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*Editors*

*Kathleen M. Haywood*

*University of Missouri–St. Louis*

*Scott Strohmeyer*

*University of Central Missouri*

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# Teamwork from the Golden-Age Pirates: Could this Strategy Work in Today's Contemporary Sports Setting?

*Eric Street*  
*Steve S. Chen*

The focus of this paper encompasses the contemporary teamwork and coaching philosophy in today's sport setting. The authors compare and contrast the modern philosophy to the beliefs of Golden Age Pirates. Our effort is to determine whether the 17th century pirates' teamwork and leadership philosophy could still be successfully transitioned and utilized in modern sports today. Could this ancient system, developed in the 17th century, have any value in 21st century teamwork building and coaching? In this paper, the authors first reiterate the modern leadership principles and importance of the leadership role to the critical success of an organization and a sport team. Then, the authors provide the evidences on how ancient pirate crews executed teamwork and achieved efficiency by demonstrating leadership principles and practices of the modern era. To make this depiction more visible and relevant, the life of pirates at sea is illustrated. The authors explain how the code of conduct and philosophy abided by the pirate crews helped them become a highly organized operational unit in order to survive and succeed under harsh conditions. The role of captains and their leadership style are also closely examined. Evidently, the exemplary leadership of the captain was extremely critical to the safety and life of seamen in carrying out motivation, discipline, and reward and punishment. Discussion and analyses of this paper provides evidence to show the practices and principles of 17th century pirates can still help make and build successful sport coaches and leaders in the 21<sup>st</sup> century.

## **Modern Philosophy and Concepts in Leadership and Coaching**

### *Summary of Leadership Philosophy*

All organizations need proper leadership to guide and manage daily activities for accomplishing organizational success. Effective leadership can significantly boost morale and organizational commitment and creates a general positive attitude (Long, Yong, & Chuen, 2016). On the contrary, an organization with low level of member commitment would appear dysfunctional and has a low level of productivity. Both transactional and transformational leadership foster organizational commitment. Objective-oriented transactional leaders are quick to convey instruction and identify expectations. They monitor and reward performance whether actively following the guidelines or by exception. Relationship-oriented transformational leaders focus on the followers' motivation and

needs, thus they offer emotional support, delegate responsibilities, and collaborate with followers to garner trust. Therefore, transformational leaders are viewed as charismatic, inspirational, intellectual, inspiring and caring (Long et al., 2016). When those qualities are exemplified, members of the organization (followers or subordinates) will be drawn to the leaders by offering their loyalty and respect. Thus, affective organizational commitment is fostered (Pierro, Raven, Amato, & Belanger, 2013). When members of the organization are committed, they feel obligated and are emotionally attached to their organization with satisfaction for their rewards (or compensations). There is no need for harsh coercion and excessive position influence (Pierro et al., 2013).

#### *Leaders' Influence on Team Success*

Leadership is a determining factor that affects a team's performance. Leaders are individuals who guide a team to have a clear mission and high performance standards. They evaluate every available opportunity, source, and talent to allow teams to achieve their goals. They also allocate time to plan and organize for the optimal use of all resources. Furthermore, leaders train new members to become potential future leaders (Harper, 2012), as well as develop existing members to reach organizational objectives (Hughes, Gannett, & Curphy, 2015).

To build a successful organization or team, there should be ways to enhance good communication and minimize and resolve conflicts. Leaders are mainly responsible to use good communication to establish goals (Hughes et al., 2015; Weinberg & Gould, 2007). So, they often dispose their intelligence, assertiveness, independence, and self-confidence to further motivate subordinates and provide constructive feedback (Weinberg & Gould, 2007). Finally, leaders need to have the courage to emerge from the difficult situation and learn to adapt and adjust to the environment, to make decisions, and provide guidance (Weinberg & Gould, 2007).

Undoubtedly, coaches are the most important leadership figures within a sport team. Coaches are charged to deliver instruction, motivate players, build team cohesion, and evaluate performance. As described among all important leadership traits and style, they exert full effort to collaborate, inspire, care, and develop others. They also need to be flexible and knowledgeable to make decisions and solutions dealing with unexpected circumstances (i.e., occurrence of players' injuries and calling plays during timeouts). This means they need to demonstrate situational leadership in order to perform under pressure.

