round as one student pushed it, and avoided the bars. The next highest proportion of students was observed on the blacktop playground area, but most were recorded at the Walking level of physical activity. Since approximately one-fourth of Missouri students do not meet minimum fitness levels (Office of Social and Economic Data Analysis, 2005) it is possible that many were not physically fit enough to participate on the climbing equipment at a more vigorous level. In addition, the slick blacktop area limited running and large movements because of risk of injury, and the four-square game rules and area also limited movement outside the small squares; thus, the students were only moderately physically active in that area. Perhaps those who were less physically fit also may have gravitated toward these areas with less equipment and smaller play spaces.

On the other hand, the lowest proportion of students was observed in the playground area that contained swings, basketball hoops, and an open play area with plenty of game equipment. With more game equipment and a safe, grassy space to play in, the students ran at higher speeds, threw balls at the goal, and jumped on and off of the swings. Most of the students in this area were recorded at the Very Active physical fitness level. Possibly, those who were most physically fit gravitated toward this area with more game equipment and more open spaces to run. Students in the playground area with limited equipment and less space to safely move were significantly more likely than those in the area with more equipment and open space to be recorded at the Sedentary physical activity intensity level. The results of this study seem to support the assertion that higher physical activity intensity levels have been seen in students playing in these more open spaces (Pellegreni & Smith, 1993) as well as when more game equipment is added to the environment (Verstraete et al, 2006).

Although national guidelines recommend the accumulation of at least one hour of moderate-vigorous physical activity each day (Council on Physical Education for Children/National Association for Sport and Physical Activity, 2001), many students do not obtain this goal (National Center for Educational Statistics, 2005). In this study, the average proportion of students observed and recorded as Very Active for all playground areas was about 26%, and about 63% were physically active (not Sedentary) at some level; consistent with the literature (National Center for Educational Statistics, 2005; Costa, 2008) and National Guidelines. Also, overall, boys were significantly more likely than girls to be observed and recorded at the ‘Very Active’ physical activity level, supporting widely accepted previous assertions made by Eaton and Enns (1986) who found that prior to adolescence the average male was
more active than 69% of the females.

When observing and recording physical activity intensity levels, the researchers used a modified version of the SOPLAY (McKenzie, 2006) to simplify recordings and improve inter-rater reliability. Therefore, the time of day (morning or afternoon recess) was not differentiated and the temperature and type of supervision was not recorded. These factors may have contributed to differing physical activity levels in the students, although the temperature did not fluctuate widely during the observation weeks. In future research of this kind, it would be most useful to examine differences in physical activity intensity level between morning and afternoon recess times.

Accumulated recess time at the study school was about 20 minutes per day, less than the 27 minutes per day national average (National Center for Educational Statistics, 2005). It is recommended for this school, and for all schools in general, that if physical education time cannot be increased then the amount of recess time in the school day should be increased as schedules permit. The academic, social, and health benefits of recess, including more focus in the classroom, improved social skills and self-responsibility, as well as improved cardiovascular fitness, increased muscle strength, and better weight control (Pellergrini, Huberty & Jones, 1995) can significantly contribute to the overall well-being of students.

It is also recommended that playground environments be more conducive to encouraging moderate to vigorous physical activity in students in order to assist in meeting national guidelines. For example, adding more open areas as well as more game equipment like jump ropes and different types of balls could possibly move more students from the Sedentary to the Walking level (Verstraete et al, 2006). Since girls are less likely than boys to be physically active at recess, more game equipment that appeals to girls, too, could be added to playground areas. Quality, daily physical education class, with a health-related physical fitness focus, would also assist all students in improving their fitness levels, allowing them to fully participate in all the games and play successfully on and with all the equipment.

References


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McSwegin Award Paper

**Comparison of Strength Changes Following Resistance Training Using Free Weights and Machine Weights**

*Emma Lennon, Elli Mathis, and Anne Ratermann*

The purpose of this study was to assess the change in strength resulting from resistance training with free weights and machine weights. College men (N = 429) who self-selected to train using free weights (FW, n = 173), seated horizontal press (SHCP, n = 125), and supine vertical press (SVBP, n = 131) were matched for FW 1-RM bench press and measured prior to and following resistance training 3 days/week for 12 weeks. Subjects who trained on machine weights were also measured for 1-RM on their specific training device. SHCP and SVBP were significantly greater than FW prior and following training. After training, the FW group made a significantly greater gain in FW bench press than did the SHCP and SVBP groups. However, when measured on each specific training device, the SHCP and SVBP groups made greater gains than did the FW group. Thus, the magnitude of upper body strength gains appears to be specific to training device and does not appear to be equal across different devices.

A wide array of weight training methods offers a variety of approaches to applying resistance to muscular movements. One of the most popular approaches to resistance training is free weights which require an individual to control the weight while applying force throughout the full range of motion. Lifting and controlling the weight requires a combination of activating prime movers and synergistic muscles (McCaw & Friday, 1994; Schwanbeck, Chilibeck, & Binsted, 2009). An alternate approach to resistance training utilizes machine weights which guide the movement through a specific pattern, allowing most of the force to be applied by the prime mover muscles without much work by synergistic muscles (Lander, Bates, Sawhill & Hamill, 1985).

Various methods have been shown to produce different values for the one-repetition maximum (1-RM)(Hart, Ward, Mayhew, & Ball, 1990; Cotterman,
Some studies have shown that individuals can lift more weight using free weights than using weight machines (Cotterman, Darby, & Skelly, 2005; Floyd, Otte, & Mayhew, 2009), while other studies have noted that more weight can be lifted using machine weights (Hart, Ward, Mayhew, & Ball, 1990; Bates, Bowen, Mayhew, & Visich, 1995; Mauchenheimer, Glover, Bates, & Mayhew, 1995). These differences in reported maximums may be due to the specific design of the various machines (Cotterman, Darby, & Skelly, 2005). Beyond the limited information about the differences among machine weights for determining 1-RM, less is known concerning the effect of the differences in load application between free weights and machine weights on strength gains when training with similar programs. If differences exist in strength gains resulting from training with different methods, it may be preferable to selectively use different methods of resistance training at various stages of a resistance program to gain maximum benefit. Therefore, the purpose of this study was to assess the change in strength resulting from resistance training with free weights and machine weights.

Methods

Subjects. A sample of college men \((N = 429)\) was selected from a larger group based on their performance on a 1-RM free weight bench press prior to training. The subjects self-selected to train using either free weights \((FW, n = 173)\), seated horizontal chest press \((SHCP, n = 125)\), or supine vertical bench press \((SVBP, n = 131)\). The groups were matched initially for FW 1-RM bench press. Subjects who trained on machine weights were also measured for 1-RM bench press on their unique training device, which was considered a specific strength evaluation. Physical characteristics of the subjects by group are shown in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Training Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FW (n = 173)</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>19.4 ± 01.3</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>178.7 ± 07.2</td>
</tr>
<tr>
<td>Body Mass (kg)</td>
<td>72.7 ± 13.1</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>22.8 ± 03.7</td>
</tr>
</tbody>
</table>

FW = free weights; SHCP = seated horizontal press; SVBP = supine vertical press
Testing Procedures. For the purposes of this study, FW 1-RM bench press was designated as a general strength evaluation. The assessment procedure has been described previously (Mayhew, Smith, Arabas, & Roberts, in press). Briefly, it required each subject to select a weight equal to approximately 75% of their estimated 1-RM and perform one repetition. If this repetition was successful, a minimum of five minutes rest was given before attempting subsequent repetitions with additional weight. This approach allowed most subjects to reach their 1-RM within three to five attempts. Each subject used a grip that was slightly wider (approximately 15-20 cm) than shoulder width.

Following one week of rest, subjects who elected to train with a machine weight method were tested for 1-RM on their unique bench press device, which was designated as the specific strength evaluation. The SVBP was performed on a plate-loaded Nautilus Leverage bench which had a fixed pivot point producing a shallow upward convex arc to the bar path. The grip hand placement was approximately 10-15 cm outside the shoulder joint. The SHCP was a Nautilus seated press machine which positioned the subject in an upright posture, producing a nearly horizontal motion with the resistance bar. Seat height was adjusted to place the hand grip at position above the pectoral muscles. The grip placed the hands approximately 5-10 cm outside the shoulder joint. Although the SHCP employed a weight stack, the use of small incremental weights (1.1 kg) allowed comparable loading to the other methods.

The same general procedures as employed with FW testing were used for maximal strength testing with the specific machines. Following several warm-up sets using lighter weights (50-70% of projected 1-RM), an initial weight was lifted for one repetition. Weight was added dependent upon the ease of completing each repetition. Both machine weight 1-RM attempts were concentric-only movements.

Training Programs. The FW group performed most of their resistance exercises using free weights while the machine weight groups used motion-specific machines to perform exercises similar to those used by the FW group. The various machine weights employed cables or lever arms to control the lifting movement through a specific path. Core exercises included bench press and squat (or leg presses), while supplemental exercises included seated behind-the-neck presses, arm curls, lat pull-downs, upright rows, and calf raises.

Each group underwent similar linear periodization resistance training programs three times per week for 12 weeks. Core lifts were performed using 3 x 10-12-RM during the first five weeks, 3 x 6-8-RM during the next four weeks, and 3 x 3-5-RM during the final three weeks. Auxiliary lifts were performed in three sets of 10-RM, with weight being added when the subject could perform three sets of 12-RM with ease.

Statistical Analyses. One-way analysis of variance was used to identify significant differences among the training methods in selected variables.
prior to and following training. When significance was noted, a Tukey post hoc test was used to isolate the differences. Pearson correlation coefficients were used to establish relationships among selected variables.

**Results**

The training groups were matched initially on 1-RM FW; therefore, there was no significant difference ($p=0.35$) for general strength prior to training (see Figure 1). However, comparison among the mode-specific 1-RM bench press values for the training methods revealed that the SHCP and SVBP groups had significant greater ($p<0.001$) values than the FW group (Figure 1).

![Figure 1. Comparison of general and specific strength performances before and after training with free weights (FW), seated horizontal press (SHCP) or supine vertical press (SVBP).](image)

To evaluate the effect of each training method on general and specific strength performances, the absolute changes were determined using difference scores (Post-Training Value – Pre-Training Value). For general strength, the FW group made a significantly ($p<0.05$) greater gain than the SVBP and SHBP groups, with the latter groups not differing significantly (see Figure 2). When the gains for general strength were considered as percent improvements, the FW group ($11.7 \pm 11.4\%$) made significantly greater gains ($p<0.001$) than the SVBP ($7.8 \pm 8.3\%$) and SHCP ($6.7 \pm 9.1\%$) groups, with the latter groups not differing significantly ($p=0.11$).

For mode-specific strength, the SHCP and SVBP groups made significantly greater gains than the FW group but were not significantly different from
each other (Figure 2). When the relative gains for specific strength were considered, the SHCP (18.1 ± 9.2%) and SVBP (16.6 ± 12.6%) groups made significantly greater gains (p<0.001) than the FW (11.7 ± 11.4%) group, with the former groups differing significantly (p=0.11).

Figure 2. Comparison of general and specific strength changes following training with free weights (FW), seated horizontal press (SHCP) or supine vertical press (SVBP).

Discussion

The main finding of this study indicated that the magnitude of upper body strength gain appears to be specific to the method used to measure it. Given this premise, it suggests that men using machine weights will make greater upper body strength gains than those using free weights. This would tend to support the measurement specificity principle which states that individuals should be measured using the method with which they trained in order to more accurately assess the gains made from training (Fry, Powell, & Kraemer, 1992).

Hortobagyi, Katch, & LaChance (1989) earlier indicated that if two measurements have a correlation greater than $r = 0.70$, there is a reasonable degree of generality between those methods for measuring strength. In the current study, the correlation between 1-RM values for FW and SVBP ($r = 0.78$) and FW and SHCP ($r = 0.80$) were above that suggested level and accounted for 61% and 64%, respectively, of the shared variance between the methods. This would suggest that free weights might be acceptable for evaluating strength improvements of the various groups, since this could represent a more realistic expectation of what might happen in the real world. That is
to say, individuals training to improve their strength performance might be expected to utilize their enhanced strength to move objects more resembling a free-weight situation.

Comparisons between 1-RM performances of the machine weight groups at the pre-training evaluation indicated they lifted approximately 16% less ($p<0.001$) using FW than using their specific machine weight. This difference widened at the post-training evaluation to approximately 21% ($p<0.001$). The increased difference between FW 1-RM and machine-specific 1-RM at the post-training evaluation would suggest that machine weight training failed to maintain the comparable difference between the two methods. This was further supported by the modest correlations between the improvement in FW performance verses that in each machine weight group (SVBP, $r = 0.20; \text{SHCP, } r = 0.24$). Hence, the increase in strength noted on the machine weights might not offer the optimal transfer to real world situations.

Therefore, it may be difficult to categorically state that one training method is superior to another. A case can be made for the excellence of each method dependent on the desired outcome. Machine weights may offer more opportunity to isolate specific muscles or movement patterns (Stone, Johnson, & Carter, 1979; Fry et al., 1992). Free weights may offer more opportunity to involve synergistic or supportive muscles during a lifting movement that could enhance coordination and balance (Coleman, 1977; Stone, Johnson, & Carter, 1979). Thus, it can probably be left to the discretion of the lifter to decide which method offers optimal benefit for a particular situation or movement.

References


Studies, 18, 287-294.

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Student Paper

A Comparison of Attitudes Regarding Health Insurance Among Students at Truman State University

Dominique D. Johnson

University students’ attitudes about their need for health insurance coverage were surveyed. A 33-item survey was administered online to Truman State University students (N=249, 70% females, 30% males) enrolled during fall semester 2009. The majority of survey respondents rated themselves as being healthy, experienced no recent serious illness, believed they were at risk for accidents/injuries, and felt health insurance is necessary and important. Most respondents were covered through their parents’ insurance and received medical care at a private doctor’s office or clinic. Results suggested that the students understood the importance of having health insurance coverage. Further research on students’ attitudes toward health insurance coverage is recommended since there is still limited research conducted on this topic.

What are college students’ perceptions about the need for health insurance? In the current economy, health care is a major topic of discussion because many people do not have health insurance coverage. Young individuals may not understand the importance of having health insurance coverage. College students specifically are among the many who are uninsured in the U.S. (Government Accountability Office, 2006). It is generally assumed that college students are covered either under their school’s health care plan or under their parents’ insurance. Unfortunately, there are many college students who do not have health insurance coverage and a primary reason is the level of importance that health insurance plays in students’ life.

In 2006, a study done by the Government Accountability Office (GAO) determined that 1.7 million college students were without health insurance coverage (GAO, 2006). At Truman State University, students complete a health survey every two years. Of the students participating in the 2006 survey, 90% had health insurance coverage under their parents’ policy.
Literature Review

In 2006, an estimated 1.7 million college students between the ages of 18-23 were uninsured (GAO, 2006). In 2005, uncompensated expenses for injury-related medical events from uninsured students totaled $120-255 million (GAO, 2006). Uninsured students ages 18-23 represented a variety of ethnic groups: 26% of Asian, 29% of African American, and 38% of Hispanic compared to 15% uninsured Caucasian (GAO, 2006). These student statistics mirror the ethnic and the racial statistics of the uninsured general population in the U.S. (GAO, 2006).

There are numerous reasons why students are uninsured. The majority of students lose their health insurance coverage under their parent’s plan because of the students’ age. Once students reach the ages of 23-24, many family insurance plans will not cover the student, while some plans even drop the students coverage at the age of 18 years old (Brindis, 1997).

To help provide health insurance for students, many universities and colleges offer students coverage at 30% lower cost than those in the commercial market (Gibson, 2005). Further, students are not deprived coverage for pre-existing conditions under some university plans (Gibson, 2005). These policies frequently cover recurring student medical needs like treatment for injuries, drug-and alcohol-related illness, prenatal care, and eating disorders counseling (Gibson, 2005).

Despite the attempts of some universities and states to increase the number of insured students, insurance problems still occur in America. Although some states have decreased eligibility requirements so dependents can remain on their parents’ insurance policies (GAO, 2006), this option is only for full-time students (Redden, 2008). Conversely, there maybe a maximum age of eligibility for insurance for those students who must switch to part-time status or take a leave of absence for medical reasons (Redden, 2008). Laws in Massachusetts and New Jersey require full-time college students have health insurance (Redden, 2008). Currently, in Missouri only international students are required to have health insurance coverage.

Obtaining health insurance is not a priority for many young adults because they believe they are not at risk for illness or injury due to their previous good health and their age. The purpose of health insurance is to reduce the financial risk and uncertainty of potential medical and hospital expenses (Manning & Marquis, 1989). Most individuals are willing to pay more than a fair amount for health insurance in order to decrease the risk of large financial losses caused by the possibility of future illnesses and the resultant medical care expense (Manning & Marquis, 1989). Such payment is more likely to occur if young adults feel they are at risk of unintentional injuries and illnesses (Manning and Marquis, 1989).

Uninsured college students face a number of potential health consequences. There are increasing amounts of prevalent health risks among young adults, such as obesity, unplanned pregnancies, HIV, and injuries (Collins, 2008).
The access to the health care system is disrupted when young adults are uninsured, and this leaves young adults and their families at risk for high out-of-pocket fees when a serious injury or illness occurs (Collins, 2008).

Untreated health problems and spiraling health care costs are some of the problems uninsured students could face. Research suggests that the decisions health professionals make differ with the patient’s insurance status (U.S. Congress, Office of Technology Assessment, 1992). The patient’s insurance status also may determine whether or not physicians order certain procedures or use other health care resources (The Congress of the United States Congressional Budget Office, 1991).

The uninsured ranged from slightly less likely to more than twice as likely to receive less intensive care than individuals who were privately insured, when other factors related to the differences in health care were considered (U.S. Congress, Office of Technology Assessment, 1992). Routine diagnostic tests and key surgical procedures are less likely to be given to uninsured patients, who are also more likely to die during their stay in a hospital than those with similar health status and private insurance (The Congress of the United States Congressional Budget Office, 1991).

Presently, the individual’s ability to pay for services determines whether or not he or she gains access to health services that they need (U.S. Congress, Office of Technology Assessment, 1992). The receipt of health services can be critical in maintaining and improving health (U.S. Congress, Office of Technology Assessment, 1992).

The lack of health insurance is a serious problem in the United States. Being uninsured causes potential threats at any age. Therefore, the purpose of this study was to survey students’ attitudes regarding health insurance.

**Methods**

A 33-question survey was developed by the investigator to determine the attitudes of undergraduate university students. No reliability or validity measures were established for the survey. Permission to conduct the study was received from the university’s Institutional Review Board (IRB) during the fall of 2009.

**Participants.** A convenience sample of 249 undergraduate students enrolled at Truman State University was surveyed during the 2009 fall semester. An on-line campus announcement was the recruitment method used.

**Instrument.** The questionnaire included: 1) demographic items (ethnicity, age, race, gender, and insurance status); and 2) Likert-type items regarding participants’ attitudes about being insured or uninsured with a five-point response set ranging from “strongly agree” to “strongly disagree.”

**Procedures.** The investigator contacted Information Technology Services (ITS) to receive permission to post the online survey and upload it to the university’s server after IRB approval was granted. An on-line email announcement about the research project was then sent to the undergraduate
students at the university. A welcome page with IRB information about participants’ rights and other appropriate disclosures appeared for students to read and respond to by “electronic consent” before gaining access to the survey. Participants not providing electronic consent were redirected from the page. The online questionnaire was available to all students for two weeks after the initial e-mail announcement. At the end of the survey, a separate web page link was made available to the participants for the option of participating in an online drawing for a $25 gift certificate to a local restaurant. Participation in the survey was totally anonymous and there was no connection to the online drawing. This separate web page required participants to provide their name, a phone number, and email address where the winner could be reached. One individual’s name was randomly selected and notified as to how to receive the gift card.

Data Analysis. Relationships between the independent variables (age, sex, class standing, ethnicity, citizenship, and health insurance coverage) and the dependent variables (attitudes and beliefs) regarding health were examined.

Results and Discussion

A total of 249 students completed the online health insurance survey. The respondents were 75 males and 74 females ranging in age from 18-21 years of age (38% were 18 years old, 24% were age 19, 20% were 20, and 18% were 21 years old). Of the 249 students participating in the survey, 94% were U.S. citizens and 6% were international students. The ethnicities of the participants were 84% Caucasian, 7% Asian, 3% Hispanic, 3% African American, and 3% classified themselves as “other”.

The majority of survey respondents (96%, n=240) were insured, while 4% (n=9) reported being uninsured. Of the insured students, 79% sought medical checkups at a private doctor’s office, 14% used a public clinic or community health center, 5% went to a hospital clinic, and 2% used a hospital emergency room. Of the uninsured students, 10% sought medical checkups at a private doctor’s office, 60% used a public clinic or community health center, and 30% went to a hospital emergency room (see Table 1).

Among Caucasian, Asian and African American respondents, medical checkups at a private doctor’s office or clinic was the most common location (see Table 2). More than half of the Hispanic students reported going to a public clinic or community health center. The African American students in this study had the highest percentage (29%) of medical care in an emergency room, when compared to the other ethnicities.

Of the domestic participants in this study, 78% receive medical checkups at a private doctor’s office, 15% at a public clinic or community health center, 4% at a hospital clinic, and 3% from a hospital emergency room (see Table 3). In contrast, among international students, 37% received care at a private doctor’s office, 37% go to a public clinic or community health center, 13%
get help at a hospital clinic, and 13% use the emergency room for their checkups.