#### *Preferred Leadership Styles and Traits in Contemporary Sports*

Surujlal and Dhurup (2012) concluded that an autocratic leadership style was not conducive for athletes; therefore, coaches should not exhibit this type of behavior. Athletes and subordinates prefer a leadership style that promotes democratic behaviors, social support, cohesion building, positive feedback and constructive criticism. Legendary UCLA basketball coach, John Wooden was famous for spending a majority of his coaching time on positive verbal instruction and motivation (Weinberg & Gould, 2007). In the contemporary organizational and sport setting, this type of leadership coaching is considered as the best way to develop subordinates

and breed future leaders (Harper, 2012).

Evidently, coaches who can adapt to different situations and environments successfully are likely to increase their team's effectiveness and productivity, but also improve players' morale and loyalty to the team. Jerry Faust, the former head football coach at the University of Notre Dame and John Calipari, head coach of University of Kentucky men's basketball, were both credited for being creative in adapting to new situations and motivating players (Weinberg & Gould, 2007).

Scholars suggested that an autonomy-supportive coaching style was associated with higher performance and prosocial behavior towards teammates (Chen, Wang, Ronkainen, & Huang, 2016; Hodge & Lonsdale, 2011). Athletes and subordinates often prefer a leadership style that promotes democratic behaviors, social support, cohesion building, positive feedback and constructive criticism (Surujlal & Dhurup, 2012). Coaches who can adapt successfully not only will increase their team's effectiveness and productivity, but also will improve morale and loyalty to the team (organization). The use of systematic leadership coaching to train players could ensure affirmative changes and foster specific skills and personal growth (Harper, 2012). It is imperative that coaches select and demonstrate a leadership style according to the situation (or circumstance) to promote motivation and pro-social behavior towards teammates.

### **Philosophy and Articles of 17th Century Pirates**

Life at sea for pirates has been falsely overdramatized by Hollywood in portrayals such as the *Pirates of the Caribbean* series. The contemporary depiction of pirates by Disney could easily make one believe that pirates were a band of ruthless, violent, uncivil, and unorganized mercenaries led by an absolute autocratic captain and his first mate. According to those fictional depictions, once an individual is aboard the ship, life was nothing short of abuses and violations of arbitrary rules. A seaman who breaks a rule, suffers immediate death by walking the plank or being locked away in the brig.

The reality is that none of these depictions are true. In fact, 17th century pirates were a highly functioning team with zero tolerance of incompetent leadership at any level. Hughes, Gannett, and Curphy (2015) closely examined the behaviors and practices of pirates and documented those unique practices. They found that a pirate team was most often not just a band of 10 to 20 scraggly men, but more like 160 highly trained and competent troopers. If a task was to overtake another ship to lay claim to the riches aboard, the crew would attack as a highly cohesive unit with speed, precision, and unity. Hughes et al. (2015) further illustrated that the pirates would not tolerate laziness, incompetence, disloyalty, or weakness, since those traits might endanger everyone aboard and the mission. There was a well-known tactic at the time that immediate surrender of a ship would result in the whole crew being spared. Any pirate who defied this edict suffered severe punishment. In order to maintain good credibility and reputation, the entire pirate crew had to be well-disciplined and act honorably by not hurting other innocent (surrendered) seamen.

Pirate crews were large (over 160 people in size) and highly

functioning, with sub-units charged with tasks. To utilize smaller slave ships to execute a fast maneuver, the crews were often broken down into small teams to tackle tasks effectively. Pirates would achieve their goals in a maximum efficiency that is rarely seen in today's business or sport organizations. Like the modern day player contract, each pirate had to sign "Articles" before one could join as a member of the crew. The Articles addressed the code of conduct and protected the crew. There was total transparency in operation of the crew (Hughes et al., 2015). In several excerpts from Articles of 1721, example of pirates' rights and responsibilities were documented by Bartholomew Roberts. Table 1 summarizes the main nine principles of those Articles that explain how order and fairness are preserved among the pirate crew.