Regarding their perceptions of their personal health condition, 44% of the students reported their health as “excellent” condition, 47% “good” condition, 7% “fair” condition, and 2% “poor” health condition. When asked whether or not health insurance was necessary in college, 60% “strongly agreed”, and 33% “agreed”. The majority of participants felt health insurance coverage was important once they graduate from college (71% “strongly agreed” and 22% “agreed”). In response to whether or not it was easy for them to get medical care when they need it, 22% of the students “strongly agreed”, while 44% “agreed” and 19% were “neutral” (see Table 4).

Table 1
Insurance Status and Percentages of Location of Medical Checkups (N= 249)

<table>
<thead>
<tr>
<th>Location</th>
<th>% Insured</th>
<th>% Uninsured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private doctor’s office or clinic</td>
<td>79</td>
<td>10</td>
</tr>
<tr>
<td>Public clinic or community health center</td>
<td>14</td>
<td>60</td>
</tr>
<tr>
<td>Hospital clinic</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Hospital Emergency room</td>
<td>2</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 2
Ethnicity and Location of Medical Checkups (N= 249)

<table>
<thead>
<tr>
<th>Location</th>
<th>Caucasian n= 210</th>
<th>Asian n= 18</th>
<th>African American n= 7</th>
<th>Hispanic n= 7</th>
<th>“Other” n= 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private doctor’s office or clinic</td>
<td>81%</td>
<td>44%</td>
<td>43%</td>
<td>43%</td>
<td>57%</td>
</tr>
<tr>
<td>Public clinic or community health center</td>
<td>12%</td>
<td>39%</td>
<td>29%</td>
<td>57%</td>
<td>14%</td>
</tr>
<tr>
<td>Hospital clinic</td>
<td>4%</td>
<td>6%</td>
<td>0%</td>
<td>0%</td>
<td>29%</td>
</tr>
<tr>
<td>Hospital emergency room</td>
<td>2%</td>
<td>11%</td>
<td>29%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Table 3
Citizenship and Percentages of Location of Medical Checkups (N= 249)

<table>
<thead>
<tr>
<th></th>
<th>% Yes</th>
<th>% No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private doctor’s office or clinic</td>
<td>78</td>
<td>37</td>
</tr>
<tr>
<td>Public clinic or community health center</td>
<td>15</td>
<td>37</td>
</tr>
<tr>
<td>Hospital clinic</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Hospital Emergency room</td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 4
Percentage of Response to Questions Regarding Health Insurance (N=249)

Survey Question: Is health insurance necessary while in college? (N= 249)

<table>
<thead>
<tr>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>33%</td>
<td>5%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Survey Question: Is health insurance coverage important once you graduate from college? (N= 249)

<table>
<thead>
<tr>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>71%</td>
<td>22%</td>
<td>6%</td>
<td>1%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Survey Question: Is it easy for you to get medical help when you need it? (N=249)

<table>
<thead>
<tr>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>22%</td>
<td>44%</td>
<td>19%</td>
<td>12%</td>
<td>3%</td>
</tr>
</tbody>
</table>

The majority of these college participants believed that health insurance is important to have while in college and after graduation. This response differs from the literature where most college students are reported as not thinking health insurance is a serious matter. In addition, the majority of the participants in this study received their medical care at a private doctor’s office. This result also contrasted with the literature review finding that most college students receive medical care in emergency rooms.
Limitations

In this study, participants’ attitudes were measured by self-report. In order to ensure the validity of self-reported data, methods recommended by Rouse, Kozel, and Richards (1985) were followed to gather data through anonymous inquiry, using brief, easily understood directions to complete the survey. The use of self-report provided estimates of the students’ most current attitudes regarding health insurance at the time of the survey.

A second limitation was that participants in this study were not a random sample, so the demographics of the university population were not reflected in the participating students. Therefore, within context of the volunteer population sample, the results of this study have to be examined very carefully.

Conclusions and Recommendations

In this study, most of the students seriously considered the need for having adequate health insurance coverage. They also understood that young adults are more at risk for accidents and unintentional injuries than any other age group. Since the majority of these participants classified their current personal health status as being “excellent” or “good”, it may have affected the way they viewed health insurance coverage compared to paying health care themselves. Although the participants in this study were not a representative sample of the university’s student population, it is still important to understand college students’ attitudes about health insurance.

This study on undergraduate students’ attitudes regarding health insurance is important primarily because very little research is available on this subject. Since most individuals are removed from their parents’ health insurance policies between the ages of 18-24, it is important to know how many students are in this situation, and whether they have health insurance coverage or not. Additionally, it is useful to know whether they are aware of the university-offered health insurance plan and about the affordability of these student policies. More information should be made available to college students about the university-offered health insurance plans.

Further investigation on this topic is recommended because of the small amount of existing research about college students and their health insurance, as well as about the attitudes of these young adults. To reduce the consequences for the 1.7 million uninsured college students, health insurance coverage is necessary. Universities and states should take the lead to provide low-cost group plans for college students as a way to reduce the health care gap for them.
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**Dominique Johnson** is a senior Health Science major at Truman State University, Kirksville, MO. She will receive her Bachelor of Arts degree from Truman State University in December, 2010. She plans to attend graduate school and study for a Master’s degree in Occupational Therapy.

Acknowledgement: Special thanks to Dr. Janice Clark Young, Associate Professor in Health Science at Truman State University, for the assistance provided on this research project.
Successful Goal Setting in Basketball: Where Should I Focus?

Jonathan Kauffman and Joe Deutsch

Jim Calhoun (2007), men’s basketball coach for 22 years at the University of Connecticut, never preaches winning to his teams but focuses instead on getting his players ready to play basketball to the best of their abilities. Team goals are important to the overall success of a basketball program because they give players and coaches areas to focus on in order to achieve success. Giannini (2009), a collegiate basketball coach of 20 years, wrote that while players and programs that lack clearly defined goals might wish to succeed, they are working without a purpose or a plan and seldom achieve their potential.

Even though team goals are almost always positive, having the wrong kind of goals or using goals incorrectly can lead to unintended results. For example, a team goal might be to attain a field goal percentage of 40%. As a result of having this precise goal, an individual player might begin to worry about his or her field goal percentage instead of just playing basketball. The player may be concerned with shot selection during games, the choice of shooting when open or passing to another teammate, etc., all of which can lead to over-thinking and poor individual performance. Coaches, in turn, might respond to players not meeting the goals by berating the player and suggesting that the player need to concentrate more on certain areas (shooting, in this case). Sidney Goldstein (1994), a men’s and women’s basketball coach of 17 years, encourages coaches to use goals and statistics to plan practices, but never to defeat or humiliate players with them.

If team goals are so important and with so many options to choose from, how does one choose which goals are appropriate to use? Many coaches use goals to focus on field goal percentages, rebounding margins, free throw percentage, turnovers, and/or assists because they feel these concepts make up the core areas of the game of basketball (Giannini, 2009; Goldstein, 1994; Krause, 1994; Phelps, Walters, & Bourret, 2000).

John Wooden (1966) is one of the most successful college coaches of all time. He coached the University of California Los Angeles to 10 national championships. Coach Wooden felt that regardless of how well a team can do everything else, if a team cannot put the ball through the hoop, then they are not going to win many ball games against teams that can. Making more baskets than the other team usually translates into more points than the other team, which leads to victory.
Wooden (1966) also wrote that more opportunities for possession will come from missed shots than by any other way, therefore making offensive and defensive rebounding very important. Wooden found that quite often the team that won the rebound battle, would probably control the game and, in his experience, this held true. When a team misses a shot, it gives the other team a chance to rebound the basketball which can result in a score and therefore establish a lead and eventually win the game. However, if a team misses their first shot and is allowed to obtain an offensive rebound and continue shooting until they score, then the opposing team misses out on the opportunity to build a lead. The team that rebounds the best will generally have the best chance of building a lead and eventually will be victorious.

Free throws are a very important aspect of any game because they are uncontested shots. Wooden (1966) wrote that free throw shooting can determine the outcome of so many games during a season that any time spent on developing this skill is never wasted. Tom Amberry (Amberry & Reed, 1996), who shot and made 2,750 free throws in a row, wrote that players can boost their scoring by getting to the free throw line. The simple fact is, Amberry writes, that the hoop is always 10 feet high and the free throw shooter always stands 15 feet from the hoop, and the only thing stopping a free throw shooter from making a basket is their own ability.

Without the basketball, a team cannot shoot, rebound, get to the free throw line, or dribble and will not be able to win. Richard Phelps (2000), who was the basketball coach of the University of Notre Dame for 20 seasons and is currently a basketball analyst for CBS and ESPN, wrote that defenses that can force the opponent to frequently turn the ball over will usually win games because opponents cannot score if they do not have possession of the basketball. Phelps reasoned that turnovers can lead to the building or losing of momentum in basketball games because a turnover generally leads to fast break points or easy layups for the other team. A team can win if the turnover margin is close (plus or minus two), but the larger the margin is in the other team’s favor, the more difficult it becomes to be successful.

To obtain a better and more specific look on how goals are established, assessed, and adjusted, the authors monitored a Midwestern Division I basketball program (Team A) during their 2008 – 2009 regular season. The regular season consisted of 18 conference and 9 non-conference games for a total of 29 games but did not include any pre-season or post-season games for which Team A was eligible. Team A’s goals were to attain a higher field goal percentage margin, rebounding margin, free-throw attempts margin, and to obtain a lower turnover margin than their opponent with the thought that the more goals they attained, the higher the likelihood of success.

On the surface, the goals used by Team A may seem too generic or too broad because no specific numbers were attached to the individual goals. However, the coaching staff took into consideration how teams and players focus on goals. As players perceive themselves to be nearing their positive goals at a satisfactory rate, they will become increasingly motivated and
focused. Conversely, players can become increasingly unmotivated and tend to lose their focus on achieving a particular goal as they perceive themselves moving farther from their goals (Rodebaugh, 2006). Essentially, when teams are winning, they will continue to play well and be successful. Panic often sets in when teams start to lose games because players often try to fix their problems and can potentially over correct their problems. In order to avoid players being concerned about their statistics, the coaching staff of Team A did not set specific statistical goals.

Team A had a very successful year and never lost back-to-back games. By winning 23 games and only losing six, Team A’s coaching staff successfully guided the men’s basketball program to win their Conference Tournament and earn a berth into the NCAA (National Collegiate Athletic Association) tournament. As referenced in Table 1, Team A won 100% of their games when they met their main four goals of having a higher field goal percentage margin, rebounding margin, free-throw attempts margin, and a lower turnover margin than the other team. Team A also won 90% of their games when they achieved three out of four goals, 88.9% when they achieved two out of four goals and Team A lost every game in which they met one or no goals.

<table>
<thead>
<tr>
<th>Main Goals</th>
<th>Wins</th>
<th>Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Goals Won</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>3 Goals Won</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>2 Goals Won</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>0-1 Goals Won</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Team A was successful by focusing on these four areas in particular: field goal percentage, rebounding margin, free-throw attempts margin, and turnover margin. In order to achieve this success, these four areas of the game of basketball were analyzed after every game, and the results were used to modify practices to help improve the players’ techniques. If Team A struggled with turnovers in more than one game, then the coaching staff of Team A would include more drills dealing with turnovers or focus more on how the team was handling the basketball during existing drills or team scrimmages, or any combination of the two.

Understanding how each individual goal correlates to the overall success of a program is very important. For example, Team A won 100% (see Table 2) of their games when their field goal percentage was better than the other team, compared to only winning 40% when shooting a lower field goal percentage than their opponent. This would indicate that field goal
percentage does indeed play a major role in the outcome of basketball games and should be a major focus of practice. Rebounding margin and free-throw attempts margins are also significant because Team A had 17 wins and three losses when attaining more rebounds than the other team but only six wins and three losses when losing the rebounding battle. Similarly, Team A won 90% of their games when shooting more free-throws than the other team, but only won 56% of their games when their opponent shot more free-throws than they did. Turnovers seemed to play a lesser role than the other three categories because Team A only won 76% of their games when they beat the opponent in the turnover battle but actually won 83% when they did not. This could be a result of both teams having close (plus or minus two turnovers) to the same number of turnovers and therefore canceling each other out. Free-throw percentage could be further analyzed because Team A won 14 games and only lost two when shooting a better free-throw percentage than the other team and compared to only winning nine games while losing four when shooting a lower free-throw percentage than their opponent.

### Table 2
Goals Met Versus Wins and Losses

<table>
<thead>
<tr>
<th></th>
<th>Team Win</th>
<th>Team Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field Goal Margin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal Met</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>Goal Not Met</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td><strong>Rebound Margin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal Met</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>Goal Not Met</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td><strong>Turnover Margin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal Met</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Goal Not Met</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td><strong>Free Throw Attempted Margin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal Met</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Goal Not Met</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td><strong>Free Throw Percent Margin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal Met</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Goal Not Met</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>

As a result of Team A’s success when having a better field goal percentage than their opponent, one can determine that a basketball team experiences more success when they shoot a better percentage than the other team. These findings are supported by John Wooden’s (1966) philosophy of regardless of
how well a team can do everything else, if a team cannot put the ball through the hoop, they are not going to win very many ball games. Even though Team A still won four games when they shot a lower percentage than the other team, all six of Team A’s losses came when they shot a lower percentage than the other team. On the other hand, Team A might have won or lost the turnover margin by one or two turnovers and, therefore, making the win or loss of the goal less important, which would indicate that turnovers alone are not very indicative of wins or losses.

Considering Team A’s success, one could conclude that the process by which they developed and used their goals can lead to success. By not setting specific statistical goals and focusing instead on outperforming opponents in each specific goal, a program will be able to focus on defeating their opponent instead of reaching a level of statistical excellence. When Giannini (2009) wrote that players and programs that lack clearly defined goals are working without a purpose or a plan and seldom achieve their potential, he did not necessarily mean specific statistical goals. By using goals clearly understood by the team, a coaching staff can still obtain an accurate picture of what areas their team needs to improve upon in order to achieve success.

References


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The Service Learning and Community Connection Program at Central Methodist University

Mozaffar Rahmatpanah

“When I hear, I forget, when I see, I remember, when I do, I know.”
–Confucius

Traditionally, service learning is conducted on the participants’ off-campus site. Yet, circumstances arise that can lead to successful on-campus service learning projects. This is the case with the Service Learning and Community Connection (SL&CC) program conducted through the Adapted Physical Education (APE) program in the Physical Education Department at Central Methodist University (CMU). The community participants of the SL&CC program have benefited from the program significantly. Bishop and Driver (2007, October, p.16) noted that “Service learning provides reciprocal benefits to the service recipient and the student.” The SL&CC program has been beneficial for both service recipients and CMU students. In fact, this has been the hallmark of this service learning initiative because it provides mutual benefits to the participants and students.

First, the SL&CC program has significant benefits for the community participants. For 15 years, the clients of Endless Options, a residential facility that provides rehabilitative services for developmental disabled children and adults, have eagerly welcomed our APE program. Endless Options is located adjacent to CMU in Fayette, Missouri. The clients are males and females ranging in age from 15 to 50 years. All these clients have multiple disabilities, including low IQ scores and deficits in adapted behavior. All clients have some form of ambulation and language impairment based on general observation and information from staff. The main reason SL&CC is conducted on the CMU campus facilities is the lack of a gymnasium facility at Endless Options.

The program has been an effective educational strategy for CMU students. It allows pre-service teachers to improve their educational experiences by providing meaningful service to a community that desperately needs it (Carson, 2008). We define our service learning/community connection as an instructional modality that provides instructional education experiences that cannot be obtained in any other manner in the curriculum. Bishop and Driver (2007, October, p. 15) have argued that “many introductory classes in adapted physical education activity (APE) typically offer ‘on campus

laboratory experience’ with youths with disabilities rather than ‘real world’ service learning experiences.” To date, there are not any research or scholarly papers indicating that there are many service learning experiences in adapted physical education classes conducted at the college or university site. There may be some on campus laboratory experiences performed on campus sites with individuals with disabilities, but the number of disabled participants is typically low. The number of SL&CC participants generally has ranged from 12 to 15 developmentally disabled individuals participating in each session for every year since the inception of the program. The limited access to a large number of disabled individuals who could be brought to a campus for APE classes might be one of the biggest limitations for many institutions.

According to Hurd and Schlatter (2007, April, p. 31), “The classroom generally serves as an artificial lab for honing skills such as problem solving, decision making, customer service, or professionalism.” When classroom-gained skills can be applied in real-world settings at any point in the educational process (on campus or off campus), then pre-service teachers can gain valuable practical experience that will be important in their future teaching responsibilities.

In addition, if students are prepared with on hands-on experiences in APE classes, then they will develop teaching skills that give them a competitive advantage over other job applicants. “One assumption when providing pre-service physical educators contact experiences with individuals with disabilities is that future teachers develop positive perceptions and/or attitudes towards learners with disabilities” (Kozub, 2002, p. 104). The SL&CC program has created positive perceptions and positive attitudes for our students toward teaching disabled individuals and toward the APE program. Kozub (2002, p. 105) further argues that “a person who has had prior field experiences working with individuals with severe disabilities may have higher biomedical perceptions than one who has had no prior contact.” Kozub defined biometrical perception as challenging behaviors being perceived by pre-service teachers as a function of disability factors.

In addition to hands-on experience gained by students in APE, there is also the shaping of the pre-service teachers’ perceptions toward working with disabled individuals. Furthermore, participation in our SL&CC program during the 8 weeks laboratory workshop has led to CMU students reporting improved self-confidence, enhanced self-efficacy, enhanced self-worth, experienced accomplishment, and practiced citizenship because they are helping developmentally disabled individuals. Mumford and Kane, (2006, March, p. 39) believe that “one of the major benefits of service-learning is that it helps foster civic responsibilities.” The above outcomes are indeed true as seen through the responses to the student evaluation given to students when they complete the program. All students unanimously felt that the APE program had a lasting favorable impact toward working with disabled individuals in physical education. Many of them stated that they might pursue careers in adapted physical education in the future. Bishop and
Driver (2007, October, p. 16) believe that “for students who are undecided about their future career, direct contact with individuals with disabilities may encourage them to pursue a career working with a special population.”

There is an additional benefit for community participants. As Hansen (2008, July / August, p. 10) stated “the most effective physical education curriculums are those that incorporate all three domains (psychomotor, cognitive, and affective) of teaching and learning.” The SL&CC program enhances disabled individuals in all three domains of learning: cognitive, affective, and psychomotor. The disabled participants learn some basic knowledge of the rules and strategies of the games (cognitive). Based on general observation, they all improve in motor skills performance (psychomotor); and during the laps walk in the gym, which is part of cardio-respiratory conditioning, the disabled individuals carry on many conversations with our students. The social interaction with our students improves their language skills, social skills, self-esteem, and self-worth (affective).

Program Goals

The need for the SL&CC program came about when the author visited Endless Options and realized that the agency did not offer a structured APE program for its clients due to the lack of gymnasium facilities on site and access to a qualified APE instructor. As a result, the Department of Physical Education contacted Endless Options offering to provide an APE program twice a week. The agency gladly accepted the invitation, and the program was launched.

According to Mumford and Kane (2006, March, p. 39) “the service aspect of service-learning must be based on a communally recognized need. The community agency or group and the teacher or class involved in the service-learning experience must agree on the need.” Bishop and Driver (2007, October, p. 17) also noted that, “Through service learning students can provide additional care, supervision, and activities that agencies might not be able to otherwise supply to individuals with disabilities.” Therefore, the goals of the APE program were:

- To promote safe and appropriate physical and leisure activities that help the participants experience and enjoy the benefits of physical activities and social interaction;
- To promote pre-service teachers knowledge and understanding of teaching responsibilities, based on hands on experiences in a real world setting, as well as developing positive attitudes and perceptions while working with disabled individuals;
- To promote the development of pre-service teachers through direct student involvement, and the teaching of civic responsibility and citizenship;
• To help and cooperate with a local agency by providing the agency with a free, appropriate, and structured APE, supplied by undergraduate students who are fulfilling courses’ objectives;
• To promote and build a sense of community of practice among the disabled and CMU students through APE and physical activities;
• To help give students an appreciation for individual differences and abilities.

Prior to conducting our program, the following steps were taken:

• The Department of Physical Education contacted the agency, informing Endless Options when the APE would start and terminate;
• A risk assumption contract agreement (Bishop & Driver, 2007) was signed and agreed upon by Endless Options and CMU. This contract is a legal document that describes all the risks associated with participating in our program;
• CMU students signed a form indicating that the personal information of the disabled is confidential and could not be revealed to anyone;
• The agency agreed to bring the clients to the gym on time and return them after the APE program.
Procedure

The SL&CC program consisted of physical fitness activities and skill development in various games such as basketball, baseball, football, and bowling. We considered these sports to be community-based activities that offer participants the opportunity to learn more community based leisure and recreational skills. Auxter, Pyfer, and Hueting (2005, p.159) believe that “this is particularly important if learners with disabilities are to have the opportunity to make a meaningful transition into community.” Furthermore, Silliman-French, Candler, French, and Hamilton (2007, September/October, p. 17) believe that “students receiving adapted physical education services should be provided functional and /or community based physical education instruction on activities to enhance progress at their appropriate level.”

CMU students were divided into four groups, with each group responsible for teaching one of the sports skills, for example, basketball, for two weeks and for conducting introductory and fitness activities. The latter included warm-up, flexibility, stretching, and cardio-respiratory activities, such as walk and run laps around the gymnasium. Each group wrote a lesson plan for their daily activities that was handed in to the instructor ahead of time so that necessary adjustments could be made. Each sport was modified appropriately so that skill development could more easily take place. For example, flag football was substituted for regular football; T-ball was substituted for baseball; lighter equipment was used (e.g. bat and ball) and the rules of the games were modified. Each CMU student was assigned to one participant (some times we had to assign two students per participant). In this way, we made sure that the ratio of teacher to client was maintained at a low rate in order to provide quality instruction. As the participants entered the gym, all the CMU students were required to greet and welcome the participants to APE class and make them comfortable so that they could fully take advantage of the program.

It is interesting to note that the participants were very interested in the parachute activity. In each session, time was allocated for various parachute activities. As Pangrazi (2007, p. 530) noted “parachutes provide an interesting means of accomplishing physical fitness goals: a good development of strength, agility, coordination, and endurance.” Parachute activities develop cooperative skills because these activities require everybody to help to accomplish various tasks.

As a form of reinforcement and encouragement, this year the CMU students presented a certificate of participation for each sport to the participants as well as a t-shirt from our athletic department office. They all were thrilled with these gifts.

The followings are examples of the skill development activities performed during the work shop for each sport:

- Basketball: Chest pass, bounce pass, two-hand overhead pass, catching
or receiving, dribbling, shooting, free throw shot, and basic basketball rules such as fouls, scoring, and substitution

- Football: Passing (forward pass, lateral pass), throwing to a target, catching, handing off the ball, and carrying the ball, punting, snapping the ball to a quarterback and basic rules for flag football.

- Baseball: Throwing, catching and fielding, batting tee, base running, pitching, fly balls, and basic rules of the game such as striking out, batter safe, foul ball, and base running and scoring

When the director and guidance personnel follow-up questionnaires were sent to Endless Options, these were some of the responses received:

- “This is a very good program. I have seen them grow relationships with students and get the physical exercise they need. And also teaches them about exercise and activities.”
- “They always look forward to the days scheduled for this.”
- “They always were ready to go to the university and ready to participate in the activities and see the students that became friends also.”
- “Please continue. It is important for the disabled and the students.”
- “I never heard any negative comments.”
- “They truly enjoy this program and the students.”
- “Thank you for providing these opportunities for our clients.”
- “Even a small improvement is a great thing.”
When CMU students responded to the students’ evaluation questionnaire, these were some of the responses:

- “I think the adapted physical education program is excellent because it gives practical, real world experience.”
- “I gained the experience I need to feel confident to work with the disabled.”
- “My perception has changed because I now know what to expect.”
- “I can honestly say that I am looking forward to work with them each day.”
- “The disabled had so much fun everyday in class, they would cheer, laugh, clap, and even hug students.”

**Conclusion**

The SL&CC program has been successful for many years. The intention of APE programs is to provide genuine and authentic opportunities for disabled individuals to experience success in learning, develop gross motor skills, and have opportunities to improve social skills through mainstreaming. “Poor motor coordination and inability to execute daily social skills have a strong effect on the individual’s attitudes, feelings and dignity. One way to improve the disabled individuals’ self esteem and enhance their level of confidence in activities of daily living is through improving their gross and overt movement development skills” (Rahmatpanah, 1985, p.1). Other educational institutions can use the APE program described here in their local communities so that the disabled individuals can have access to a quality APE program provided by pre-service teachers. This APE program is one of the best pedagogical models to improve students’ knowledge and to apply that knowledge in a real-world setting while serving others through the Service Learning and Community Connection.

**References**


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Use the Web to Find New Aerobic Choreography

Julia Spresser and Janice Jewett

If you are looking for new aerobic choreography that your students will like, try surfing the web by typing in “youtube, Zumba Choreography”. Check out the video “Zumba Kids by Tania – Dance – You Tube 3:57.” You can see kids doing Tania Amthor’s choreography to the song “Low” – Flo Rida (feat. T.Pain), a song many school-age kids know. Seeing the video makes it easy to understand the written choreography breakdown that is shown below:

Introduction
Single, Single, Double Lunge

Chorus
Single, Single, Double Lunge (4 times/8 counts)
Jump feet out, cross right over left and turn left, (4 counts)
Side step right with arms sweeping across eyes (I see you hands) then side step left with left arm sweeping across eyes (4 counts)
Circle self taking 8 steps/counts
Sink low for 8 counts
Repeat from the lunges but replace the side steps with right-left-right hips & a hip slam

Verse 1
A repeated Reggaeton step [two side steps right, single side left then right, reverse]

Verse 2
A repeated Hip Hop step [4 knees up while arms push, push & pull, pull with each knee]

Chorus
Repeat above

Verse 1
Repeat above

Verse 2
Repeat above

Chorus
Repeat above

Verse 1
Repeat above

You can use the music “Low” (feat. T.Pain) made famous by Flo Rida from the album Mail on Sunday with a time of 3:49. It is available online for a small fee. You could also download the Hip Hop instrumental version if you are concerned about the language for a school audience.
Below are some suggestions for modifications that will make the choreography easier for younger kids to master and will allow you to teach while dancing, for a better workout.

1) On the Introduction and Chorus: do single lunges, adding under-cut arms. Add the single, single, double-timing when single lunges and arms have been mastered. The lunges need to be very small because the music is fast.

2) On the Chorus: jump feet out-in-out then do only arm pulls with “I see you hands”—no side steps, gradually add feet out-cross-out and finally add the jump-cross-turn.

3) Do the second repeat of the chorus exactly the same as the first with the “I see you hands” not the hips.

4) For Verse 1 teach just the Reggaeton footwork (two steps right with a single side step left then right, reverse left) then teach the Reggaeton with arms following the footwork (both hands punching right twice then left once and right once, reverse). If need be, breakdown by doing the arms by themselves then feet. Then put punches with feet. The final challenge will be for arms to swing in the opposite direction of the feet.

5) For Verse 2 do knees only then, add knees and push downs, then change to knees and pull down, then knees with 2 pushdowns and 2 pull downs. We have been doing the “box step” (up right, up left, back right, back left) instead.

Help your students have success by letting them know that they can stick with the easier steps or modifications if they choose.

If you are looking for more choreography by Tania, Google/search with these key words “zumba kids, choreography by Tania”. She does choreography for “Impacto” by Daddy Yankee. The video title from www.youtube.com is “El Impacto ft. Fergie - Zumbatomic Zumba Kids Dance Fitness Choreography by Tania Amthor. It looks like she uses the explicit version which you should avoid. Remember to have a native Spanish speaker listen to your version to make sure all the words are appropriate if you have Spanish speaking students! Feel free to change the choreography to make it easier or more appropriate for your students!

References

Web Site Citation:
www.youtube.com
www.itunes.com (free itunes download)
www.easybib.com (free bibliography citation assistance)
Video Citation:

Music Citation:

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Dare to be Great! Implanting GREATness into Future Teachers

Brad Mears and Dennis Docheff

There seems to be an emphasis placed upon the “science” of pedagogy in the preparation of tomorrow’s teachers. The focus is on developing strong teaching skills before entering the profession. As important as these skills are, some people submit that it is the “art” of teaching which designates the GREAT teacher from the good teacher. The “art” of teaching includes how teachers develop themselves as people. The personal qualities future teachers develop impact how they end up teaching our children. These qualities, also known as dispositions, are “attitudes and beliefs that are held internally,...they do manifest themselves in the form of observable behavior” (Smith, Skarbek, & Hurst, 2005). These personal attributes include values, commitments, professional ethics, and more. These authors believe that these dispositions greatly influence teaching behavior.

What makes GREAT teachers? How can students go from good future professionals to GREAT practicing educators? The purpose of this article is to share specific qualities of GREAT teachers. Ten attributes are shared for the purpose of enhancing the development of future teachers. This article presents GREAT as an acronym (twice) of personal characteristics that need to be developed in future teachers to ensure their “GREATness”.

Making G.R.E.A.T. Teachers

As these concepts are presented, the reader is encouraged to scrutinize the list of attributes and consider others that may be meaningful to future professionals. The items presented are not all-inclusive, yet these qualities are critical to becoming GREAT teachers. Here are ten qualities that determine GREAT teachers:

- Growth – personal and professional
- Relationships – based on compassion
- Equality – does not mean fair
- Alignment – focusing on purpose
- Total Value – cost versus outcome
- Goal orientation – assessment of learning
Reinvest in the profession – making a contribution
Enthusiasm for learning – role models for life
Attitude is everything – positivity breeds success
Take charge of learning – TEACH!

Let’s examine each in more detail.

Growth – Personal and Professional
The idea that there is a need for continuous professional growth in physical education is nothing new. Common sense tells us that professional development leads to growth. In support of this notion, Teachernet (2009 ¶ 1) stated, “In order to ensure high-quality PE and school sport, teachers and others need development and support.” Leaders in education emphasize this importance as they continue to provide professional development opportunities both through internal means as well as funding for external opportunities, such as conferences, workshops, and more. Another area of growth that is probably as important, yet rarely thought of, is the personal growth of teachers. As future professional physical educators gain an understanding of the holistic approach to education, consistently teaching within the cognitive, psychomotor and affective domains, so must they incorporate that approach in their own lives. It is personal growth that motivates GREAT teachers to seek professional development. GREAT teachers must strive to consistently improve themselves beyond the profession in a way that makes them well-balanced people.

Relationships – Based on Compassion
The relationships that physical educators create with their students, faculty/staff peers, and patrons of the community are an integral part of becoming GREAT teachers. Although it may not be realistic to think that teachers agree with all constituents on educational process and policy, it is important that teachers demonstrate compassion and respect for the people in their communities. When discussing the NCATE accreditation standards, Butler (2006) reminded us that teacher candidates should be able to work with diverse students and colleagues. The implication is that the ability to develop diverse relationships should be a main concern for future professionals. Compassion is the key to creating these ever so important relationships, leading to the most suitable learning/teaching environment. Compassionate teachers may recognize differences, while they focus on similarities. It is these similarities that help GREAT teachers connect with and develop compassion for their students. Compassion for students demonstrates a sincere desire to teach others. GREAT teachers exude kindness, portray empathy toward others, and offer a caring concern for all. GREAT teachers reach out to others in need, while looking for the good in people.
Equality – Does Not Mean Fair

To go from good to GREAT, teachers must always keep the students’ best interests at heart. Teachers often make statements like, “We want to give students an equal opportunity to learn,” and, “We need to use behavior management plans that are fair.” These are true declarations, but GREAT teachers understand that fair and equal are not always the same. As individual students are so drastically different, what seems fair for all students is seldom equal—this is why the education profession so desperately needs strategies that include individualized education and behavior management plans, as well as differentiated instruction and assessment applications. “In order for students to have a more full understanding that fair does not always mean the same, we must teach and model this concept” (Butler, 2004/2005). GREAT teachers are not driven to give students what they want or what is equal; they strive to give students what they need! GREAT teachers realize that to ensure equality in educational opportunity they must sometimes provide unequal, and seemingly unfair, learning experiences.

Alignment – Focusing on Purpose

Internal program alignment is more than a process used in curriculum planning and design. It is also a mindset or a way of thinking. Good teachers establish sound curriculum that is internally aligned with their goals and curriculum model. Lund and Tannehill (2010) suggested connecting three elements to create instructional alignment; 1) the intent of students learning, 2) the assessment of performance; and 3) how teachers teach and students practice. The point is that the curriculum be aligned with program goals. GREAT teachers not only align their curricula and program goals, but also spend time reflecting on how choices made in lesson planning and instruction may go in a direction other than their curriculum plan. For example, in a lesson designed to develop skills the teacher may spend more time making sure a game is played correctly rather than making sure the skills are being adequately performed in the game. By understanding that they often tend to make such decisions, GREAT teachers constantly do all they can to avoid making those kinds of mistakes. In addition, GREAT teachers also closely examine external alignment between their program/district goals and state and national standards (more on this later).

Total Value – Cost versus Outcome

In today’s economy everyone is looking for a good value. As education is a service it is very important that teachers keep value in mind. Physical educators must promote the value of Physical Education and physical activity. NASPE (2004) claimed that “Physical education is an integral part of the total education of every child from kindergarten through grade 12”. People are interested in value—and there is no greater value children can receive than a healthy active lifestyle. GREAT teachers always remember that tax payers not only pay the teachers’ salaries, but communities also vote
to pass bonds and tax increases to boost the funding for our schools. The public volunteer their time in the schools and support an endless number of school fundraisers. More importantly, they trust teachers with the most valuable entity in their lives—their children! GREAT teachers make sure that every interaction they have with each child is worth more than the trust and support that has been given to them. True value is developed when GREAT teachers provide quality goods and services to their constituents. GREAT teachers teach the value of learning, an outcome which enhances the quality of life.

Goal orientation – Assessment of Learning

Future professionals need to consider their purpose in becoming physical educators. Do their proposed outcomes align with state standards? Are future teachers setting goals that are measureable and meet the standards as put forth by our governing bodies (DESE; NASPE)? In order to create a goal-oriented perspective on teaching, GREAT teachers must be able to assess the attainment of such goals; GREAT teachers assess learning. Lambert (2007) stated, “There must be a clear idea about what is to be learned and how it will be assessed.” In other words, not only does the assessment need to be aligned with program goals, students must be made aware of the assessment expectations placed upon them. The assessment of learning is a skill that has been ignored in many teaching situations over the years. In these days of accountability, teachers are being held responsible for the learning (or non-learning) that occurs in their classrooms. Therefore, it behooves GREAT teachers to enter the field with a goal-oriented attitude. The assessment of learning demonstrates the attainment of goals and the meeting of standards.

Reinvest in the Profession – Making a Contribution

As kids, many are taught that periodically adding to bank accounts provides needed funds for the future. The same is true in teaching. Future professionals must make investments in their futures as teachers—they are able to make deposits into their professional “back account”. How do developing teachers go about doing this? The best way to invest in their futures is to reinvest in their professional organizations. The American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) encourages professionals to become members in order to “advance, accentuate, and accelerate your career” (AAHPERD, 2009). Clearly, professional membership should be a consideration for all future professionals. GREAT teachers become members in the national association (AAHPERD) and the state AHPERD, which provides many opportunities for future professionals. This helps to develop a personal habit of professional development. Typically, GREAT teachers who become professional members are provided with journals, conventions, workshops, and other opportunities for professional growth (addressed earlier). Reinvesting some of their hard earned money
(even if their dollars come from mom and dad) allows students to begin to network with other professionals. In addition, membership offers GREAT teachers an organization to belong to, identify with, and look to for support and advocacy needs. Reinvesting in the profession has too many positive outcomes for GREAT teachers to ignore.

**Enthusiasm for Learning – Role Models for Life**

Future professionals may enter the teaching world thinking, “Man, finally done with school. I will never crack another book again!” This kind of thinking discourages future professionals from becoming lifelong learners. An attitude of “I need to know more” should be developed in our future teachers. This type of attitude adds to the growth of the profession. It is assumed that teachers make strong role models. This is not always the case; as noted in his letter to the editor of JOPERD, Evans (2004) stated, “Far too many physical educators practice the philosophy of “do as I say, not as I do.” Becoming strong role models for both physical activity and learning (in general) is a must! It also turns future professionals into GREAT practicing teachers. An enthusiasm for learning is one of the most critical role model attributes GREAT teachers can develop. When their professors do not adequately answer a question, future GREAT teaching professionals should seek out other guidance. If GREAT teachers begin to critically examine how they were taught (and are taught), then they may want to learn how to more effectively teach their students. When young children see their teachers wanting to learn, students want to learn as well. When GREAT teachers express an enthusiasm for learning, students are impacted for life!

**Attitude is Everything – Positivity Breeds Success**

Some argue that an attitude sets the tone for how people view their day. It is simple to see that a teacher’s attitude sets the tone for the learning environment. Although physical educators cannot seem to agree on whether or not student attitudes should be a part of grading, it is clear that many teachers do believe that attitude should be considered when grading students (Issues, 2002). Interestingly, the attitudes that really need to be measured are the attitudes of the teachers that are leading students in a lifelong quest for learning. GREAT teachers demonstrate a positive attitude; it is a choice! Future professionals must develop this attitude before they enter the workforce. Young professionals are sometimes bombarded with closed-minded veteran teachers, angry parents who dislike everything the school does, and frustrated peer students who are sadly unaccustomed to a teacher giving them a positive experience. The only limitation to a teacher’s positivity is the choice to not be positive. When people are positive, their day goes better. They learn more; they laugh more; they love more. This creates an environment where students want to learn more. If GREAT teachers go into the schools with the ability to create an atmosphere where students want to learn, they can positively impact an entire community.
Take Charge of Learning – TEACH!

The main reason learning does not occur is because many teachers no longer teach! Too many teachers have become facilitators of movement activity, providing activities with minimal or no teaching at all; they shuffle students in and out of the gymnasium with little concern for learning. Martin (2004) claimed that, “Highly effective physical educators teach well…. because they are committed to their values and principles” (p.48). Bottom line, GREAT teachers teach! Learning requires a purpose. The purpose requires a plan. Planning requires work. Whatever happened to teachers selecting an objective, developing plans for students to reach that objective, and then assessing students to ensure that the objective has been reached? This is not rocket science! GREAT teachers must be “take charge” kind of people—educators who do not succumb to letting standards falter by the wayside. GREAT teachers demand that their students learn. This places a strong responsibility on the teacher to teach! Too many future professionals have come out of programs where they played the entire class period, never learned new skills, did not experience adequate skill testing, and learning did not occur. GREAT teachers are not recreation leaders…they are teachers! They must WANT to teach!

Conclusion

“Dare to be Great” is a phrase that has become quite common in society. As a matter of fact, an internet search of that phrase produces over 20 million results! This article suggests that teachers can learn to be GREAT. Can students in physical education teacher education programs believe the claim, “All teachers can be GREAT”? GREAT teachers possess ten (actually more) attributes that lead to quality programs and learning. GREAT teachers grow personally and professionally; they develop relationships based on compassion; they understand that quality may not always appear to be fair; they align their programs with purpose; and, they provide real value for their communities. In addition, GREAT teachers have a goal-oriented approach to assessment; they reinvest in their profession; they demonstrate a life-long enthusiasm for learning; they exude a positive attitude; and, they take charge of learning by TEACHING!

GREAT teachers demonstrate true success in the educational system. Hopefully, though, the real success of this article is that those reading it are able to assess their own personal GREATness as they consider how to instill GREATness into our future professionals. As strong physical education teacher educators in higher education develop their own ways to be GREAT, they provide a challenge for their students to accept the dare to be GREAT.
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Evaluation of the NFL-225 Test for Predicting One Repetition Maximum Bench Press in Small-College Football Players

Jerry L. Mayhew, Scott Srnka, Charles Getty, Andy Ball, and Jeff Jacques

The purpose of this study was to evaluate the predictive potential of NFL-225 equations to estimate one-repetition maximum (1-RM) bench press in small-college football players. Players (n = 130) from three colleges with enrollments of less than 1,800 students volunteered to be evaluated at the conclusion of their off-season heavy-resistance training programs. Within 3-5 days before or after 1-RM testing, players performed as many repetitions as possible with an absolute load of 225 lbs. Six, previously developed NFL-225 prediction equations had high correlations between predicted and actual 1-RM values (ICC > 0.95) but overpredicted by an average of 1.3 to 4.2%. Success of the NFL-225 test in small-college players for predicting may depend on the desired application by the strength and conditioning specialist.

The one-repetition maximum (1-RM) bench press technique has been accepted as the major measure of choice when evaluating the upper body strength of football players at all levels of competition. This technique requires the individual to lift the most weight possible in a single, maximal effort. Some teams have adopted an absolute-load, maximal-repetition approach as their primary measure of upper body strength, with the NFL-225 test receiving the most attention. This test requires a player to perform as many repetitions as possible in the bench press with an absolute load of 225 lbs until fatigue halts the test. The vast majority of prospective NFL players attending the National Football League combine, the testing program for players to showcase their physical talent, come from the NCAA Division I and IAA levels, with only a small proportion coming from the Division II and III levels (McKee &
Burkett, 2003). Although the players at the Division III level are typically smaller in size and possess less proficient physical performance abilities than players from larger institutions (Fry & Kraemer, 1991; Garstecki, Latin & Cuppert, 2004), many of these institutions may employ the NFL-225 test as a primary measure of strength in their players. Since there may be moderate correlations ($r = -0.31$ to $0.61$) among body mass, lifting repetitions, and 1-RM (Whisenant et al., 2003; Mayhew et al., 2004), the NFL-225 test may not function well as a predictor of maximal bench press strength due to the smaller size of small-college players. It would be useful to coaches, strength and conditioning specialists, and players at smaller colleges to determine the efficacy of predicting maximal strength using NFL-225 equations generated from data collected on larger players who compete at higher NCAA levels. Therefore, the purpose of this study was to determine the accuracy of six existing NFL-225 equations for predicting 1-RM bench press performance in small-college football players.

**Methods**

Small-college football players ($n = 134$) from three colleges with enrollments of less than 1,800 students volunteered to participate (Table 1). Players from the different schools did not differ significantly ($p > 0.05$) in measures of age, height, weight, 1-RM, or muscular endurance repetitions. Each player had undergone a minimum of 10 weeks of heavy-resistance training during their off-season winter conditioning program and had experience with the bench press as a major training exercise. Players were measured the week following the last workout of a periodization cycle to allow sufficient recovery to achieve peak performance. Since these tests were part of the routine year-end evaluations, there was a highly competitive atmosphere associated with player performance. Only four players were unable to complete at least one repetition with 225 lbs and hence were excluded from the analysis. The study was approved by each university’s Institutional Review Board, and each player signed a written consent form.