**Table 1**

**Principles and Contents of Articles Abided by the Pirates**

Title	Description
Article I	Each man can cast an equal vote in determining the movement and relocation of the vessel
Article II	Each man gets a fair share, if one cheats other crew members, he should be marooned and left to die
Article III	Gambling was strictly prohibited
Article IV	Mind for others (Lights and candles should be put out at night)
Article V	Each man should be war ready at any time (Keep one's piece, cutlass and weapons operational and ready at a moment's notice)
Article VI	No fraternizing with the opposite sex (Violation of this rule shall result in death)
Article VII	Do not desert one post (Violation of this may suffer immediate marooning or death)
Article VIII	A duel on shore can be imposed to resolve conflict
Article IX	Any man who becomes a cripple or loses a limb shall be relieved of service and receive additional compensations

Although some of the rules and punishments may seem harsh and impractical today, many of them were vital for the survival and completion of group tasks. Those Articles express the essence (or principles) of democracy, responsibilities, fairness, compassion, and discipline. Each member of the pirate crews would abide by these principles to work with other colleagues and respect each other. The contents of aforementioned Articles clearly demonstrate that the pirate crews were highly conducive to performance and loyalty that mirrors a great resemblance of today's sport teams and organizations.



### *The Role and Acts of a Pirate Captain*

It is easy for us to assume the captains of pirate crews were ruthless and brutal dictators who ruled according to their own wills and pleasure. In fact, most of the Hollywood portrayals about the “infamous” pirate leaders are inaccurate and misguided. According to Hughes et al. (2015), leadership authority on a pirate ship was procured, when the captain and crew members all executed the rules based on the aforementioned Articles. Captain and first mate were elected positions aboard a pirate ship. The captain was responsible for issuing direct instructions and orders, and the first mate or quartermaster often led the crew into battle. However, other decisions that impacted the wellbeing and benefits of the crew were made by a majority vote. This procedure of voting was usually conducted by a show of hands. Decisions could also be overturned utilizing the same method. Most importantly, captains could be both elected to and removed from power by a majority of votes. A ship might go through as many as 13 different captains on a single voyage (Hughes et al., 2015). Incompetence and recklessness shown by leaders was simply not tolerated on a pirate ship, as lives of crews and the success of the mission were contingent on competent leadership.

Sullivan and Kent (2003) found that leadership behaviors are in large part a function of the leader’s personal attributes. Pirate captains are often mischaracterized as evil individuals who abuse subordinates, pay nothing to compensate others, and have impossible demands and services. In fact, other than giving direct and quick instructions and orders under the rules of Articles, captains were effective in soft power to positive organizational atmospheres and obtained commitment from the crews (Pierro et al., 2013). Competent captains would earn the trust and loyalty from their crews and preserve a democratic-oriented subunit. In addition, unpredictable situational factors increased the stresses and danger associated with the pirate mission; therefore, the ability of captains to select and execute appropriate leadership style to guide and influence the crew members was critical.

Reward systems of the 17th century pirates were indeed much different than our 21st century modern organizations. Unlike the modern day leaders who may accumulate a great amount of wealth and compensation, the reward structure for distributing booty was set in a predetermined manner. The captain and first mate would receive no more than double the amount of a crew member (Hughes et al., 2015). Captains and their top assistants could not be greedy or selfish while trying to reward every crew member fairly. This practice is drastically different from today’s corporate business in America. Corporate executives obtain astronomical salaries in comparison to their subordinates. The existence of unfairness and inequality would naturally create internal unrest. Animosity would develop in light of the huge pay difference and selfish acts by the captains.

### **Discussion and Conclusions**

The essential traits and leadership behaviors for becoming a successful pirate captain in the 17th century and a modern day sport coach share many similarities.

As mentioned in the earlier section, pirate crews were highly functional teams that were guided with a democratic leadership style. In the piracy era, the captains often understood how to demonstrate appropriate leadership behaviors and practices to promote motivation and pro-social behavior towards crew members. Pirates' code of conduct depicted the idea of self-sacrifice for the greater good of the team. The success of each voyage relied on each pirate member's personal commitment to the collective objectives in order to effectively carry out one's duties on a daily basis. Strong commitment and self-sacrifice are two vital elements for nurturing teamwork. The authors believe that players and crew members alike both benefit and prefer a leadership style that focuses on the preferences of the subordinates.

Modern sport coaches frequently express a controlling style and a more authoritative approach with little regard for a player's feelings (Chen et al., 2016). This style is characterized by manipulation of tactics, guilt, and punitive measures for underperforming individuals. Furthermore, the controlling coaching style tends to create a negative environment, detrimentally impact the performance, and stir up anti-social behaviors among players (Chen et al., 2016). It would be ideal for the excessive controlling (or autocratic) coaches to learn the philosophy and tips from the 17th century pirate captains, so they could gain a new perspective on how to earn respect and trust.

Both pirate captains and sport coaches have group members that count on their guidance and wait for their instruction. They both need to rise to the occasion to make decisions and maximize the best outcome for the group under all types of challenging conditions. It is a disappointment that Hollywood studios persistently mischaracterize captains as being, incompetent, lazy, and ruthless, instead of showing the actual talent and charisma of the crews' competent leaders. In fact, research indicates that 17th century pirates had ethical and functional rules for them to achieve team cohesion. They also understood how to elect most qualified captains to motive, lead, and train others. It is highly evident that the crews' leaders often excel in building dynamic leader-follower relationships, fostering loyalty, and making best outcomes in critical situations. These exceptional captions' actions and traits make the authors think that true leadership qualities are ageless. Coaches in the 21<sup>st</sup> century may still examine early pirates' organizational principles and leadership styles to improve their coaching methodology.

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**ERIC STREET** holds the Master of Business Administration degree and is currently an instructor at Midway University in Kentucky and a doctoral student at the United States Sports Academy in Alabama.

**STEVEN S. CHEN** holds the Doctor of Sports Management degree and is currently a professor of Sport Management in the School of Business Administration at Morehead State University in Kentucky.

*Refereed Article*

# The Impact of Past Athletic Experience on Functional Movement Screen Scores in University Students

*Craig Triplett, Corey Selland, Daniel Jensen, Christopher Poole, and Nathan Deichert*

*The primary purpose of the current study was to determine if past high school athletic experience had an impact on Functional Movement Screen (FMS) scores in university students. The FMS is a tool designed to identify dysfunctional movement patterns by analyzing an individual's mobility and stability. Second, the goal was to investigate which sports impacted FMS scores. One hundred university students performed the FMS. Participants indicated which sport(s) and how many seasons they participated in each sport(s) during high school. Playing two or more sports ( $r=0.29$ ) and multiple sport seasons ( $r=0.32$ ) in high school was correlated with higher FMS scores in university students ( $p < 0.05$ ). Pearson  $r$  values represent relationship between the total number of sport seasons played in high school and FMS scores and the total number of sports played in high school and FMS scores. Participation in high school football [15.29 (2.37) vs. 13.55 (2.72)], basketball [14.71 (2.54) vs. 14.19 (2.79)], or track [15.00 (2.57) vs. 13.96 (2.71)] for males and volleyball [15.13 (2.71) vs. 13.88 (2.20)], basketball [15.22 (1.90) vs. 13.88 (2.69)], or track [14.90 (2.20) vs. 14.08 (2.63)] for females was associated with higher FMS scores in university students. The results suggest participating in multiple sports could increase FMS scores, potentially leading to decreased injury risk or improved performance.*

*Keywords:* Functional test, asymmetry, injury risk factors

A popular topic of sports medicine and performance enhancement research has been the pre-participation or pre-season athletic screen. Screens are often performed prior to the commencement of a training program. Common procedures attempt to identify individuals that may be at an increased risk of injury (Abraham, Sannasi, & Nair, 2015; Henry, Evans, Snodgrass, Miller, & Callister, 2016; Khayambashi, Ghoddosi, Straub, & Powers, 2016; Padua et al., 2015; Shanley et al., 2015; Smith, DePhillipo, Kimura, Kocher, & Hetzler, 2017; van Dyk et al., 2016;

Weinhandl et al., 2014). Screening procedures are utilized to identify muscular imbalances, weaknesses, or asymmetries that may increase an individual's risk of getting injured, but also may provide valuable qualitative data to the fitness professional in regard to the movement quality of their athlete or client.

The Functional Movement Screen (FMS) is a tool designed to identify dysfunctional movement patterns by analyzing an individual's mobility and stability. The assessment consists of 7 individual tests (deep squat, hurdle step, in-line lunge, shoulder mobility, active straight leg raise, trunk stability push-up, and rotary stability) scored on a scale from 0-3, with a total sum composite score of 21 (Cook, Burton, Hoogenboom, & Voight, 2014a, 2014b). The FMS has been used to predict injury rates and performance outcomes on several populations including: professional American football players, elite track and field athletes, Marine officer candidates, adolescent children, young active adults, high school baseball players, junior and high school ice hockey players, high school athletes, and female collegiate athletes (Abraham et al., 2015; Bardenett et al., 2015; Chapman, Laymon, & Arnold, 2014; Chorba, Chorba, Bouillon, Overmyer, & Landis, 2010; Kiesel, Plisky, & Butler, 2011; Kiesel, Plisky, & Voight, 2007; Kiesel, Butler, & Plisky, 2014; O'Connor, Deuster, Davis, Pappas, & Knapik, 2011; Parenteau et al., 2014; Schneiders, Davidsson, Horman, & Sullivan, 2011; Song et al., 2014). Research involving professional American football players identified individuals scoring  $\leq 14$  on the FMS are more likely to become injured than individuals scoring  $\geq 15$  (Kiesel et al., 2007). This injury risk cut-off score has been debated in research and clinical application.