The 1-RM bench press procedure followed a standard “touch-and-go” protocol in which the bar was required to be lowered slowly to touch the chest before being pressed immediately to full arms’ extension. During testing, each player was allowed to warm up according to personal preferences using light weights of approximately 50% to 75% of estimated 1-RM. When testing began, a weight was selected by the player, and one repetition was performed. Following this and subsequent attempts, a minimum of five minutes rest was given between all attempts. Most players ($n = 128$) reached their 1-RM within three to five attempts. Standard Olympic bar and plates were used for all lifts, and the player used a grip that was slightly wider (approximately 15-35 cm) than shoulder width.
Table 1
Physical and Performance Characteristics of Small-College Players (n = 134)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Range</th>
<th>Correlation with 1-RM Bench Press</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>19.9 ± 1.2</td>
<td>18.0 - 24.0</td>
<td>0.14</td>
</tr>
<tr>
<td>Height (in)</td>
<td>71.9 ± 2.5</td>
<td>66.0 – 77.0</td>
<td>0.10</td>
</tr>
<tr>
<td>Body Mass (lbs)</td>
<td>225.5 ± 42.2</td>
<td>150.0 – 366.0</td>
<td>0.52**</td>
</tr>
<tr>
<td>BMI [Wt (kg)/Ht (m²)]</td>
<td>30.7 ± 4.9</td>
<td>21.0 - 49.7</td>
<td>0.56**</td>
</tr>
<tr>
<td>Reps@225 lbs</td>
<td>12.1 ± 5.9</td>
<td>1 - 31</td>
<td>0.91**</td>
</tr>
<tr>
<td>%1-RM</td>
<td>76.4 ± 11.0</td>
<td>52.3 - 100.0</td>
<td>-0.98**</td>
</tr>
<tr>
<td>1-RM/kg</td>
<td>1.33 ± 0.20</td>
<td>1.01 - 1.90</td>
<td>0.21</td>
</tr>
<tr>
<td>1-RM Bench Press (lbs)</td>
<td>301 ± 44</td>
<td>225 – 430</td>
<td></td>
</tr>
</tbody>
</table>

* p<0.05  
** p<0.01

During the week prior to or following the 1-RM testing, each player performed the NFL-225 test by completing as many bench press repetitions as possible with an absolute load of 225 lbs. Following individual warmups, the player grasped the bar at the same position used during the 1-RM procedure. The NFL-225 tests is not performed with an enforced no cadence, but each player was encouraged to maintain a constant pace and was allowed no more than a two-second pause between each repetition. The bar was required to touch the chest on each repetition, but the subject was admonished not to bounce the bar off the chest and to return it to full-arm extension on each repetition. The head, upper back, and buttocks were required to remain in contact with the bench throughout the test. The test was terminated when the subject could not complete a repetition with proper form.

A repeated measures analysis of variance was used to determine the validity of six NFL-225 prediction equations (Table 2) for estimating 1-RM bench press in the combined sample. In addition, the difference between predicted and actual 1-RM values was determined for players who completed ≤10 repetitions with 225 lbs and those who completed >10 repetitions. Intraclass correlation coefficients (ICC) were used to evaluate the agreement between predicted and actual 1-RM performances. Independent t-tests were used to compare separate groups on selected variables.
Table 2
NFL-225 Prediction Equations to Estimate 1RM bench Press in College Football Players

<table>
<thead>
<tr>
<th>Source</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allenheilegen (2003)</td>
<td>1-RM (lbs) = 220.1 + 7.49 Reps@225 lbs</td>
</tr>
<tr>
<td>Chapman et al. (1998)</td>
<td>1-RM (lbs) = 223.1 + 6.67 Reps@225 lbs</td>
</tr>
<tr>
<td>Mayhew et al. (1999)</td>
<td>1-RM (lbs) = 226.7 + 7.1 Reps@225 lbs</td>
</tr>
<tr>
<td>Mayhew et al. (2002)</td>
<td>1-RM (lbs) = 225.4 + 7.14 Reps@225 lbs</td>
</tr>
<tr>
<td>Mayhew et al. (2004)</td>
<td>1-RM (lbs) = 221.7 + 7.11 Reps@225 lbs</td>
</tr>
<tr>
<td>Slovak et al. (1999)</td>
<td>1-RM (lbs) = 221.8 + 7.17 Reps@225 lbs</td>
</tr>
</tbody>
</table>

Results

The six NFL-225 equations from the literature produced predicted 1-RM values that were highly correlated ($p<0.01$) with actual 1-RM performances (Table 3) but significantly overpredicted 1-RM bench press by 1.3% to 4.2% ($SD = 5.8\%$ to $6.1\%$). The Chapman et al. equation (1998) produced the highest percent of players with predicted 1-RM values within ±10 lbs (3% error) of their actual 1-RM. It also had the smallest total error value (Table 3).

Previous studies have indicated that prediction of the 1-RM was better when 10 repetitions or fewer were completed with the NFL-225 test (Mayhew et al., 1999, Slovak et al., 1999; Mayhew et al., 2002; Mayhew et al., 2004). The same principle was noted in the current study (Table 4). Although the correlations between predicted and actual 1-RM were slightly lower for the ≤10 repetition group, a substantially greater percentage of them had a difference between predicted and actual 1-RM of less than ±10 lbs compared to the >10 repetition group. Further analysis indicated that 23 players were underpredicted by more than 10 lbs and 45 players were overpredicted by more than 10 lbs. Comparisons between these two groups indicated significant differences in body mass, 1-RM bench press, and the %1-RM represented by the 225-lb repetition weight (Table 5).

Because all of the previously developed NFL-225 prediction equations overpredicted the 1-RM bench press in these players, a new equation for use on small-college players was generated. This equation used repetitions with 225 lbs to predict 1-RM bench press, producing a correlation of $r = 0.91$ and a standard error of estimate of ±18.5 lbs (Figure 1). The standard error of estimate for players completing ≤10 repetition with 225 lbs was ±15 lbs, while standard error of estimate for players completing >10 repetition was ±20 lbs. The new equation was:

$$1\text{-RM (lbs)} = 219.3 + 6.75 \text{Reps@225}$$

Eq 1
Table 3
Accuracy of NFL-225 Prediction Equations to Estimate 1-RM Bench Press for Small-College Football Players (n = 130)

<table>
<thead>
<tr>
<th>Source</th>
<th>Predicted Mean ± SD</th>
<th>Constant Error Mean ± SD</th>
<th>% within Mean ± SD</th>
<th>TE b</th>
<th>ICC c</th>
<th>±10 lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allenbeilegen</td>
<td>311 ± 44*</td>
<td>10 ± 19</td>
<td>21</td>
<td>0.953**</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Chapman et al.</td>
<td>304 ± 40*</td>
<td>3 ± 18</td>
<td>19</td>
<td>0.950**</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Mayhew et al.</td>
<td>313 ± 42*</td>
<td>12 ± 18</td>
<td>22</td>
<td>0.950**</td>
<td>39</td>
<td></td>
</tr>
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<td>Mayhew et al.</td>
<td>312 ± 43*</td>
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<td>0.952**</td>
<td>40</td>
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<td>0.953**</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Actual 1-RM</td>
<td>301 ± 44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Constant Error = Predicted 1-RM (lbs) – Actual 1-RM (lbs)

bTotal error (TE = \sqrt{\Sigma([\text{predicted} – \text{actual}]^2 / n)})

cIntraclass Correlation Coefficient between predicted and actual 1-RM

*Significantly different from actual 1-RM (p<0.05).

**p<0.01

Figure 1
Relationship between repetitions with 225 lbs and 1-RM bench press in small-college football players (n = 130).
Table 4
Accuracy of NFL-225 Prediction Equations by Repetition Group for Small-College Football Players (n = 130)

<table>
<thead>
<tr>
<th>Equation</th>
<th>&lt;= 10 Reps@225 lbs (n=48)</th>
<th>&gt;10 Reps@225 lbs (n=82)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>ICC</td>
</tr>
<tr>
<td></td>
<td>±10 lbs</td>
<td></td>
</tr>
<tr>
<td>Allenheilegen</td>
<td>266 ± 21</td>
<td>0.893**</td>
</tr>
<tr>
<td>Chapman et al.</td>
<td>264 ± 18</td>
<td>0.874**</td>
</tr>
<tr>
<td>Mayhew et al.</td>
<td>270 ± 20*</td>
<td>0.885**</td>
</tr>
<tr>
<td>Mayhew et al.</td>
<td>269 ± 20*</td>
<td>0.885**</td>
</tr>
<tr>
<td>Mayhew et al.</td>
<td>265 ± 20</td>
<td>0.885**</td>
</tr>
<tr>
<td>Slovak et al.</td>
<td>266 ± 20</td>
<td>0.886**</td>
</tr>
<tr>
<td>Actual 1-RM</td>
<td>262 ± 27</td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05.
**p<0.01

Table 5
Comparison of Physical Characteristics of Players Underpredicted by >10 lbs and Overpredicted by >10 lbs in the NFL-225 Test (n = 68)

<table>
<thead>
<tr>
<th>Equation</th>
<th>Overpredicted (n=23)</th>
<th>Underpredicted (n=45)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Range</td>
</tr>
<tr>
<td>Height (ins)</td>
<td>71.9 ± 2.5</td>
<td>67 - 77</td>
</tr>
<tr>
<td>Body Mass (lbs)</td>
<td>250 ± 53</td>
<td>178 - 366</td>
</tr>
<tr>
<td>1-RM Bench Press (lbs)</td>
<td>262 ± 27</td>
<td>265 - 430</td>
</tr>
<tr>
<td>Repetitions@225 lbs</td>
<td>13.9 ± 6.2</td>
<td>4 - 25</td>
</tr>
<tr>
<td>%1-RM (225/1-RM)</td>
<td>67.2 ± 9.1</td>
<td>52 - 85</td>
</tr>
<tr>
<td>%BM for 225 lbs*</td>
<td>93 ± 19</td>
<td>61 - 127</td>
</tr>
</tbody>
</table>

*Body mass/225 x 100.
**p<0.01
Discussion

The players in the current sample had 1-RM bench press values slightly above average for Division III performers. According to the normative data provided by Fry and Kraemer (1991), the current sample had an average bench press ranking at the 60th percentile (range = 13th-100th percentile). With such a wide range of scores, it seems reasonable to assume that these data were representative of players at the small-college competitive level.

All of the equations previously developed to predict 1-RM performance from the NFL-225 test significantly overestimated the average 1-RM bench press in the current sample of small-college players (Table 3). Those equations were developed on Division I, IAA, and II players (Table 2) and have slopes for the regression lines of 1-RM on repetitions that were generally steeper than for the current sample. Of the currently available equations, the Chapman et al. equation (1998) may have worked as well as it did for this sample because the slope of the prediction equation (slope = 6.67) was closer to that found in the current players (slope = 6.75). This indicated that for every repetition performed in the NFL-225 test, 6.75 lbs should be added to the basic weight (i.e., 225 lbs) to determine maximal performance (Figure 1).

Previous studies have indicated that the prediction error increases when a player performs more than 10 repetitions in the NFL-225 test (Mayhew et al., 1999, Slovak et al., 1999; Mayhew et al., 2002; Mayhew et al., 2004). The current study supported that principle, noting that the average difference between predicted and actual 1-RM bench press ranged from 7 to 18 lbs, depending on the prediction equation, when ≤10 repetitions were completed with the NFL-225 test. The average difference increased to 19 to 30 lbs when more than 10 repetitions were performed. The same pattern was present for the new equation, with the difference between predicted and actual 1-RM being smaller when ≤10 repetitions were performed (-1.4 ± 15.5 lbs) than when more than 10 repetitions were performed (0.7 ± 20.0 lbs).

It was interesting to note that simple body size variables, such as body mass and BMI (Table 1), or combination variables produced from simple variables (e.g., LBM/Ht), made only slight improvements (<3%) to the variance accounted for in the prediction equations to estimate 1-RM in these players. The lack of contribution of size variables agreed with recent work on Division II players in which body composition and structural variables did not enhance the prediction accuracy of maximal strength beyond that achieved by the NFL-225 repetitions alone (Mayhew et al., 2004). Since the addition of these variables did not increase the variance accounted for substantially (ΔR²<0.02) nor reduce the SEE markedly (<1.0 lbs), the decision to include them in any prediction equation appears more academic than practical.

The difference in accuracy among the prediction equations (Table 3) might be explained by differences in training programs or muscle fiber type. Most football resistance programs now follow a periodization model consisting
of a hypertrophy phase, a strength phase, and a power phase. Fry et al. (2003) have shown that powerlifters who perform resistance routines similar to football players have a higher percentage of type IIa muscle fibers and a lower percentage of type IIb fibers, offering them greater power capability than endurance. To our knowledge, no biopsy studies on relevant muscles have been done on college football players; hence, we can only speculate that those players who were able to perform more repetitions with an absolute load have a greater proportion of type IIa muscle fibers. Thus, those players with more type IIa fibers might be expected to underpredict their 1-RM, while those players with more type IIb fibers might be expected to be overpredicted. In addition, resistance programs that use a heavy-weight, low-repetition format might tend to reduce the potential for improvements in muscle work capacity represented by repetitions (Goto et al., 2004; Brechue & Mayhew, 2009).

Several studies have stated that starting players at several positions have significantly higher 1-RM bench press values than nonstarters (Black & Roundy, 1994; Sawyer et al., 2002), while one study noted that 1-RM bench press was a major factor predicting football playing ability (as assessed by coaches’ ranking) only for offensive linemen (Sawyer et al., 2002). Thus, it is possible that the bench press may be underrated as an evaluation of football performance ability or player potential. Further investigation might be needed to isolate those tests which provide more descriptive evidence of football ability as judged by coaches’ evaluations or game performance.

Proponents of the 1-RM technique point to the very low injury rate when using this procedure (Risser, Risser & Preston, 1990; Mazur, Yetman & Risser, 1993) and conclude that it is the only true way to assess current strength performance (Bompa & Cornacchia, 1998). Opponents indicate that the 1-RM procedure requires excess time for evaluation, and other sources note that it may be subject to motivational variations (Zatasorsky, 1995; Giebring, 2005). Overlaying the arguments concerning the best approach to assess muscle performance is the fact that many laboratory tests may not predict sports performance skills with a high degree of accuracy (Seiler et al., 1990; Miller et al., 2002). In the current study, Therefore, the discussion over whether to use the 1-RM procedure or a multi-repetition submaximal procedure to evaluate muscular performance in football players is likely to continue.

**References**


Conditioning Research, 16, 44-49.

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**ANDY BALL** was an assistant football coach at Culver-Stockton College, Canton, MO, at the time of the study. He is currently an assistant coach at the Missouri University of Science and Technology in Rolla, MO.

**JEFF JACQUES** was an assistant football coach and the strength and conditioning coach for Truman State University at the time of the study. He is currently the assistant principal at Kirksville High School.
The purpose of this study was to determine the degree of weight gain that might be expected if college students engaged in a structured exercise program during their first semester. A random sample of first-time college men (n = 346) and women (n = 509) were selected from a required fitness class and stratified by gender and Body Mass Index (BMI). They were measured for height, weight, and gender-specific skinfolds before and after participating in fitness activities 3 days/wk for 12 wks. Results indicated that underweight individuals tended to gain weight while overweight and obese individuals tended to lose weight. The average weight gain was 0.9 kg (±2.4 kg). There was no significant difference between the genders in body composition change. Regular physical activity may be a viable means of restricting the typical weight gain of college freshman.

In the past 20 years, the obesity epidemic in the United States has continued to increase (Mokdad, Bowman, Ford, Vinicor, Marks, & Koplan, 2001; Flegal, Carroll, Ogden, & Johnson, 2002; Wyatt, Winters & Dubbert, 2006). The negative health consequences of this disorder are having a major impact on the economics of health care and could undermine the way future generations are treated medically (Colditz, 1999; Finkelstein, Ruhm, & Kosa, 2005). The alarming statistics confirm the need to address this epidemic prior to its manifestation.

Obesity has many causes, including decreased physical activity, increased food portion sizes, inappropriate knowledge about nutrition, and lack of sleep (Hill & Melanson, 1999; Martinez, 2000). The significant decrease in physical activity over the past 20 years is one of the biggest contributors to the weight gain. The freshman college year is an especially susceptible period for major weight gain (Anderson, Shapiro, & Lundgren, 2003; Racette, Deusinger, Strube, Highstein, & Deusinger, 2005). The new-generation teenager may
become even less active in college due to the increased academic load and stress level (Economos, Hildebrandt & Hyatt, 2008; Pullman, Masters, Zalot, Carde, Saraiva, Dam et al., 2009). The increase in the sedentary lifestyle of college students may instill a life-long predisposition to low-calorie activity levels and increase the chances of young adults becoming obese (Levitsky, Halbmaier & Mrdjenovic, 2004).

Weight gain and obesity may be prevented simply by a balance of calorie intake with calories expended. Studies have shown that college freshman may gain a significant amount of weight because of over-nutrition and under-activity patterns accentuated by their new lifestyle (Butler, Black, Blue, & Gretebeck, 2004; Jung, Bray, & C"{i}nis, 2008; Pullman et al., 2009). It has long been assumed that the average weight gain among college freshman is approximately 15 pounds. However, recent studies have shown this value to be an over-estimation and have shown the gain to be more around 3-9 pounds (Anderson, Levitsky, & Lowe, 2003; Anderson, Sharp, & Lundgren, 2003; Racette et al., 2005; Hajhosseini, Holmes, Mohamadi, Goudarzi, McPoud, & Hollenbeck, 2006). While these values do not seem extraordinary, they may indicate a pattern that could result in as much as a 20-to-30 pound gain over a college career. Since a modest amount of physical activity has been shown to prevent excessive weight gain (Fogelholm & Kukkonen-Harjula, 2000), our purpose was to determine the degree of weight gain that might be expected if college students engaged in a structured exercise program during their first semester.

**Methods**

A random sample of first-time college men (n = 346) and women (n = 509) were collected over two successive years from a required fitness class at a small Midwestern university. The subjects were stratified by gender and Body Mass Index (BMI). BMI groups include underweight (BMI ≤18.5 kg/m^2), normal (BMI>18.5 and <25 kg/m^2), overweight (BMI≥25 and <30 kg/m^2), and obese (BMI≥30 kg/m^2)(Seidell, 1996). The study was approved by the Institutional Review Board at Truman State University, and subjects provided signed consent to participate.

Measurements for body composition were taken during the 1st and 12th weeks of the semester. These measurements included height, weight, and gender-specific skinfolds. Skinfold measurements were taken at the chest, abdomen, and thigh sites in men, and the triceps, suprailiac, and thigh sites in women. Three measurements were taken at each site, and the average at each site was summed to estimate body density from the Jackson-Pollock equations (Jackson & Pollock, 1978; Jackson, Pollock, & Ward, 1980). The same tester performed all skinfold measurements and had reliability coefficients of greater than 0.95 (Bird, Mayhew, Schwengler, Crossgrove, Etemady, & Peterson, 2009) for all measurements. Density was converted to percent body fat (%fat) using the Siri equation. This allowed the estimate of fat mass (FM)
from: Body Mass $\times \%\text{fat}/100$. Lean body Mass (LBM) was then estimated from: Body Mass – FM. Initial demographics are shown in Table 1.

During the semester, students participated in three 40-minute sessions of aerobic or resistance training each week. The total caloric expenditure for these training sessions was estimated to range from 800-1700 Kcal/week depending on the activity chosen by the participate.

Results

A multivariate analysis of variance (MANOVA) evaluated the changes in body mass, LBM, FM, and $\%\text{fat}$ made by the genders and BMI groups. None of the body composition changes were significantly different between the genders. The underweight and normal weight groups made significant gains ($p<0.01$) in body mass compared to the overweight group, while the obese group had a significant reductions (Figure 1). The underweight and normal weight groups made significant gains in LBM while the overweight and obese groups did not change significantly. None of the changes in FM were significantly different among the BMI groups. None of the gender by BMI group interactions was significant ($p>0.25$).

When the body composition changes were considered as percent differences, many of the patterns were similar to the absolute changes. None of the percent body composition changes was significantly different between the genders. The underweight and normal weight groups made 2-3% gains in body mass mediated largely by gains in FM (5-10%), while the obese group lost body mass (1%) by reductions in LBM (1%) and FM (0.5%). The overweight group remained practically the same (0.1-0.2%) in all measures.

Discussion

This large scale study indicated that a modest amount of physical activity may retard the freshman weight gain shown in recent studies. The changes were selectively positive for the BMI groups, with the underweight individuals gaining LBM and the obese group losing FM. The net change for all subjects was a 0.9-kg gain in body mass that was composed of a 0.6-kg gain in LBM and a 0.3-kg gain in FM. Hajhosseini et al. (2006) found no significant change in caloric intake during the first semester in a small sample of first-year students. In addition, they observed only a slight reduction in the resting metabolic rate but noted that the change would have been sufficient to account for the average 3-lb gain (1.4 kg) made by their subjects. The gain by their subjects was sufficient to increase the BMI from an average of 23.5 to 24.1 kg/m$^2$ and to cause 7% of their subjects to move from the normal category to the overweight category. In the current study, the average percent of men and women shifting from normal to overweight was approximately the same as shown by Hajhosseini et al. (2006). Furthermore, a substantial percent of those in the overweight and obese categories shifted
Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Women (n = 509)</th>
<th>Men (n = 346)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Underweight</td>
<td>Normal</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>18.7 ± 0.6</td>
<td>18.8 ± 0.6</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>168.0 ± 5.7</td>
<td>165.0 ± 6.0</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>49.9 ± 4.4</td>
<td>58.5 ± 6.4</td>
</tr>
<tr>
<td>LBM (kg)</td>
<td>41.4 ± 3.1</td>
<td>40.9 ± 2.9</td>
</tr>
<tr>
<td>FM (kg)</td>
<td>8.6 ± 2.0</td>
<td>8.5 ± 2.0</td>
</tr>
<tr>
<td>%Fat</td>
<td>16.9 ± 3.0</td>
<td>21.8 ± 4.0</td>
</tr>
</tbody>
</table>

Legend: LBM = Lean Body Mass, FM = Fat Mass
down one weight category (Table 2).

It is difficult to state definitely that the involvement in the physical activity classes was the primary reason many of the students maintained their weight within ±1 kg (men = 32%, women = 39%). However, since Hajhosseini et al. (2006) noted that the 55 Kcal difference between the decrease in resting metabolic rate and daily caloric intake could account for the 3-lb gain of their subjects, we can speculate that the average caloric expenditure of our exercise sessions (1,200 Kcal/week) would have more than offset the suspected caloric gain students at this university experienced. Furthermore, it is well known that metabolic rate remains elevated for a substantial time following physical activity (Melby, Scholl, Edwards, & Bullough, 1993).

A major factor that has not been explored extensively is the degree of change in the diet when an individual moves from the home environment to college cafeteria plan. Like many college food plans, our university provides a buffet-style cafeteria organization. Recent evidence supports the concept that when more food is presented, individuals tend to eat larger portions (Levitsky & Youn, 2004). Diet recall surveys are tenuous at best due to the inexperience of the subjects in estimating portion size (Klesges, Eck, & Ray, 1995), but it is safe to say that a daily buffet-style food service provides ample opportunity to overeat and gain weight (Pliner & Saunders, 2008). On-campus residents, especially those who profess to be in some phase of “dieting,” tend to gain more weight in their first year, sometimes as much as 9-11 lbs (Lowe, Annunziato, Markowitz, Didie, Bellace, Riddell, et al., 2006; Pliner & Saunders, 2008). Furthermore, a great many of the students may eat too much fast-food and/or high-fat foods (Racette et al., 2005). Recent evidence supports the benefits of providing nutritional information and guidelines to new college students for maintaining body mass (Matvienko, Lewis & Schafer, 2001). Since the current subjects were also involved in a wellness instructional portion of the course where a healthy diet was discussed in conjunction with the benefits of physical activity, it is possible that those who maintained their weight and those who lost weight combined the caloric expenditure of the exercise with better food selection to moderate the weight gain.

Most of the attention of the weight gain for college students has focused on the freshman year with little regard for subsequent years. Recently, evidence has suggested that weight gains may continue beyond the first year (Racette et al., 2005; Lloyd-Richardson, Bailey, Fava, & Wing, 2009). These studies show large portions (as much as 70%) of freshmen may have gained an average of 9 lbs by the end of their sophomore year. Despite the average age of freshman and sophomores being below the legal age for alcohol consumption, evidence indicates that a significant amount of calories could come from alcoholic beverages (Butler et al., 2004; Hoffman, Polocastro, Quick, & Lee, 2006; Economos, Hildebrandt, & Hyatt, 2008).

The tendency over a lifespan for most individuals is to slowly gain weight and increase BMI (Li, Hardy, Kuh, Conte, & Power, 2008). If this process is
accelerated during the college years, it places the individual at greater risk of developing debilitating chronic diseases. On the other hand, if individuals could maintain their weight during the early adult years and develop more active lifestyles, it might slow the lifespan weight gain (Williamson, Kahn, Remington & Anda, 1990), which could reduce the likelihood of serious illness and begin to curb the rising cost of medical care. Central to this process may be a well-designed, up-to-date, relevant wellness course during the college freshman year.

Table 2

Percent of Subjects Who Changed BMI Category Stratified by Gender and Starting BMI Category

<table>
<thead>
<tr>
<th>Category Shift</th>
<th>Underweight (≤18.5 kg/m²)</th>
<th>Normal (&gt;18.5 and &lt;25.0 kg/m²)</th>
<th>Overweight (≥25.0 and &lt;30.0 kg/m²)</th>
<th>Obese (≥30.0 kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men (n = 346)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Same</td>
<td>47</td>
<td>90</td>
<td>89</td>
<td>77</td>
</tr>
<tr>
<td>Up</td>
<td>53</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Women (n = 506)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>Same</td>
<td>64</td>
<td>95</td>
<td>90</td>
<td>75</td>
</tr>
<tr>
<td>Up</td>
<td>36</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

References


Figure 1. Comparison of changes in body mass, lean body mass, and fat mass by BMI group for men (top) and women (bottom) during their initial semester of college.


Flegal, K. M., Carroll, M. D., Ogden, C. L., & Johnson, C. L. (2002). Prevalence


Levitsky, D. A., & Youn, T. (2004). The more food young adults are served, the more they overeat. *Journal of Nutrition*, 134, 2546-2549.


Matvienko, O., Lewis, D. S., & Schafer, E. (2001). A college nutrition science course as an intervention to prevent weight gain in female college


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Superintendents’ Perceptions of Physical Education and the NASPE Standards

Ken D. Bias

The current study was designed to investigate superintendent perceptions about their school district’s physical education programs in relation to standards set by the National Association of Sport and Physical Education (NASPE). A total of 115 superintendents representing school districts from within the Central District Region of the American Alliance of Health, Physical Education, Recreation and Dance took the survey. Data were gathered on-line. Results revealed that the majority of public school superintendents perceived their school district’s physical education program as meeting the standards recommended by NASPE.

Over the last four decades a wealth of information has been produced concerning the value of physical activity (Corbin, 2002). Although we are aware of the value of physical activity, we are constantly challenged as physical educators to provide a quality, standards-based program for all students (Housner et al., 2008). Thus, increasing the physical activity level of all individuals is a nationwide concern for promoting and developing a healthier lifestyle (Scruggs, Beveridge & Watson, 2003). Many understand how increased activity improves an individual’s ability to live a healthy active lifestyle. However, individuals within the United States are becoming more inactive and obese every year. According to Keith et al. (2006), the occurrence of obesity in the United States has been escalating for over a century with noticeable acceleration occurring in the past three decades. Additionally, Lobstein, Baur, and Uauy (2004), claimed that over ten percent of students are estimated to carry excess body fat.

Quality physical education programs are able to promote physical activity and develop the skills needed to encourage lifestyle changes. Furthermore, quality physical education may influence the health and well-being of all individuals across their life span (Lambert, 2000). Consequently, quality physical education is one of the few fields of study which advocates a holistic
approach to an individual’s growth and development. Quality physical educators emphasize the importance of promoting the development of the body and mind simultaneously (Sibley & Etnier, 2003).

According to Irwin and Irwin (2004), it is important for all public school administrators to develop a better understanding of what constitutes a quality physical education program. Tozer and Horsley (2006) argued that national guideline standards for Math, Science and Communication Arts in the United States have resulted in physical education being eliminated or considered dispensable within many public school systems. Since most students attend public schools, Pangrazi, Beighle, Vehige and Vack (2003) stated the importance of promoting physical education in the public school system, and school administrators should accept responsibility in promoting physical activity in children beyond just the standard recess time.

Dale, Corbin, and Dale (2000) discussed the set of national standards developed by the National Association for Sport and Physical Education (NASPE) has developed a basic set of national standards for all students who are participating in physical education programs. These standards have become the basic guiding principles for all universities and colleges to prepare future physical educators. The American Alliance of Health, Physical Education, Recreation and Dance (AAHPERD) promotes these standards through state and national conferences and workshops.

Castelli and Rink (2003), argue that the focus of education reform should be placed on the NASPE standards and holding individuals accountable to meeting these standards. This standards based reform should emphasize establishing a minimum standard of learning for each individual in the school. Further, Parcel et al. (2008) investigated how school climate affects curricular change. Their findings showed that administrator and teacher attitudes directly affect a school’s ability to make and sustain positive change within the system.

One of the major functions of the educational system is to develop the entire individual. Physical education, along with other disciplines has focused on such interpersonal-development goals as admiration, accountability, teamwork and citizenship. Furthermore, physical education may assist individuals in enhancing cognitive abilities such as critical thinking, problem solving and writing skills. In addition to these shared goals of enhancing cognitive abilities, quality physical education’s unique contribution to education is the development of an individual’s health, fitness and motor skills (Buchanan et al., 2002). However, to achieve these goals and follow the standards set forth by (NASPE), quality physical educators must have the support of their administration. Therefore, it is important to discover how superintendents perceive physical education and the national standards. An understanding of how superintendents perceive the NASPE standards and their own physical education programs, will allow members of AAHPERD to focus their educational efforts in promoting quality physical education.

The purpose of this study was to determine how public school
superintendents perceive their school district’s physical education programs in relation to the national standards set by the National Association for Sport and Physical Education (NASPE). The NASPE standards were intended to provide physical education teachers with content and performance standards which provide direction and accountability for all physical educators. With the growing concern over the quality of teaching in all subjects and school reform, Deal, Jenkins, Byra and Gates (2002) believed national physical education standards allow for an increased level of accountability.

Methods

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

The use of a descriptive research design helped minimize the threats to internal and external validity of the study. The researcher is aware of uncontrolled extraneous variables which may affect survey responses, such as the superintendents’ educational backgrounds or regional philosophies towards movement and physical activity. Knowledge of these possible complications allowed the researcher to report participant’s perceptions. The study was approved by the University Institutional Review Board and all participants consented to the study by submission of their responses.

Participants

A random sample of 2,835 public school superintendents across the United States was asked to participate in this study. A total of 322 (11.4%) chose to participate. Of those, 115 were from states in the Central District of AAHPERD: 4 from Colorado, 6 from Iowa, 5 from Kansas, 14 from Minnesota, 74 from Missouri, 8 from Nebraska, 2 from South Dakota, and 2 from Wyoming. No superintendents from North Dakota participated.

Instrument

Through the use of the national standards designed by NASPE, 30 items were created to measure public school superintendents’ perception of their school district’s physical education program in relation to the national standards.

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

Scoring. Each item on the survey was rated by the public school superintendent using a Likert scale ranging from 1 for strongly disagree to 5 for strongly agree. Frequency data are reported here.

Data Analysis

The analysis of the survey responses was divided into two parts. The first part obtained a profile of school district size. The second part used descriptive statistics to describe the perceptions of superintendents toward their physical education programs.

Results

Responses to the question about school size are summarized in Table 1. The largest cluster of public school superintendents reported their school district’s size as being 1,000 or less students. The second largest cluster reported their school district’s size as being 1,001 to 5000 students.

Table 1
Frequency Distributions District Size

<table>
<thead>
<tr>
<th>District Size</th>
<th>1,000 or Less</th>
<th>1,001 to 5,000</th>
<th>5,001 to 10,000</th>
<th>10,001 to 15,000</th>
<th>15,001 or More</th>
<th>No. of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>51 (44.3%)</td>
<td>44 (38.2%)</td>
<td>10 (8.6%)</td>
<td>6 (5.2%)</td>
<td>4 (3.4%)</td>
<td>115</td>
</tr>
</tbody>
</table>

The public school superintendents were responding to a set of three items each dealing with one of NASPE’s six standards. Tables 2 and 3 represent the frequency analysis of these responses.

Responses to each of the three items represented in Table 2, Standard 1 indicate how the public school superintendents perceive their school district’s physical education program. All three statements had the largest response rate as “Agree”: Item 4, “our students at all levels are taught to develop motor skills and movement patterns during physical education class” (n= 87, 75.6%); Item 14, “our physical education program focuses on developing motor and movement skills needed to perform a variety of physical activities” (n= 87, 75.6%); and Item 24, “competency in movement skills is a major component to our district’s physical education curriculum” (n= 76, 66.1%). The combined score of the three statements produced a response rate of 72.8% for “Agree” and 9.6% for “Strongly Agree”. A total of 82.5% of the responses were “Agree” or “Strongly Agree”.

Superintendents’ Perceptions/Bias
Table 2
Superintendent Responses Regarding Standards 1, 2, and 3

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>No. Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 4</td>
<td>1 (0.8%)</td>
<td>8 (6.9%)</td>
<td>7 (6.0%)</td>
<td>87 (75.6%)</td>
<td>12 (10.4%)</td>
<td>115</td>
</tr>
<tr>
<td>Item 14</td>
<td>0</td>
<td>4 (3.4%)</td>
<td>9 (7.8%)</td>
<td>87 (75.6%)</td>
<td>13 (11.3%)</td>
<td>113</td>
</tr>
<tr>
<td>Item 24</td>
<td>0</td>
<td>5 (4.3%)</td>
<td>26 (22.6%)</td>
<td>76 (66.1%)</td>
<td>8 (6.9%)</td>
<td>115</td>
</tr>
<tr>
<td>Total</td>
<td>1 (0.2%)</td>
<td>17 (4.9%)</td>
<td>42 (12.2%)</td>
<td>250 (72.8%)</td>
<td>33 (9.6%)</td>
<td>115</td>
</tr>
</tbody>
</table>

NASPE Standard number 1: Demonstrates competency in motor skills and movement patterns needed to perform a variety of physical activities

<table>
<thead>
<tr>
<th>Item</th>
<th>No. Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 7</td>
<td>113</td>
</tr>
<tr>
<td>Item 17</td>
<td>113</td>
</tr>
<tr>
<td>Item 27</td>
<td>114</td>
</tr>
<tr>
<td>Total</td>
<td>28 (8.2%)</td>
</tr>
</tbody>
</table>

NASPE Standard number 2: Demonstrates understanding of movement concepts, principles, strategies, and tactics as they apply to the learning and performance of physical activities

<table>
<thead>
<tr>
<th>Item</th>
<th>No. Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 9</td>
<td>115</td>
</tr>
<tr>
<td>Item 20</td>
<td>115</td>
</tr>
<tr>
<td>Item 29</td>
<td>114</td>
</tr>
<tr>
<td>Total</td>
<td>73 (21.2%)</td>
</tr>
</tbody>
</table>

NASPE Standard number 3: Participates regularly in physical activity

<table>
<thead>
<tr>
<th>Item</th>
<th>No. Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 3</td>
<td>4</td>
</tr>
<tr>
<td>Item 10</td>
<td>4</td>
</tr>
<tr>
<td>Item 28</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>71 (61.7%)</td>
</tr>
</tbody>
</table>

Responses to the three items represented in Table 2, Standard 2 indicate how the school superintendents perceive their school district’s physical education program. All three statements had the largest response rate to “Agree”: Item 7, “our students are taught in physical education class to understand the importance of movement concepts as they apply to physical activities” (n= 72, 63.7%); Item 17, “physical activities taught in our physical education programs promote movement concepts and principles” (n= 87, 76.9%); and Item 27, “our physical education curriculum is designed to teach students the principles and strategies needed to perform physical activities” (n= 93, 81.5%). The combined score of the three statements produced a response rate of 74.1% for “Agree” and 8.26% for “Strongly Agree”.

Responses to each of the three items represented in Table 2, Standard 3 indicate how the superintendents perceive their school district’s physical education program. All three had the largest response rate under the “Agree” category: Item 9, “our students participate in regular daily physical activity”
(n= 54, 46.9%); Item 20, “our district believes it is important to provide students with regular physical activity” (n= 83, 72.1%); and Item 29, “as the superintendent I believe it is important to give all students the opportunity to be physically active on a regular basis” (n= 71, 61.7%).

Responses to each of the three items represented in Table 3, Standard 4 indicate how the superintendents perceive their school district’s physical education program. All three statements had the largest response rate under the “Agree” category: Item 2, “our students are given the opportunity to achieve and maintain a health-enhancing level of physical fitness every day” (n= 70, 60.8%); Item 12, “maintaining students’ health levels is a major priority to our district” (n= 71, 62.2%); and Item 22, “our physical education department incorporates objectives to promote and develop a health-enhancing level of physical fitness in all students” (n= 84, 74.3%). A total of 65.7% of the responses were “Agree”.

Table 3
Superintendents’ Responses Regarding Standards 4, 5, and 6

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree Not Disagree</th>
<th>Agree</th>
<th>Strong Agree</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NASPE Standard number 4: Achieves and maintains a health-enhancing level of physical fitness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 2</td>
<td>3 (2.6%)</td>
<td>16 (13.9%)</td>
<td>15 (13.0%)</td>
<td>70 (60.8%)</td>
<td>11 (9.5%)</td>
<td>115</td>
</tr>
<tr>
<td>Item 12</td>
<td>0</td>
<td>5 (4.3%)</td>
<td>16 (14.0%)</td>
<td>71 (62.2%)</td>
<td>22 (19.2%)</td>
<td>114</td>
</tr>
<tr>
<td>Item 22</td>
<td>0</td>
<td>4 (3.5%)</td>
<td>15 (13.2%)</td>
<td>84 (74.3%)</td>
<td>11 (9.7%)</td>
<td>113</td>
</tr>
<tr>
<td>Total</td>
<td>3 (0.8%)</td>
<td>25 (7.3%)</td>
<td>46 (13.4%)</td>
<td>225 (65.7%)</td>
<td>44 (12.8%)</td>
<td></td>
</tr>
<tr>
<td><strong>NASPE Standard number 5: Exhibits responsible personal and social behavior that respects self and others in physical activity settings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 5</td>
<td>1 (0.8%)</td>
<td>9 (7.8%)</td>
<td>12 (10.4%)</td>
<td>77 (66.9%)</td>
<td>16 (13.9%)</td>
<td>115</td>
</tr>
<tr>
<td>Item 15</td>
<td>0</td>
<td>1 (0.8%)</td>
<td>5 (4.3%)</td>
<td>82 (71.9%)</td>
<td>26 (22.8%)</td>
<td>114</td>
</tr>
<tr>
<td>Item 25</td>
<td>0</td>
<td>4 (3.4%)</td>
<td>14 (12.1%)</td>
<td>82 (71.3%)</td>
<td>15 (13.0%)</td>
<td>115</td>
</tr>
<tr>
<td>Total</td>
<td>1 (0.2%)</td>
<td>14 (4.0%)</td>
<td>31 (9.0%)</td>
<td>241 (70.0%)</td>
<td>57 (16.5%)</td>
<td></td>
</tr>
<tr>
<td><strong>NASPE Standard number 6: Values physical activity for health, enjoyment, challenge, self-expression, and/or social interaction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 10</td>
<td>0</td>
<td>4 (3.4%)</td>
<td>11 (9.5%)</td>
<td>87 (75.6%)</td>
<td>13 (11.3%)</td>
<td>115</td>
</tr>
<tr>
<td>Item 19</td>
<td>0</td>
<td>1 (0.8%)</td>
<td>12 (10.4%)</td>
<td>87 (75.6%)</td>
<td>15 (13.0%)</td>
<td>115</td>
</tr>
<tr>
<td>Item 30</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>73 (64.0%)</td>
<td>41 (35.9%)</td>
<td>114</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>5 (1.4%)</td>
<td>23 (6.6%)</td>
<td>247 (71.8%)</td>
<td>69 (20.0%)</td>
<td></td>
</tr>
</tbody>
</table>
Each of the three items represented in Table 3, Standard 5 indicate how the superintendents perceive their school district’s physical education program. All three items had the largest response rate under the “Agree” category: Item 5, “our school district’s physical education program teaches students to be personally responsible for their personal and social behavior” (n= 77, 66.9%); Item 15, “our students are taught to respect others during physical activity settings” (n= 82, 71.9%); and Items 25, “our physical education curriculum is designed to teach students how to exhibit responsible personal and social behaviors that respect self and others” (n= 82, 71.3%).

Responses to each of the three items in Table 3, Standard 6 indicate how superintendents perceive their school district’s physical education program compared to the recommended standards. All three items had the largest response rate under the “Agree” category: Item 10, “students in our physical education classes are taught the enjoyment, and challenges involved with physical activity” (n= 87, 75.6%); Item 19, “our school district believes it is important promote social interaction through the use of physical activity” (n= 87, 75.6%); and Item 30, “as a superintendent I believe it is important to teach students how to value physical activity for the health benefits, the enjoyment of participation, and the social interaction it provides” (n= 73, 64.0%). A total of 91.9% of responses were “Agree” or “Strongly Agree”.

Discussion

Public school superintendents have the responsibility of overseeing all operations of their school district. It is impossible for superintendents to know everything about each subject area covered in their district’s curriculum. Nevertheless, it is crucial to develop a better understanding of how these individuals, who are in charge of so much, perceive the importance of providing their students with quality physical education. Understanding superintendent perception of their school district physical education program with respect to NASPE standards will allow AAHPERD to better promote the national standards.

Standard Number 1 from NASPE recommends students should be able to demonstrate competency in motor skills and movement patterns needed to perform a variety of physical activities. The data showed all three responses dealing with NASPE standard 1, fell into the categories of “Agree” and “Strongly Agree”. These responses show how the largest portion of public school superintendents in the Central District Region perceive their physical education programs as meeting NASPE Standard 1.

Standard Number 2 from NASPE recommends students should be able to demonstrate understanding of movement concepts, principles, strategies and tactics as they apply to the learning and performance of physical activities. Once again the data collection showed the largest portion of superintendents responding to the survey perceive their district physical education program as meeting NASPE Standard 2, with the most common response falling into
the category of “Agree”.

Standard Number 3 from NASPE recommends students participate regularly in physical activity. The overall combined scores for the three questions in the categories of “Agree” and “Strongly Agree” had a combined score of 81.6%. Statements 20 and 29 were consistent with the largest group of public school superintendents chose “Agree” or “Strongly Agree” as the answer to their perception of their school district’s physical education program compared to NASPE Standard 3. However, statement 9 had a variety of answers chosen as responses. Although responses for 9 “The district’s students participate on a daily basis in physical activity”. The largest portion of respondents to this chose “Agree” (46.9%) not all superintendents believe this statement fit their district. A large number of respondents (n= 39, 33.9%) chose “Disagree” as their response to statement 9, and 3(2.6%) of the superintendents chose response “Strongly Disagree” to statement 9.

Standard Number 4 from NASPE recommends students should be able to achieve and maintain a health-enhancing level of physical fitness. Data collection for NASPE standard 4 showed all responses to the statements in this standard fell into the desired categories as the most common responses fell into the desired categories of “Agree” and “Strongly Agree” with a combined score of (n= 269, 78.6%). These responses show how the largest portion of public school superintendents in Central District perceive their physical education programs as meeting the recommended NASPE standard 4.