A recent meta-analysis has concluded that the use of the FMS as an injury prediction tool may show conflicting evidence. A primary concern was the relatively low number of studies that provide strong statistical significance that individuals scoring  $\leq 14$  on the FMS are more likely to become injured than individuals scoring  $\geq 15$  (Moran, Schneiders, Mason, & Sullivan, 2017). Due to the conflicting nature of the research studies examined in the meta-analysis, additional investigation was warranted to identify if a cut-off score can identify a person's risk for injury, or whether additional factors need to be examined when predicting an individual's risk for injury, such as their past participation in athletics.

Despite lack of data supporting the injury risk cut-off score, no research has examined the effect of previous athletic participation on an individual's performance on the FMS. Therefore, the purpose of this study was to determine if the number of seasons played during high school and the number of different high school sponsored varsity sports an individual participated in was associated with their FMS scores as university students. The secondary objective was to investigate which high school sponsored varsity sports had a significant impact on FMS scores for both males and females, due to the differences in sports played by each gender. The researchers' hypothesis was that the more sports

an individual participated in during high school, the higher their FMS score. The hypothesis was based on research that suggested that early specialization in one specific sport may lead to increased physiological stress, overuse injuries, and decreased desire to continue participation in sports (Fabricant et al., 2016; Jayanthi, Pinkham, Dugas, Patrick, & Labella, 2013; Pasulka, Jayanthi, McCann, Dugas, & LaBella, 2017). The result of early specialization in a single sport could lead to a decreased FMS score as a university student. The researchers also hypothesized that the type of sport would impact the overall FMS score due to the unique biomechanical forces that each sport places on an athlete. Due to the FMS identifying mobility and stability in multiple planes of movement, the researchers hypothesized that male participants who played football, basketball, or wrestling would have a higher FMS scores due the biomechanical demands of these sports in all three planes of movement. Similarly, the researchers hypothesized that female participants who played basketball or volleyball would have a higher FMS scores due the biomechanical demands of these sports in all three planes of movement. Additionally, males and females who participated in bowling, track, and cross country would have lower FMS sore due to the primarily single plane demands of these sports.

### **Methods**

The current retrospective study examined if the number of high school sports seasons was associated with FMS scores in university students. In addition, we examined the association of various high school varsity sports participation with current FMS scores in university students. A convenience sample of 100 healthy participants (57 females, 43 males) between 18 and 26 years of age ( $X = 19.5 \pm 1.7$  years) were recruited from a university level introductory wellness class. Participants included in the study engaged in regular physical activity as part of the university wellness class, which consisted of two structured moderate to vigorous group exercise sessions each week. Exercise sessions were a combination of circuit resistance training and cardiovascular exercise. Exclusion criteria included any reported recent (within 6 weeks) musculoskeletal or head injuries that may affect their overall performance on the FMS.

After participants provided written informed consent, and prior to the FMS testing, each participant completed a short written questionnaire. The questionnaire asked the following: age of participant, which school sponsored high school varsity sport(s) the participant competed in, and how many seasons the participant competed in each sport.