Standard Number 5 from NASPE recommends students should be able to exhibit responsible personal and social behavior that respects self and others in physical activity settings. The data received showed the largest portion of superintendents responding to the survey perceive their district’s physical education program as meeting the desired standard recommended by NASPE, with the most common responses falling into the desired categories of “Agree” and “Strongly Agree” with a combined score of (n= 298, 86.6%).

Standard Number 6 from NASPE recommends students should be able to value physical activity for health, enjoyment, challenge, self-expression and or social interaction. The data collection illustrated how the largest segment of superintendents answering the survey perceived their district’s physical education program as meeting the desired standard recommended by NASPE, as the most common responses fell into the desired categories of “Agree” and “Strongly Agree” with a combined score of (n= 316, 91.8%).

According to the responses received, the majority of public school superintendents perceive their school district’s physical education program as meeting the standards recommended by NASPE. Although the majority of the respondents perceived their physical education programs in a positive light, some standards were not perceived as met. Wirszyla (2002) discussed how it is important for school districts to not only follow but to understand the guidelines put in place by the NASPE standards. Results from this investigation support the idea that the largest percentages of public school
superintendents in Central District who responded perceive their school district as following NASPE standards. Trudeau and Shepard (2005) pointed out, however it is vital for public school superintendents to not only perceive their district as providing a quality physical education program, but to assure it.

Weber (2007) discussed how it is crucial for superintendents to make sure their school district’s curriculum focuses on the entire student and not just on specific aspects of a student’s education. This investigation clearly demonstrates how the field of physical education is challenged with educating superintendents about the importance of quality physical education and not the old “roll out the ball” approach.

**Recommendation for Future Studies**

Future research should compare individual school district curricula with national standards to determine how well they actually follow the NASPE Standards. In addition, investigation of superintendent perceptions of their physical education programs when compared to those districts honored by AAHPERD as outstanding programs could provide additional understanding of the importance of promoting these standards to all school districts.

**References**


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The purpose of this study was to determine whether there were statistically significant differences in mental preparation between practice and competition among a group of athletes. Descriptive statistics and paired samples t-tests were employed to analyze data collected from a modified version of the Test of Performance Strategies (TOPS). Descriptive statistics were reported for practice and competition scores in all categories measured. Paired samples t-tests revealed athletes used the psychological skills of relaxation, negative thinking, activation, self-talk and imagery more in competition than in practice. Future research should consider examining how the use of these skills in practice and competition impacts performance. Further study is also needed on the type, quality, and individuality of psychological skills employed by athletes. This study illuminated how, in general, psychological skills were being utilized by the study group. Finally, the study identified opportunities for athletes to improve performance through psychological skill development, practice, and implementation.

Many assessments of athletic performances are completed during a bout of intense competition. While determination and physical ability are two factors that often separate winners from losers, athletes will often do more to gain an extra edge over opponents, ranging from overtraining to the use of ergogenic aids. As athletes continue to search for the competitive advantage, mental preparation provides a healthy, legal, and generally accepted alternative in the quest for the perfect performance.

Findings have shown sport psychology interventions improve athletes’ performances. Greenspan and Feltz (1989) sought to understand the validity of athletic performances and the interventions used to enhance such performance. However, this study did not illuminate whether athletes utilize mental preparation in both practice and competition and the researchers indicated the need for further studies that address the effects of different psychological interventions with elite, young, and minority athletes.
Mental preparation/practice has been referred to as the “cognitive rehearsal of a task in the absence of overt physical movement” (Driskell, Copper, & Moran, 1994, p. 1). Early research on mental preparation can be traced to the writings of Washburn (1916) and to Jacobson (1932) who found that actual muscular activity occurs when one imagines performing a physical skill (as cited in Dorothy & Robinson, 1986). While Jacobson’s theory did not prove that mental practice can enhance performance, it showed that there was a relationship between mental practice and muscular activity.

The value of mental practice is widely accepted and is often included in coaches’ plans for athletes. Therefore, coaches should be aware of the psychological factors that impact performance. These factors include positive thoughts, self-talk, and imagery. All are often considered tools for success. To better understand how to apply these factors, coaches may seek council from sport psychologists to assist in the development of psychological skills training regimens.

The effectiveness of psychological interventions has been criticized, as many sport enthusiasts believe that interventions in sport psychology are based upon unconfirmed principles rather than on scientific evidence (Dishman, 1983; Landers, 1994; Morgan, 1997). On the other hand, studies have also demonstrated that interventions have proven to be effective in keeping athletes’ mental and emotional states consistent (Weinberg & Gould, 2007).

Factors on which athletes focus include motivation, confidence, and degree of effort. Identifying the role these and other factors play with each athlete is important. Evidence has shown that “psychological contributors to performance are not always linear or the same for all athletes” (Taylor, 1995, p. 341).

If coaches and athletes can identify objectives of mental training in specific situations such as practice and competition, they may identify keys to improved performance. The purpose of this study was to determine whether there were statistically significant differences in mental preparation between practice and competition. Taylor (1995) noted data may be gathered through observation of athletes during practice and competition. This study utilized a modified version of the Test of Performance Strategies (TOPS). The TOPS was based upon the psychological processes thought to underlie successful athletic performances. Subscales of the measure are: attentional control, goal setting, relaxation, activation, self-talk, emotional control, automaticity and negative thinking. This study explored whether there was a statistically significant difference in subscale scores between mental preparation in practice and competition.

**Background**

It is the desire of many athletes to perform at an optimal level during
competition. However, this is not always an easy task. Mental preparation techniques provide an opportunity for the transition from practice to competition to be improved.

Athletes often experience optimum performance levels when they plan and execute mental strategies before competition. Orlick and Partington (as cited in Gould et al, 1992) concluded that “mental readiness was an extremely important factor influencing athletic performance” (p. 360). Orlick and Partington noted that among physical, technical, and mental readiness, mental readiness was the only statistically significant factor found to influence Olympic ranking. Similarly, athletes did not perform up to potential because they were not adequately prepared for distractions and unforeseen circumstances.

However, it is unclear which particular strategy is preferred by certain types of athletes in practice and competition. In a comparison of 1976 Olympic men’s gymnastics qualifiers with non-qualifiers, it was reported that the finalists were better able to cope with competitive mistakes and anxiety (Mohoney & Avener, 1980). Mental preparation techniques, such as imagery, self-talk, goal setting, automaticity, emotional control, activation, relaxation and negative thought stopping provide a means for enhancing performance. Can athletes learn how to create their ideal performance? Although not a one dimensional state, perhaps athletes can attempt to do so with proper education, training, and practice related to mental preparation.

To attain peak performances athletes may have to include skills and strategies. Some of these skills include goal setting, imagery, competition planning, and coping skills. These are skills and strategies that can be learned through education and practice, thus resulting in a greater likelihood for enhanced performance.

The measure used in this study to evaluate mental preparation in both practice and competition was adapted from the Test of Performance Strategies (TOPS) (Thomas, Murphy, & Lewis, 1999). Thomas et al. stated “it is surprising that the research reviewed had focused exclusively upon the use of psychological skills in competition, neglecting the use of psychological skills during practice” (Thomas et al., 1999, p. 698). Therefore, Thomas, Murphy, and Lewis chose eight constructs to evaluate use of psychological skills in both practice and competition.

Attentional control. This technique is a central factor in cognitive sport psychology. Gould et al. (1989) reported 80 percent of the sport psychology consultants surveyed conducted attention training with their clients.

Goal setting. The use of this technique is one of the keys to better athletic achievement (Burton, 1992). Sport psychology consultants have reported using goal setting more than any other psychological intervention in their work with athletes and coaches (Gould et al., 1989).

Imagery. Researchers have identified imagery as an important psychological skill in sport (Vealey, 1988; Murphy & Jowdy, 1992). They also suggest imagery is a skill that can be practiced and improved (George, 1986; Thomas
Relaxation and activation. Arousal control was identified as an important psychological skill in many of the sources that were reviewed (Thomas et al., 1999). Consequently, relaxation (or the lowering of somatic anxiety) and activation (or the raising of psychological and physiological energy) were viewed as separate skills. By developing separate measures for these concepts, it was possible to examine their relationships independently.

Self-talk. Self-talk appears to be closely related to other constructs such as attitude control (Loehr, 1989) and thought control (Vealey, 1989). Self-talk can be defined as internal thought and conversation and can be either positive or negative.

Emotional control. There is evidence that an ability to deal with frustration and negative emotions is important for competitive athletes. Coping with adversity is an important factor in successful athletic performance.

Automaticity. This construct is basic to nearly all descriptions of expert performances. This ability to perform at a high standard without thinking about what one is doing is also central to the theory of ‘flow’, which has been influential in recent sport psychology research (Thomas et al., 1999).

Many athletes have become proficient in applying psychological skills. This proficiency has led to the development of mental training programs to further improve these psychological skills. The peculiar characteristics of practice and competition strategies used by athletes in different sports have forced consultants to adapt and refine mental preparation procedures because of performance requirements and competition pressure.

Mental preparation programs have been shown to benefit athletes emotionally. For example, sprinters and hurdlers have been found to run faster when ‘psych up’ interventions are employed 60 seconds prior to competition as compared to a control group of athletes (Caudil, Weinberg & Jackson, 1980). Recently, psychological skills and strategies have been correlated to an optimal mental emotional state associated with peak performance. The consistent use of these skills and strategies allow athletes to prepare themselves mentally to perform, putting them in a psychological position to be successful (Hardy, Gould, & Jones, 1996).

Methods

Participants
Participants in this study were drawn from a convenience sample of athletes from a National Collegiate Athletic Association Division II program. Fifty track and field student athletes volunteered to participate. Half of the participants were women (n=25), half were men (n=25). Their average age was 21.5 years (+/- 2.5 years). This study was approved by the cooperating university’s Institutional Review Board and all participants provided informed consent.
**Instrument**

The Test of Performance Strategy (TOPS) is a 64 item measure designed to assess the psychological process thought to underlie successful athletic performances. For this study, the instrument was modified and resulted in a 60 item inventory. Responses to this test reflected the extent to which athletes used mental preparation in practice and competition on the aforementioned constructs. A five-point Likert-type scale, ranging from strongly disagree (1) to strongly agree (5), was used. Items were then combined to generate subscales. Differences in subscale totals reflected differences in frequency of the use of psychological skills. Two questionnaires were developed to acquire the information needed for this study, one for practice and one for competition. Each questionnaire was comprised of 30 psychological skill questions that athletes may have used in either practice or competition.

**Procedures**

Coaches of the participants received a description of the questionnaire with information related to date, time, and location of the study. Upon consent, athletes completed the inventories. Data were blinded by the researcher to protect the identity of participants. The participants completed the questionnaires under similar conditions. One questionnaire was taken before practice and the second was taken before competition.

**Statistical Analyses**

Means and standard deviation for each subscale for both practice and competition were calculated. Paired sample t-tests were used to determine if any statistically significant differences existed between psychological skills used during practice and psychological skills used during competition. An alpha level of 0.05 was utilized for this study.

**Results**

**Descriptive Statistics**

Descriptive statistics for the two conditions are presented in Table 1. Means for competition were higher than for practice in all categories except Automaticity and Emotional Control.

**Inferential Statistics**

Paired sample t-tests were conducted for each subscale to determine whether there were statistically significant differences between practice and the competition conditions (see Table 2). There were no statistically significant differences on the subscales of goal setting, automaticity, and emotional control. The test, however, indicated athletes used the psychological skills of relaxation, negative thinking, activation, self-talk and imagery more in competition than in practice.
Table 1
Descriptive Statistics For Practice And Competition For The Instrument Constructs

<table>
<thead>
<tr>
<th>Skill</th>
<th>Practice</th>
<th></th>
<th></th>
<th>Competition</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activation</td>
<td>3.89</td>
<td>.79</td>
<td>4.06</td>
<td>.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automaticity</td>
<td>2.84</td>
<td>.98</td>
<td>2.80</td>
<td>1.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Control</td>
<td>2.52</td>
<td>.95</td>
<td>2.39</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal Setting</td>
<td>4.22</td>
<td>.78</td>
<td>4.37</td>
<td>.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imagery</td>
<td>3.96</td>
<td>.87</td>
<td>4.20</td>
<td>.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Thinking</td>
<td>2.98</td>
<td>.61</td>
<td>3.19</td>
<td>.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxation</td>
<td>3.42</td>
<td>1.02</td>
<td>3.63</td>
<td>1.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self Talk</td>
<td>3.82</td>
<td>.91</td>
<td>4.07</td>
<td>.82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2
`t`-test Analysis Results for Practice and Competition on the Modified TOPS

<table>
<thead>
<tr>
<th>Source (n)</th>
<th>Mean D</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relaxation (49)</td>
<td>-0.214</td>
<td>-2.078</td>
<td>48</td>
<td>.043</td>
</tr>
<tr>
<td>Negative Thinking (49)</td>
<td>-0.214</td>
<td>-2.295</td>
<td>48</td>
<td>.026</td>
</tr>
<tr>
<td>Activation (49)</td>
<td>-0.173</td>
<td>-2.401</td>
<td>48</td>
<td>.020</td>
</tr>
<tr>
<td>Self-Talk (49)</td>
<td>-0.255</td>
<td>-2.549</td>
<td>48</td>
<td>.014</td>
</tr>
<tr>
<td>Imagery (49)</td>
<td>-0.245</td>
<td>-2.795</td>
<td>48</td>
<td>.007</td>
</tr>
</tbody>
</table>

Note: Significant when \( p \leq 0.05 \)

Discussion

These data provided insight into the utilization of mental preparation techniques by a selected group of intercollegiate athletes in practice and competition settings. The eight constructs used for this evaluation were: goal setting, relaxation, activation, imagery, self-talk, attentional control, emotional control, and automaticity. Descriptive statistic evaluation of the
eight constructs demonstrated that the use of psychological skills by athletes was different between practice and competition. However, $t$-test results indicated that the goal setting, attentional control, and emotional control were not significantly different in practice and competition.

Athletes in the study group employed mental preparation techniques in both practice and competition. While the mean scores for all eight constructs in both the practice and competition were similar, athletes reported using techniques of relaxation, negative thinking, activation, self-talk, and imagery more frequently in competition than in practice. There may be environmental conditions associated with competition that impact the use of these skills. For example, as the competition environment often elevates arousal levels, athletes may feel the need to utilize relaxation techniques more in these settings. Similar examples are appropriate in each category studied.

Conversely, participants reported using automaticity and emotional control at about the same levels in practice and competition. Practice time is often associated with skill, strategy, and technique development, while in competition, coaches and athletes alike desire to perform more automatically at an arousal level and emotional mind-set necessary for best performances. The results of this study indicated an opportunity for coaches to develop and implement strategies related to automaticity and emotional control to increase use of these mental skills. Since both improved automaticity and emotional control in the competition environment would likely have a positive impact on performance, a program of this type could have benefits to both the individual and team performances.

According to Thomas et al. (1999), these eight psychological constructs are important feature of athletes’ psychological preparation for competition. The results of this study showed that many athletes also made use of these strategies in practice. Future research should consider examining how the use of these skills in practice and competition impacts performance. While further study is also needed on the type, quality, and individuality of psychological skills employed by athletes, this study illuminated how, in general, psychological skills were being utilized by the study group. Practitioners might take the results of this study as identifying opportunities for improvement. By implementing basic psychological skills training programs, athletes may be able to improve performance in both practice and competition. In addition, practicing psychological skills may allow coaches and athletes to identify individual mind-set for best performance and allow athletes to set the performance thermostat. Applied studies provide a unique opportunity to allow coaches, athletes, and sport psychology consultants to work together to develop strategies to further improve performance.
References


Thomas, P. R., Murphy, S. M., & Hardy, L. (1999). Test of performance


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Refereed Paper

Effect of Autonomy on Motivation in Strength Training Class

William A. Sodemann III and Carla D. Smith

Understanding the factors that motivate youth to engage is physical activity is critical for physical educators. The fervor to prevent childhood obesity has risen, even as physical education classes and recess are dropped from school schedules. According to the Youth Risk Behavior Surveillance Survey 65% of youth do not get the recommended amount of activity, 46% do not even attend a physical education class. Additionally, 17.6% of 12-19 year olds are considered obese (Brenner, 2008). While 68% of Missouri schools require a physical education class be taught at each grade level, 56% of middle and high school students did not meet recommended levels of physical activity (MYRBS, 2007) It is critical for physical educators to understand motivation so we can affect as much change as possible, even with our limited time to influence students’ behaviors.

Motivation is part of the complex personality of human beings. Motivation is a broad concept that is comprised of several different aspects. Motivation is traditionally defined as the direction and intensity of one’s effort (Sage, 1977). There are many theories that can be applied to better understand motivation in general. There are also more specific theories related to motivation and exercise. Self-determination theory (SDT) has been used to help explain how individuals are motivated to engage in exercise. Self-determination theory addresses the degree to which motivation toward an activity is internal (degree of self-involvement) and how self-determination influences the selection of an activity (Deci & Ryan, 1985, 1991). SDT assumes that all humans possess three basic psychological needs that must be fulfilled by the individual. The first need is for self-determination or autonomy. Autonomy is the notion that the individual is the origin and regulator of his or her own actions. In Physical Education class, this would be exemplified if the students were free to choose the activity in which they participate. Students who perceive the activity as their choice feel more autonomous. The second need is to demonstrate competence. Competence is the belief that one can act and interact successfully in a given environment, producing the outcomes that were desired. Students in a Physical Education class would demonstrate competence by engaging in an activity and feeling successful in executing a skill or game play. Students who perceive themselves as successful are perceiving competence. The final need that must be fulfilled for students to feel...
self-determined is relatedness. Relatedness is the seeking and development of secure and connected relationships with significant others (Deci & Ryan, 1985; Standage, Duda, & Ntoumanis, 2003). Being an accepted part of a team, working well with a group, positive interactions with peers and the teacher would demonstrate relatedness. Particularly for adolescents, a meaningful and positive social atmosphere is a critical part of a successful learning environment. Essentially SDT indicates that when a person feels an activity is more self-determined, the person is more motivated because the activity is a free choice. In the public school situation the classroom environment must be designed for all psychological needs to be met, in order for an individual’s learning to feel self-determined (Ryan & Deci, 2000).

SDT places motivation on a continuum. At the top of the continuum is intrinsic motivation. Intrinsic motivation is doing an activity for the internal, personal enjoyment of that activity. People who are intrinsically motivated have the most self-determined type of motivation and engage in highly autonomous activities to obtain the feelings of fun, pleasure, and satisfaction that stem from that activity (Standage, Duda, & Ntoumanis, 2003). Pelletier, Vallerand, and Sarrazin (2007) divided intrinsic motivation into three subcategories: intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to experience stimulation. Extrinsic motivation spans the middle ranges of motivation and is separated into three subcategories: identified regulation, introjected regulation, and external regulation. The highest form of extrinsic motivation is identified regulation. Identified regulation states that achieving personal goals motivates behavior. Introjected regulation is the form of extrinsic motivation which suggests that behavior is motivated by a self-imposed source of pressure, such as a sense of shame or guilt, or a sense of obligation. The last form of extrinsic motivation, which involves the lowest level of self-determination, is external regulation. External regulation suggests a person would engage in a behavior strictly to obtain an external reward, or avoid an externally applied punishment (Lox, 2006).

At the bottom of the continuum is amotivation. Amotivation is the lack of motivation or interest to partake in an activity. People described as being amotivated have very low self-determination, meaning that if a person with amotivation for activity is being active, it is likely not by that person’s own choice (Ryan & Deci, 2000).

Using SDT as a guideline, this study takes another step toward understanding motivation in a typical classroom setting. The purpose of this study was to determine how the amount of autonomy allowed by the teacher in a strength training class would affect students’ motivation.

**Method**

**Participants**

The participants in this study were 73 sophomores, juniors and seniors.
Due to missing data only 60 were used for data analysis. All participants were enrolled in coeducational strength training classes as an elective credit at a predominantly middle to upper class high school located in a large suburban area. Average age of the students in this study was 17 years. A total 59 males and 14 females were involved in the study. Each class met for a total of 90 min/class period, two to three days/week depending on block scheduling.

**Procedures**

Three separate classes were used in this study. Each class experienced a different level of autonomy throughout the semester. Although intact classes were used, each class was randomly assigned a treatment level. One treatment class was labeled “no autonomy” (n=24). “No autonomy” was characterized by students in the group having no choice in their weight lifting routines. Students were told exactly what strength training exercises must be completed each day and were not able to vary from the routine. In addition, students were required to lift on command by the instructor. The “no autonomy” class met first period of the day, Monday and Wednesday mornings.

A second treatment class was labeled “moderate autonomy” (n=20). This particular class was given some choices in their lifting routine, but was also given direct instructions. Students were assigned three different types of lifts to do, but were given the opportunity to select three other lifts of their choice to complete the routine. The “moderate autonomy” class also met first period of the day, Tuesday and Thursday mornings.

A third treatment class was labeled “complete autonomy” (n=16). This treatment group was allowed to choose between different lifts and was also able to choose the order in which they completed the lifts. The “complete autonomy” class met on Tuesday and Thursday afternoons.

Each student in all three classes completed an assent form and returned parent consent forms in accordance with the Institutional Review Board of the university sponsoring the research. Prior to this study, participating students had completed one cycle of lifting which lasted approximately six weeks. For this study, a cycle is defined as one six-week period where students’ main goal was to increase muscular strength through resistance training.

The study lasted a total of four weeks which equaled 10 strength training sessions. In a typical 90-minute class period students participated in a cardiovascular endurance program followed by a stretching routine. After the warm-up routine, students would begin the designated strength training procedures. Before entering the weight room, each class was given verbal instructions for the lifting protocol that day. The instructions were also clearly written on a white board inside the weight room. Each of the three classes was given instructions specific for the class and the treatment level of autonomy assigned to that class. Students were assigned to a specific lifting group of two to three people for the duration of the unit.
Measures
At the end of the four-week strength training cycle, participants were given a survey to complete. The Sport Motivation Scale adapted to Strength Training class, was given to assess students’ level of motivation to participate in strength training exercises during class. The scale was obtained through permission from the author, with permission to adapt to strength training class. The scale was adapted to strength training class by substituting the words “strength training class” for the word “sport.” For example, the survey asked respondents to rate their feelings about strength training class on a 7-point Likert scale. Questions included feelings of pleasure with the class, difficulty, excitement, satisfactions, and feelings about their success in class. The Sport Motivation Scale (SMS) is comprised of seven constructs corresponding to the levels of motivation which include: intrinsic motivation to know, intrinsic motivation to accomplish, intrinsic motivation to experience stimulation, identified regulation, introjected regulation, external regulation and amotivation.

Statistical Analyses
Mean and standard deviation for each construct of the SMS were derived. A multivariate analysis of variance (MANOVA) was performed on the seven constructs of the SMS. If a significant $F$-ratio was identified, a univariate one-way analysis of variance (ANOVA) was performed, with a Tukey post hoc test conducted to identify the significantly differences of motivational level. If there was no significant difference between genders, males and females were collapsed into a single group for analysis. Significance level was set at $p<0.05$.

Results
There were no significant differences among the classes on any of the seven constructs of the SMS (see Table 1). For all seven constructs of motivation, the $F$-ratio was greater than $p = .05$. Means and standard deviation of each class are given in Table 1.

Discussion
The purpose of this study was to determine how levels of autonomy affected students’ motivation in strength training class. The hypothesis that students in the more autonomous class would score higher on the SMS was not supported in this study. Although it has been suggested that student motivation would be optimized when allowed some “choice” (Atherley, 2002), students in this study did not differ in motivations level, regardless of autonomy allowed during class. There are clearly many factors that influence student motivation, including teacher support of autonomy and motivational climate of the class (Ommundsen & Kvalo, 2007). For this study
Table 1
Class Scores on Subscales of Sport Motivation Scale (SMS; n = 64)

<table>
<thead>
<tr>
<th>Constructs of SMS</th>
<th>No Autonomy Mean ± SD</th>
<th>Moderate Autonomy Mean ± SD</th>
<th>Complete Autonomy Mean ± SD</th>
<th>F ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Know</td>
<td>21.0 ± 4.5</td>
<td>18.1 ± 7.4</td>
<td>20.3 ± 5.1</td>
<td>2.81</td>
<td>.07</td>
</tr>
<tr>
<td>Accomplish</td>
<td>20.6 ± 5.7</td>
<td>18.6 ± 6.7</td>
<td>19.8 ± 3.8</td>
<td>1.39</td>
<td>.26</td>
</tr>
<tr>
<td>Stimulation</td>
<td>19.1 ± 6.0</td>
<td>17.2 ± 7.1</td>
<td>19.3 ± 5.0</td>
<td>1.97</td>
<td>.15</td>
</tr>
<tr>
<td>Indentify</td>
<td>16.4 ± 6.1</td>
<td>15.5 ± 6.8</td>
<td>18.1 ± 4.4</td>
<td>1.88</td>
<td>.16</td>
</tr>
<tr>
<td>Introjection</td>
<td>16.8 ± 6.2</td>
<td>17.1 ± 6.5</td>
<td>17.6 ± 5.3</td>
<td>0.16</td>
<td>.85</td>
</tr>
<tr>
<td>External</td>
<td>17.1 ± 6.0</td>
<td>16.4 ± 7.0</td>
<td>18.1 ± 4.3</td>
<td>0.78</td>
<td>.46</td>
</tr>
<tr>
<td>Amotivation</td>
<td>9.8 ± 7.4</td>
<td>11.4 ± 6.8</td>
<td>11.9 ± 6.4</td>
<td>0.19</td>
<td>.83</td>
</tr>
</tbody>
</table>

The manipulation of autonomy alone was not enough to affect students’ motivation. Additionally, it is unclear how students perceived this “choice.” The level of choices provided in class may not have afforded students any feelings of true autonomy.

It was hypothesized that satisfying the psychological needs of autonomy, competence and relatedness would facilitate motivation. Based on this assumption, it was anticipated that the “complete autonomy” class would indicate higher levels of motivation because their needs of autonomy would be met to a higher degree. Furthermore, it was expected that the class given “no autonomy” would demonstrate less motivation, due to the fact that they were not given choice on which exercises to complete, or when to lift. The lack of significant differences between the three levels of autonomy might be due to a variety of extraneous variables.

Due to unique personalities of individuals, each class developed its own character. In this study, the disposition of each class differed with time of day and personalities of individuals in lifting groups. Although students in all classes were constantly reminded and encouraged to give effort and stay on task during lifting, the “complete autonomy” class was unexpectedly observed as “off task” more than other classes. Due to the nature of the educational setting, students may have misinterpreted the lack of direction from the teacher as freedom from any expectation, rather than individual freedom to determine their actions and work toward an individual goal. Despite the fact that the class was an elective, and the teacher provided some level of choice, students may not have considered the class and activity
as having any personal importance, which would clearly affect personal motivation.

The “moderate autonomy” class, typically followed directions, worked out at an appropriate intensity and stayed on task the majority of the time. Perhaps students felt they had a reasonable amount of choices within their lifting routine but also had structure and order to keep them on task.

The “no autonomy” class had the least amount of choices in their lifting routine. They had to lift on command and had no choice between lifts. There were more behavioral issues in this class: students not staying with the pace of lifting set by the instructor, not following directions, and doing the wrong lifts. The “no autonomy” class seemed to have more down time between lifts which caused the students to become off task. Behavioral problems in this class were different from off task problems in the “complete autonomy” class. The problems in the “no autonomy” class were primarily students misbehaving and not following directions, whereas problems of being off task in the “complete autonomy” class dealt with sitting down and not lifting.

One of the main ideas of the self-determination theory assumed for this study was that if each student was fulfilling his or her three basic psychological needs of autonomy, competence and relatedness, the student would score higher on the motivation continuum, which would be indicated by scores on the SMS (Standage, 2005). Daily class procedures were designed to fulfill the needs of autonomy, competence and relatedness in several ways. In two of the three classes, autonomy was provided in terms of choices of exercise. Although, all three classes in which students were enrolled were elective weight training classes, students may have perceived “class” as a forced choice, and therefore not perceived any activity as an autonomous choice. While the teacher assumed interest in the elective, and the intent was to provide students with choice of activity, some students may have been enrolled in the class as the physical education requirement, and perceived all content as forced activity.

In an attempt to fulfill the need of competence, students were guided in personal goal setting. Competence was also addressed by evaluating effort, rather than amount of weight a student could lift. However, a student’s perceived competence is likely influenced by feelings of mastery. The class environment may not have provided adequate knowledge of what mastery would involve. In fact, the activity of weight lifting may not provide a clear level of mastery, as mastery would be different for each student. Although the personal goal setting was intended to indicate a level of mastery, students may not have set realistic goals, or may have compared goals. Although the teacher tried to alleviate social comparison by avoiding evaluation of performance, but rather evaluated effort only, it was not sufficient to induce feelings of mastery. In addition, individual students may have engaged in self imposed social comparisons which could have reduced their personal feeling of competence.

In an attempt to fulfill the need of relatedness, students were allowed to...
choose exercise groups of friends with whom they felt comfortable. Because there were no significant differences in motivational levels of the three classes, it is reasonable to assume that the attempts to satisfy needs in each of the three areas might not have been sufficient. Although it was assumed that competence and relatedness were held constant in each of the three classes, there were no specific procedures in place to assess whether the needs of competence and relatedness were actually being fulfilled.

For teachers attempting to increase motivation by providing more autonomy, there may be no easily attainable level of autonomy that will increase student motivation. The level of autonomy that will increase or decrease motivation may depend on many other factors, student maturity, time of day, preceding classes, and disposition and dynamics of the class. A longer lifting cycle would likely help groups establish a routine and allow students to better formulate their feelings of autonomy. In addition, a longer lifting cycle might also allow time for students to truly gain feelings of competence in the activity. Due to the public school setting in which this research was conducted, the length of the lifting cycle could not be altered. Motivation is a multidimensional construct that develops in a time frame not clearly understood. Future studies of this type should consider a longer unit of strength training to fully develop the aspect of competence.

In Physical Education it is important to give students some practice in making good choices. All teachers must continue to try to find that delicate balance of autonomy and control that will elicit the optimal learning environment for a given class. Instead of giving students complete autonomy, which may lead to off task behavior, students may be given guided choices. From observations in this study, the “moderate autonomy” class seemed to create the most positive motivational environment, although there were no statistical differences in motivational levels. Therefore, the strategy of providing “moderate autonomy” in strength training is cautiously recommended. Giving students a choice of three lifts that work the same muscle or muscle group and allow them to choose their preferred exercise is one option for moderate autonomy. Future studies concerning autonomy and motivation should chart progress from the beginning to the end of the class, which might clarify mastery and enhance student feelings of competence.

**References**


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2009 Scholar Address

Are We As Biomechanists, Concentrating on the Right Things OR
Is “Fat Freddy” Our Best Teacher?

H. Scott Strohmeyer

I have never really thought of myself as a person one would consider a scholar. What I can tell you is that in 1988 my passion for the profession was unveiled. Yet, due to the influences of many people I have associated with since and the multitude of students who have passed through my classes, my passion for the profession of biomechanics burns as hot now as it ever has. To acknowledge all those individuals who significantly influenced my thinking would, I am afraid, take the sum of the allotted space for this article. However, I would be remiss if I did not thank Jackie Hudson and Michael Bird for their influences on my thinking in the area of biomechanics.

The title “Are we as Biomechanists Concentrating on the Right Things” will, I hope, by the end of this essay, address some concerns I have had for some time now with respect to biomechanics research, the teaching of biomechanics, and/or hiring practices for biomechanists. My conclusions are drawn from research I have either read or conducted over the past 20 years. The sub-title “Fat Freddy, Our Best Teacher” is derived from the philosophies acquired from Jackie Hudson, research accomplished over the years, and in working with movers, all the way from children performing fundamental motor skills to the very elite.

Collaboration

As with our students, I believe that without integration of the various sub-disciplines, even biomechanists’ view of the movement world will be deficient and these deficiencies will manifest themselves in the interpretation of their research. I watched a sport sciences television show many years ago, and a biomechanist, working with a javelin thrower, gave feedback that the individual (after biomechanical review) should practice throwing the javelin at 39 degrees above horizontal to get maximum distance. I have, ever since then asked my students to show me 39 degrees above horizontal, followed by “are you sure?”. Invariably, we decide that there is no way to know without
some apparatus, which leads to wondering who will, in their professional life, carry the apparatus necessary to determine angles for each individual they may try to adjust. As the impossibility of the situation manifests itself, my students begin to speculate how they may get a more desirable outcome in a throwing situation without the aid of biomechanical tools. At this point, we begin to explore the integrative nature of the sub-disciplines in exercise science. Although the biomechanics are important, raw numbers do not make effective integration, and the biomechanist who does not incorporate the varied sub-disciplines into the class environment, is falling well short of sharing the information needed to “round out” these students to be effective practitioners. That is, or should be, the purpose of all undergraduate biomechanics courses.

I have been very fortunate throughout the years to increase my depth of understanding in biomechanics by working collaboratively with such individuals as Jackie Hudson, Michael Bird, Duane Knudson and Jean Eckrich (see references). However, also through collaboration, I have been able to broaden my scope in exercise science by working with people like Jean Eckrich (pedagogy), Ruth Ann Nyhus (pedagogy), Kathleen Williams (motor development), Lavon Williams (motor development) and Don Morgan (exercise physiology; see references). Finally, in a support role for students and faculty, I have gained a greater understanding of sport sociology, sport and exercise psychology, pedagogy, motor learning and exercise physiology. The influences of these people, through collaboration, has allowed my teaching and the interpretation of research in biomechanics to evolve into a much more useful presentation of concepts.

Are We Concentrating on the Right Things?

Typically, the model for biomechanics research stems from examining the “best” performer of a skill or imposing theoretically “ideal” manifestations of movement using computer simulation. I simply cannot buy into these methodologies for a variety of reasons.

Performing a skill well (i.e., based upon performance outcomes of the elite model) is contingent upon talent, training, and technique. Talent is something a performer brings with them to the performance environment. It can include, but may not be limited to muscle fiber composition (i.e., fast twitch or slow twitch), number of fibers, nerve conduction velocity, bone length and breadth, connective tissue elasticity, and/or location of body fat. All these variables are not something that I can, as an interventionist, immediately control. Most of one’s abilities with regard to talent are genetically determined and are, thus, inaccessible to intervention strategies. Training entails the development of strength, endurance, mass, nerve processing, bone density, flexibility of connective tissue, and the amount of fat. While the factors that are effected by training are not as inaccessible as those factors that influence talent, we know from numerous studies that changes in variables related to training
take time that may not be available to those charged with altering the most basic of movements and/or movement patterns. College/elite coaches may change performance based upon training but it can be argued that most high school seasons are too short to see long-term training changes in skill execution.

What is left for the movement teacher then is technique. Technique concerns itself with such factors as force application, force magnitude, visible coordination of the movement, leverage, etc. Colloquially, technique deals with those variables we can observe and, using integration of various sub-disciplines in exercise science, immediately alter. Most of the individuals we teach in undergraduate biomechanics will not be in professional movement environments where they can “pick” the best performer (talent) or work with them for months or years (training). Rather, they will be trying to get each performer to be the best they can be in a brief period of time. Thus, discovering and teaching appropriate technique is the most effective way to intervene on movement that will affect the broadest spectrum of movers (i.e., beginners through elite).

Computer simulation based upon the elite model and theoretically (mathematically) derived best performances proves of little use to the learning environment in undergraduate biomechanics. First, the mathematics used to create simulations is extremely difficult for most undergrads in physical education, exercise and sport science. Second, the ability to program the simulation also requires higher levels of computer interface experience than most students get within the kinesiology major (especially if those institutions are regionally focused not research oriented). The researcher must exercise care, when creating these simulations, to truly evaluate the models functionality for human movers. The potential simulations may not be physically possible for humans to execute (see Figure 1). Theoretically, the perfect vertical jump should be executed in instantaneous event sequences. Unfortunately, human muscle takes time to develop tension and cannot instantaneously create tension. However, theoretical models are useful for directing thought processes. We can show that if an individual can create a greater area under the curve that most closely resembles the theoretical model, they should be jumping as high as they possibly can. While computer simulation provides many models that are unattainable for the human performer, they do provide, with reasonable interpretation, a mechanism by which exercise scientists and pedagogues may explore methods of performance enhancement that are useful for all movers.
My first excursion in biomechanics research was to compare the jump serve to the conventional overhand serve in volleyball. As a young researcher in exercise science, I thought it was a tremendous opportunity to work with our United States Olympic Volleyball teams to examine this “new” serve that had just hit the volleyball scene (shows how old I really am). I felt that I had hit the “big time” in biomechanics research. What I really ended up learning was how to set up and use good methodologies to get answers to questions that did not add much to the body of knowledge. Was there a difference in performance between the two serve types? Yes, but visual inspection of the skills can show one this. All I did was quantify and describe the movement with “cool” tools. I did not solve any problems!

Through the advice of Paul Dunham at the University of Wyoming I explored the possibility of attending the University of North Carolina at Greensboro. There I met Jackie Hudson and biomechanics would never be the same. I found my passion. It was at UNCG that I first heard “biomechanics is a tool without a question.” Theories in science are paramount to progressing that science and the values it creates. Biomechanics had lost its focus and relied too heavily on its tools. Thus, we were seemingly just pointing out obvious movement parameters that anyone who spent a good deal of time observing movement probably already knew from an applied perspective. The question then arises, How useful are we (i.e., biomechanists) in the
training of undergraduate students if we: 1) point out the obvious; and 2) insist upon using mathematical constructs that 98% of undergraduate kinesiology students will never need or use? I find myself, even today, stating that this is the mathematical evidence to prove what good performers are already doing is correct. It seems we are proving things we already know to be true. We should be exploring how to advance people to these truths. This is where integration of our sub-disciplines into the undergraduate biomechanics curriculum will make us (biomechanists) more useful as colleagues, teachers and/or researchers.

Lack of theory, speaking over the heads of our peers/students, or the economy of the college has led many institutions to allow non-biomechanists to teach biomechanics. I can sympathize with all these reasons for not hiring a biomechanist, but I cannot, nor will I ever agree with these practices. The biomechanist can provide depth of understanding in movement due to their training. The biomechanist can assist the pedagogues in creating effective teaching cues and show their effectiveness as a result of their training and equipment. The biomechanist can assist the exercise physiologist in understanding further those mechanical variables which affect physiological manifestations and the biomechanist can help the adapted specialist effectively design equipment to meet the needs of individuals. The list could go on, but the case is made that the biomechanist is a necessary part of a complete Kinesiology department.

So, how do we fix this? It will take a concerted effort on two fronts. First, biomechanics training at the doctoral level needs to evolve into truly theoretical approaches to movement efficiency and be more integrative in nature. Doctoral programs should concentrate more fully on solving real problems. That is, How do we get “Fat Freddy” from point A to point B? OR How did “Fat Freddy” get from point A to point B? While these look like pedagogy and motor development questions, it is leading questions such as these that will make the biomechanist more useful for the undergraduate curriculum. As a result, someone or some university must step up and create “applied” biomechanists or biomechanists capable of integrating the various sub-disciplines of exercise science into their curriculum and research. This is an especially important approach to biomechanics training, especially for institutions who are regionally focused. Second, it should be the responsibility of regionally focused institutions to seek out and hire these “applied” biomechanists. My guess is that their research dossier will not consist of biomechanics only articles, but will also show collaborative efforts where biomechanics is infused. These are the people the regionally focused institutions want. These are the people who will get undergraduates involved in research and these are the people who will continue to support the departments (not always personal) efforts for scholarly activity at a teaching institutions.
Toward Theory

My values in research and teaching were in large part shaped by Jackie Hudson at the University of North Carolina at Greensboro. She is the first person to draw my attention to “Fat Freddy” as an effective mover. She preferred the term “overachievers”. I use the term “Fat Freddy” to make a philosophical point to my students. In exercise and sport science, we often equate good movement with an athletic somatotype (i.e., one that is not fat). However, if we are truly examining technique, those individuals we examine may not have athletic talent or training. They may, however, be “overachieving” expectations or their inherent talent and lack of training. This research is not based upon absolutes. Rather, this research is based upon relative improvements in varying complexities of a skill. For example, if we ask an individual to execute a countermovement jump with the hands on the hips and record a 24” vertical jump for one performer and 6” for another, immediately we judge the 24” jump as better. Then we ask the performers to execute countermovement jumps with arm swing and record jump heights of 27” and 9”, respectively. Still we often conclude that the 27” jump is best based on absolute performance measures. It is here that many biomechanists proceed to determine those factors that set the 27” vertical jumper apart. I will contend that this is an inefficient approach as the confounding variable of talent, may lead to faulty conclusions. Looking at the best absolute performance is an example of using an elite model to determine best practices.

If we apply an “overachieving” eye to these data, what happens? Both performers improved by 3”, but the relative improvement is different. The jumper who jumped 27” improved (based upon jump complexity) by 12.5% and the jumper who jumped to 9” improved by 50%. By examining relative improvement, we are able to adjust for inherent talent and/or training. Physically, the higher (absolute score) jumper may also have an athletic build while the other performer may not (thus the reference to “Fat Freddy”).

If we then turn our attention to examining what factors led “Fat Freddy” to greater relative performance improvements, we find that the variables of concern may be greatly different than for the absolute product (i.e., height of jump) analysis paradigm. Further, there may be implications across the ability spectrum as we may have now successfully removed the confounding variables of talent and training from the movement formula. To repeat, there is nothing we can do about talent, and training takes a lot of time. Technique is where the biomechanists, pedagogues, motor specialists, etc will make the greatest impact on skill improvements for all individuals.

Further, Figure 1 shows a “theoretically perfect” vertical jump force tracing. Though humanly impossible to achieve the nice instantaneous force manifestations of the model, we often see that the “overachievers” force profile more closely assimilates the “model” (see Figures 2 and 3). Figure 2 is the force tracing for a very successful volleyball player in his 20’s and Figure
3 is the force tracing for a somewhat active pre-teen female aged 12 years. Applying the overachiever model resulted in overall improvements, between varying complexities of the vertical jump, of 8% and 22%, respectively between the volleyball player and the pre-teen. If you could pick up figure 1 and overlay it over versions of Figures 2 and 3 on the same scale, you would note that the force tracing for Figure 3 fills out the "theoretical model" to a greater extent than the force tracing in Figure 2. What then, is the pre-teen, sans talent and training, doing to "overachieve" expectations? (Please Note: I have not shared absolute performance measures. While absolute performance measures are interesting and necessary, at least in this line of research, to determining who "overachievers" are, the absolute measures draw our attention to talent and training and not technique.). Kinematic examination of these individual jumpers helps us find variables that are different between "overachievers" and "high" achievers (i.e., based solely upon vertical jump height). Then, through collaboration with pedagogues, motor specialists, etc., methodologies may be developed whereby the intervention strategies employed are applicable for elementary school children and Olympians.

**Figure 2**
Force Platform Vertical Jump Force Tracing of Successful Volleyball Player
There is much research to be done in vertical jumping alone before we can, with confidence, say this IS the proper technique, but I have taken ideas from what we have found, thus far in this research line, to effectively alter absolute vertical jump performance in 20 minute technique sessions. Average performance changes in 20 minutes of intervention result in 2-inch improvements for jump height. What elite performer in volleyball would not want 2 more inches on their vertical jump? I share this only to illustrate the potential usefulness of the “overachiever” model in teaching. The interventions I have made are without the assistance of pedagogues, motor specialists, etc. and will require much more formal collaborative examination before we can say, with certainty, that these variables really do matter.