The lead researcher was blinded to questionnaire results until after FMS testing was completed. The FMS has demonstrated acceptable interrater and intrarater reliability (Shultz, Anderson, Matheson, Marcello, & Besier, 2013; Minick et al., 2010). In order to ensure intrarater reliability, all scoring was performed by the lead researcher, who is FMS Level 1 Certified. The participants were asked to wear their usual workout clothing and athletic



shoes. Each participant performed each of the seven tests (deep squat, hurdle step, in-line lunge, shoulder mobility, active straight leg raise, trunk stability push-up, and rotary stability) three times. Each time the participants performed each of the seven tests they were scored on a scale of 0 to 3. A score of 0 indicated that the participants reported pain during the performance of the specific test. A score of 1 indicated a failure to complete the test or a loss of balance during the test. A score of 2 indicated completion of the test, but with movement compensation. A score of 3 indicated completion of the test, without a movement compensation. For each of the seven tests, the highest score of the three trials was given to the participant. For tests with a bilateral assessment component, (hurdle step, in-line lunge, shoulder mobility, active straight leg raise, and rotary stability), both the right and left sides were scored. If there was a difference between right and left scores, the lower of the two scores was taken, indicating an asymmetry on the test. The sum of the seven assessments provided an overall maximum score of 21. Three of the tests (shoulder mobility, trunk stability push-up, and rotary stability) within the FMS also have a clearing procedure associated with them, to further assess if certain movements are painful. During the clearing procedures, which are additional movements used to identify the presence of pain, the participant was given a positive if they reported pain during the clearing procedure or a negative if they reported no pain. FMS scores were calculated and compared to the results on the questionnaire for each participant during statistical analysis.

## Results

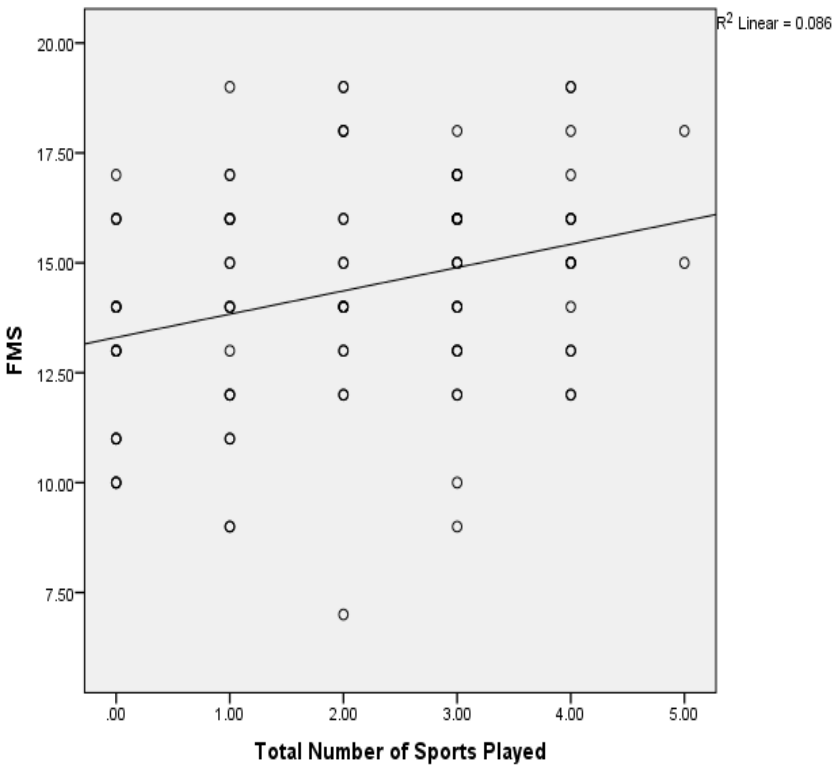
The mean FMS score for all participants was 14.4 ( $SD = 2.6$ ). The range of high school sport season participation ranged from 0 to 16, with a mean of 6.8 seasons ( $SD = 5.0$ ) across an average of 2.07 sports ( $SD = 1.4$ ). Fifty participants had an FMS score  $\leq 14$  and 50 participants had an FMS score  $\geq 15$ . Demographic statistics by gender are shown in Table 1.

The main goal of the current study was to determine the strength of association between participation in high school sports and FMS scores as university students. Pearson correlations were calculated to determine the relationship between the total number of sports played in high school and FMS scores ( $r=0.29$ ) (see Figure 1), as well as the total number of sport seasons played in high school and FMS scores ( $r=0.32$ ) (see Figure 2). Both correlations were statistically significant ( $p < 0.05$ ) and showed a positive relationship to FMS scores (see Table 2), with greater participation in high school sports predicting higher FMS scores. Total number of sports played accounted for 8.4% of the variance in FMS scores while the total number of seasons accounted for 10.2% of the variance. These results were consistent for both males and females.