If You Build “It”, “It” Will Come

Those of you who have seen the movie “Field of Dreams” might recognize the heading for this section as a slight variation of “If you build it, he will come”. This altered quote has become my motto for teaching undergraduate kinesiology (biomechanics) and for directing my research. While strongly influenced by the “overachiever” work we have done, this motto is also influenced to a great extent by research we have done examining intersegmental coordination. Specifically, we wanted to examine intersegmental coordination development for novel tasks with velocity and accuracy constraints.

In the late 80’s, as graduate students, Michael Bird and I (with Jackie
Hudson as our guide) decided to examine intersegmental coordination in a novel task as an offshoot of the “overachiever” work we were also doing. We had a small group of people (n=4) that we could keep occupied for some period of time (6 weeks) and we wanted to observe changes in intersegmental coordination as a result of intervention and practice. The novel task chosen was the badminton smash. The badminton smash was chosen because no one in our small group was a badminton player and, when executed skillfully, the badminton smash has velocity, accuracy and trajectory requirements. In other words, it should exhibit high velocity, be angled in a downward direction and must land within the constraints of the court boundaries.

Intersegmental coordination is commonly examined using joint angular velocities (proximally to distally) during the propulsive phase of a skill. It is most commonly presented as either simultaneous (push-like) or sequential (throw-like) in nature (see Figure 4). Examples of simultaneous intersegmental coordination would include almost all free weight lifting maneuvers (e.g., bench press and squats). We often describe these types of movements as push-like, but with respect to intersegmental coordination, we see all segments contributing to the skill at the same time. Examples of sequential intersegmental coordination include (but not limited to) throwing skills. In these throw-like skills, we see a sequencing of segmental contributions beginning with the more proximal segments and continuing to the more distal segments. While no one alive can move their body at 90 miles per hour (mph), the fingers must be moving at 90 mph if one is capable of throwing a baseball at that rate of speed. The only way the 90 mph fastball will result, is if the slow moving body effectively transfers momentum to the next distal segment and muscular involvement speeds that segment further until the appropriate time when the process can be repeated with the next distal segment. Eventually, the movement progresses to the extent of our linked system, and velocity is imparted to the object being thrown. It is speculated, however, that truly simultaneous and sequential intersegmental coordination patterns are only endpoints on a continuum of intersegmental coordination patterns and that skills exist (i.e., rowing) which combine attributes of both patterns. Further, there is also speculation that intersegmental coordination develops predictably. That is, with respect to throw-like patterns, appropriate sequencing precedes appropriate timing (see Figure 5 for a possible example).
Returning to our initial investigation, we wanted to examine intersegmental coordination in a novel task (badminton smash) and its development (if any) with intervention and practice. The results were really amazing (remember n=4). On pre-test, three of our four subjects exhibited an intersegmental coordination pattern (with very slight deviations) similar to the pattern suggested in Figure 5. The fourth subject exhibited an intersegmental coordination pattern identical to the sequential pattern seen in Figure 4.
(theoretically ideal). With respect to the purpose of the smash, we found that the first three individuals exhibited relatively low velocities and the shuttle was not directed at a downward direction in each of 10 trials. However, each of these people were a perfect 10 for 10 on accuracy. The fourth person (remember, theoretically ideal movement pattern) missed every shuttle. These data, at least for the 1st three subjects, support the speculation that appropriate sequencing precedes appropriate timing.

After six weeks of intervention and practice, the intersegmental coordination for the 1st three individuals, who exhibited accuracy success, progressed toward the “ideal” model in Figure 4, but had not quite exhibited truly appropriate timing of segmental contributions. Each person’s velocity had improved, trajectory angles had decreased and accuracy was still perfect in the testing trials. The fourth person’s intersegmental coordination did not change. However, after 6 weeks, this person’s velocities were faster than the other 3 performers, trajectory angles were lower than the other 3 performers, and all the smashes were in the court boundaries. What happened? While results from this investigation were presented at the International Society of Biomechanics in Sport (ISBS) in 1991 and a related study was presented to ISBS in 2009 primarily concerning sequencing and timing, I find that it is what we did not report, that has directed my “If you build “it”, “it” will come” approach to biomechanical research and teaching.

The 1st “it” refers to process in movement. The 2nd “it” refers to product. If we replace the “its” we come up with “If you build process, product will come”. Unique to our 4th performer in the first investigation was a desire to make the skill look right. The performer was a competitive volleyball player who had extensive experience with the volleyball spike. His understanding of the process of the overhand spiking pattern and the value it had for a similar movement pattern eventually led to this person experiencing greater and faster improvements in product when compared to the other performers. It was his unwillingness to compromise process for product that led to the follow up study in 2009 where we examined the intersegmental coordination of the badminton smash on a badminton court with and without a net and court markings in place. While the number of subjects (n=38) was larger, we were only able to support the conclusions from 1991, that appropriate sequencing precedes appropriate timing in throw-like intersegmental coordination. Alas, it seems that the badminton smash may be too novel a task for Midwestern college students (much to the astonishment and a few chuckles of our international peers). Since 1991, however, I have advocated teaching velocity before accuracy. We can alter processes (i.e., teaching cues and drills) that will affect velocity (product) and accuracy (product), but accuracy adds different motivational strategies that may not be conducive to getting the body to move efficiently or with proper technique conducive to also developing velocity. Thus, if we build the right processes, the best product for each individual will come.
Summary

I believe our job as movement specialists is to make every mover the best they can be. How can this be accomplished from a biomechanists point of view? First, lets find ways to examine technique without the confounding variables of talent and training. Find those “overachievers” and determine how they do it. Second, in collaborative efforts, with the other sub-disciplines in Kinesiology, find ways to build the process of efficient, technically sound movement for all levels of performers. Finally, prepare “applied” biomechanists by creating a generation of researchers that are concerned about movement and not solely the product of movement as a guiding theme in their research. Further, however, regionally focused institutions will be doing themselves and their students a favor by recruiting, retaining and valuing these “applied” biomechanists. Your students will profit through greater understanding and usability of biomechanical knowledge in the other sub-disciplines. Your faculty will also find someone who is able to collaborate effectively.

In sum, if the field of biomechanics begins concentrating on Technique (the right thing) without the added influences of talent and training, our usefulness in collaborative efforts will be realized. To do so, however, will require that “Fat Freddy” steps to the front of the class.

Selected References (Reverse Chronology)


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Abstracts from the Future Professionals
Poster Presentations
2009 MOAHPERD Conference
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2009 Dr. Patricia Mcswegin Research Award Winner
Comparison Of Strength Changes Following Resistance Training Using Free Weights And Machine Weights
Emma Lennon, Elli Mathis, and Anne Ratermann, Truman State
Faculty Mentors: Jerry Mayhew and Tim Schwegler
The purpose of this study was to assess the change in strength resulting from resistance training with free weights and machine weights. College men (N=429) who self-selected to train using free weights (FW, n = 173), seated horizontal press (SHP, n = 125), and supine vertical press (SVP, n = 131) were matched for FW 1-RM bench press and measured prior to and following resistance training 3 da/wk for 12 wks. Measurements included body weight, lean body mass (LBM), and %fat. Subjects who trained on machine weights were also measured for 1-RM on their specific training device. There were no significant differences in pre-training measurements of FW 1-RM or body composition, save for %fat which was lower in the FW group than in the SVP group. SHP and SVP were significantly greater than FW (17.1 ± 14.9% and 16.8 ±18.9%, respectively). These differences increased significantly following training (28.2 ± 15.2% and 26.9 ±17.1%, respectively) but were not significantly different. Following training, the FW group made a significantly greater gain in FW bench press (15.2 ± 13.0 lbs) than did the SHP group (9.6 ± 9.5 lbs) or SVP group (8.3 ± 11.0 lbs). However, when measured on each specific training device, the SHP (27.6 ± 14.0) and SVP (24.2 ± 13.4 lbs) groups made greater gains than did the FW group (15.2 ± 13.0 lbs). Thus, the magnitude of upper body strength gains appears to be specific to training device and does not appear to be equal across different devices.

Comparison of Alcohol Consumption Among College Men and Women of Different Exercise Levels
Abby Schuerman, Truman State; Faculty Mentor: Dr. Jerry Mayhew
The purpose of this study was to evaluate the alcohol consumption reported by college men and women with different levels of exercise. A beverage survey, which requested the average alcohol consumption per day during the week (WD) and on weekends (WE), was distributed to members (112 F, 64 M) of a wellness class. A Gender x Exercise Level ANOVA revealed that men drank more than women on WD (p<0.002) but not on WE (p=0.06). Exercisers tended to drink more than non-exercisers on WD (p = 0.06) but not on WE (p = 0.19). Male athletes (n = 20) and club sport participants (n = 10) drank 1.7 times more than less-active males (n = 26) on WD, a difference that increased to 3.9 times more on WE. Female athletes (n = 7) and club sport participants (n = 10) drank 6.0 times less than less-active females (n = 96) on WD, a difference that was reduced to approximately equal on WE; in both cases, the club sport participants drank significantly more than the athletes. From these limited data, it appears that more-active college men and women tend to consume more alcohol than less-active students, perhaps because they have more opportunities for social interactions or have larger social circles that support that activity. Since 89% of the subjects in this
The Relationship of Contact and Glasses Wear with Eye Health Practices among College Students

Kelly Durst, Truman State; Faculty Mentor: Dr. Jerry Mayhew

The purpose of this research was to examine the relationship of contact and glasses wear with yearly eye exams in college students. A 9-question survey related to overall eye health was developed and validated by a board-certified Optometrist. The survey was administered to members (N=193) of an introductory health classes. 75% of men (n = 72) and 78% of women (n = 123) rated maintaining eye health as a major concern. 60% of the sample currently wore glasses or contacts. Of those wearing glasses or contacts, 86% attended yearly appoints for vision checks, while only 33% of non-correction wearers maintained regular vision checkups. 62% of those wearing corrective vision wear reported using UVA protection while only 39% of non-correction wearers wore protection. Of those wearing glasses or contacts, 82% wore protective eyewear when working with hazardous materials but only 26% wore protection when playing sports. These findings suggest a variety of health issues including non-compliance with contact lens wearing schedules and increased chances of the occurrence of preventable eye diseases among college-aged individuals.

A Comparison of Attitudes Regarding Health Insurance Among Students at Truman State University

Dominique Johnson, Truman State; Faculty Mentor: Dr. Janice Clark Young

Over 1.7 million college students were uninsured in 2006 (Dawn, 2008). At Truman State University, health insurance coverage is required for international students only. The purpose of this study was to survey students’ attitudes about the need for health insurance coverage. A 33-item survey was administered online to Truman State University students (N=42, 11 males and 31 females) enrolled during summer semester 2009. The data indicated that the majority of survey respondents (85.7%, n=36) were insured mainly through their parents’ policies, did not think college students are more prone to have accidents and unintentional injuries than other age groups, and health insurance coverage was neither necessary while in college, nor important afterwards. All of the uninsured students were satisfied with being uninsured. Results suggested that more information should be made available to students regarding the university-offered health plan. Further investigation is recommended because of the small sample size of this study and the limited amount of existing research about college students, their insurance coverage, and their attitudes about health insurance.

Comparison Of Anthropometric Dimensions And Magnetic Resonance Imaging With Bench Press Performance In High School Football Players

Garret Powell, Missy Flickinger, Stephanie Grauel

Faculty Mentors: Dr. Jerry L. Mayhew and Dr. D. Chris Main

The purpose of this study was to determine the change in dominant arm muscle size and fat deposition before and after the completion of two cycles of the Bigger, Faster, Stronger program. High school, male, football players (N=7) trained 3 da/wk for 8 wks. Each subject performed a 1-RM bench press and was measured for selected anthropometric dimensions before and after training. An MRI was also performed on each subject’s flexed biceps before and after training. The 1-RM bench press increased nonsignificantly (p = 0.19) by 6 lbs (±11.4 lbs). Anthropometric arm
cross-sectional area (CSA) decreased by 3% following training (87.7 ± 19.4 vs 85.1 ±12.9 cm²), while MRI CSA increased by 5% (91.0 ± 18.1 vs 95.8 ± 17.8 cm²). These changes were not significant. Correlations of arm circumference, anthropometric CSA, and MRI CSA with 1-RM bench press were significant at pre-training ($r = 0.93$, 0.96, and 0.81, respectively) and post-training ($r = 0.87$, 0.91, and 0.89, respectively). MRI scans revealed significant decreases in biceps and triceps fat layers; however, skinfold measurements of these same locations failed to show significant decreases. In conclusion, it appears from this limited sample that changes in muscle size may not reflect changes in bench press strength in high school football players. Further analysis on a larger sample may be needed to confirm or refute the current findings.

Effect of Conditioning With And Without A Racquet On The Agility Of College Tennis Players

Anna Greenwald

Coaches appear divided on whether conditioning drills in tennis should be performed with or without the racquet. The purpose of this study was to determine the effect of performing agility drills with and without a racquet. Men ($n = 8$) and women ($n = 9$) varsity tennis players performed 3 pre-training trials of the pro-agility test (PAT) and line touch test (LTT) with and without a racquet. Scores were ranked and used to produce training groups using a matched-pairs design. The groups completed a 7-wk conditioning program consisting of different lateral agility drills performed 3 times/wk for a 10-min time period. One group (CON, $n = 8$) served as a control and performed all drills without a racquet; the experimental group (EXP, $n = 9$) completed all drills with a racquet held in proper playing position. Intraclass correlation coefficients indicated excellent reliability among the trials for PAT ($ICC = 0.96$) and LTT ($ICC = 0.98$), allowing the average of each test to represent performance. None of the differences in agility times between EXP and CON were significantly different. However, EXP decreased their PAT without racquet by 2.5% while CON increased their time by 6.7%. When PAT was performed with racquet, both groups produced times with <1% of their pre-training times. Both groups increased their LTT times by 2.9% to 6.3% following training. In conclusion, it appears that changes in short-term agility times appear comparable whether done with or without the racquet. Thus, it may be left to the description of the player or coach to decide which is preferred.

Effect Of General Fitness Training On Factors Contributing To The Margaria-Kalamen Stair Run Power Test

Anne Ratermann, Elli Mathis, and Emma Lennon, Truman State
Faculty Mentors: Jerry Mayhew and Tim Schwegler

The purpose of the study was to determine the effect of general fitness training on factors that influence power production in the Margaria-Kalamen stair run test. A convenience sample of college men ($n = 114$) enrolled in a general fitness class volunteered to be assessed using the Margaria-Kalamen power test (M-K), isotonic single-leg extension strength (LS), skinfold predicted %fat, and lean body mass (LBM). Subjects were tested prior to training and after 12 weeks of exercising for 40 minutes 3 days/week. Stepwise multiple regression selected LBM and LS, in that order, as the only significant variables contributing to the prediction of M-K power ($R = 0.85$, $SEE = 138$ W, $CV = 10\%$). Using the equation to estimate post-training M-K resulted in a significant ($t = 2.74$, $p<0.007$) under-prediction of 3.9% (±12.3%). However, if all scores were expressed as change scores (i.e., post-training – pre-training) and used to estimate change in M-K, the difference between predicted and actual scores was not
significant ($p=0.99$) despite only a modest correlation between them ($ICC = 0.45$). The current analysis indicated that, prior to training, greater LBM and stronger LS tended to produce higher M-K power values. General fitness training significantly increased %fat, LBM, LS, and M-K. The pre-training prediction was not effective in estimating post-training M-K power. However, the amount of change in LBM and LS following training provided acceptable estimates of the increase in power following general fitness training.

Factors Identifying Fast And Slow 40-Yd Dash Performances In Untrained College Women

Elli Mathis, Anne Ratermann, and Emma Lennon, Truman State
Faculty Mentors: Jerry Mayhew and Tim Schwegler

The purpose of this study was to determine the factors that identify fast and slow 40-yd dash performances in untrained college women. Fast ($n = 50$) and slow ($n = 49$) performers were selected from a convenience sample ($N = 125$) at a small, Midwestern university based on performance of two 40-yd dash trials. Subjects were also measured for vertical jump (VJ), standing long jump (SLJ), Margaria-Kalamen stair run power (M-K), isometric leg strength (ILS), skinfold-predicted %fat, and thigh cross-sectional area (CSA). Stepwise discriminant analysis selected SLJ, VJ, and CSA, in that order, to differentiate fast and slow performers (canonical correlation = 0.70). The unstandardized discriminant function correctly categorized 84% of the slow performers and 82% of the fast performers. The analysis indicated that greater SLJ, higher VJ, and smaller CSA were associated with faster 40-yd dash performance in untrained college women.

Comparison Of Percent Body Fat Measurement Techniques In Male And Female Distance Runners And Throwers

Kaylie Andersen and Michaela Steele, Truman State
Faculty mentors: Dr. Jerry Mayhew and Tim Schwegler

The purpose of this study was to determine the difference in the percent body fat (%fat) between male and female distance runners and throwers. College track athletes (18 M, 15 F) were measured on 7 skinfolds to estimate %fat from 3 athletic equations. In addition, %fat was estimated using a handheld bioelectric impedance analysis (BIA) device. A repeated measures ANOVA indicated there was a significant difference in %fat between the distance runners and throwers and between men and women. BIA underestimated %fat in distance runners by 1.2 to 3.4% fat units, while it overestimated in throwers by 5.3 to 6.2% fat units. However, when body size, determined by body mass index (BMI), was accounted for using ANCOVA, the two event groups were not significantly different ($p = 0.11$) in %fat; the significant difference between the genders remained ($p<0.001$). Therefore, the measurement techniques used to estimate %fat in athletes of different size are not consistent and may be overestimating in some and underestimating in others. These prediction techniques should be evaluated relative to a criterion reference such as dual energy x-ray absorptiometry.

Effects Of Exercise On Self-Image Of College-Aged Men And Women

Jennifer Talaski and Kate Spooner, Truman State; Faculty mentor: Jerry Mayhew

The purpose of this study was to determine the effect of exercise on self-perception in college men and women. A convenience sample of men ($n = 27$) and women ($n =
completed the Social Physique Anxiety Scale (SPAS) and an exercise frequency and type survey. A gender x frequency x exercise type (2 x 3 x 2) ANOVA produced a significant difference only between genders (p<0.01). Men had significantly higher SPAS scores than women.

**Effect of Caffeine on Steady State Running Performance**

**Keith Fangman**

Caffeine plays a curious role in the body’s systems. Through research and data collection, we hope to acquire a breadth of knowledge useful to the active community. The purpose of this study was to examine the physiological effects of caffeine on a 2-mile steady state run in women. Fourteen non-habitual caffeine users consented to participate. They ran on a treadmill connected to a metabolic cart, which examined their RER, rate of perceived exertion (RPE), and heart rate (HR). We also looked at their blood pressure before and after exercise but found that it was completely unaffected. The subjects completed 2 single-blind trials, one with caffeine and one with a placebo. The caffeine was administered according to each participant’s weight at a ratio of 5mg/kg. The difference in respiratory exchange ratio (RER) means between placebo and caffeine was less than 0.0030 (placebo 0.9728, caffeine 0.9700). Mean HR during the caffeine trial (180.84 bpm) was increased by 25 bpm, compared to the placebo trial (155.83bpm). During caffeine consumption half of the participants experienced a decreased RPE compared to placebo consumption. According to our study, caffeine does not appear to affect RER. Thus, caffeine does not increase substrate utilization. There is also evidence that caffeine increases HR during steady-state exercise. The lower RPE suggests that under the influence of caffeine the steady-state run seemed easier.

**An Investigation Of Physical And Psychological Effects Of Music On Running**

**B.W. Lundy, A.D. Dixon, D.R. Wright, K.A. Jackson, & S. Burns**

**University of Central Missouri**

Understanding how music benefits exercise is currently a popular topic even though many of the people do not understand what music or how music affects their own exercise individually. If someone knows that music can motivate them, they may be more inclined to use music to increase exercise. By testing classical, rock, and electronic genres against each other and no music, we compared the effects of each to determine if one is more or less beneficial, or if there is no difference. The selection criterion to participate was active, 18 to 30 yrs old (9 males and 3 females) and enrolled at the University of Central Missouri. Data collected included the distance reached during each 10 min treadmill exercise session. Subjects also separately rated on scales of 1 to 10 their motivation and perceived difficulty after each run, 1 being the lowest and 10 being the greatest. When looking at the mean distances, motivation, and perceived difficulty of the different genres, rock was the best motivator 8.17 ± 1.53, compared to no music 6.58 ± 2.02, classical 7.00 ± 1.41, and electronic 7.67 ± 1.92 (M ± SD). Rock genre elevated the subjects’ performances the most 1.75 km ± .31 km (no music 1.67 km ± .37 km, classical 1.64 km ± .34 km, and electronic 1.66km ± .34 km). Also, the subjects’ favorite genre (scale of 1-10) had a substantial increase in perceived difficulty 6.5 ± 2.28 when compared to the least favorite genre 7.75 ± 1.96. The data supports the hypothesis that rock is the most effective single genre for increasing intensity with the other genres having no significant differences in mean distances (± 0.03 miles). Finally, if a person was looking for a genre of music to motivate them or reduce how difficult they perceived a run, that person should choose their favorite genre.
Reviewers for the 2010 Missouri Journal of Health, Physical Education, Recreation and Dance

The editors wish to express their appreciate to the following professionals who freely gave of their time to act as reviewers for the many refereed articles we received this year. They worked hard to get the reviews done and offered helpful feedback to authors. Without their contribution, the Journal would not be able to publish refereed articles.

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