**Table 1**  
**Descriptive Statistics**

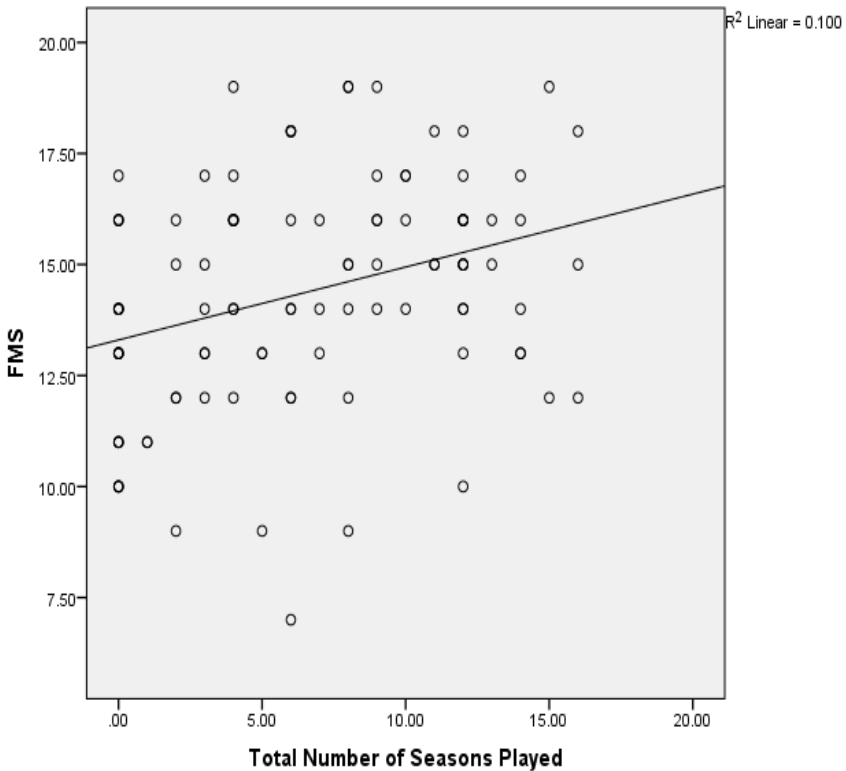
Characteristics	Females (n = 57)		Males (n = 43)		t
	Mean	SD	Mean	SD	
Age	19.2	1.3	19.9	1.97	2.2*
Number of seasons played	6.2	4.9	7.3	4.89	1.1
Number of sports played	1.9	1.4	2.3	1.41	1.6
FMS	14.4	2.5	14.4	2.67	.02

*Descriptive Statistics: The range of high school sport season participation ranged from 0 to 16 across an average of 2.07 sports (SD = 1.4). Fifty participants had an FMS score ≤ 14 and 50 participants had an FMS score ≥ 15.*



**Figure 1**  
*Relationship Between High School Sports Played and FMS Score (r=.32, p < .001)*





**Figure 2**  
*Relationship Between High School Sport Seasons Played and FMS Score ( $r=.29, p < .001$ )*

Our next goal was to determine if participation in specific sports (e.g., football, basketball, etc.) demonstrated stronger relationships with higher FMS scores than other sports. Although students reported participation in numerous high school sports ( $n = 13$  different sports), only four sports were endorsed by 20 or more students in the current study. Therefore, our analyses to test the relationship between specific sport participation and FMS scores was limited to football ( $n = 21$ ), basketball ( $n = 39$ ), volleyball ( $n = 24$ ), and track ( $n = 40$ ). To test the impact of specific sports, we conducted independent samples  $t$ -tests comparing FMS scores between participants and non-participants.

**Table 2**  
**High School Sport Participation and FMS by Gender**

	<i>r</i>	<i>p</i>
Overall Sample ( <i>n</i> = 100)		
Total Sports	.32	< .001
Total Seasons	.29	< .001
Females Only ( <i>n</i> = 57)		
Total Sports	.36	< .01
Total Seasons	.33	< .01
Males Only ( <i>n</i> = 43)		
Total Sports	.27	< .05
Total Seasons	.26	< .05

*Pearson r values for the total number of sport seasons played in high school and FMS scores and the total number of sports played in high and FMS scores. All correlations were statistically significant ( $p < .05$ ).*

In our sample, football and volleyball had only male and female participants, respectively. Therefore, these analyses included only one gender. As shown in Table 3, a large, statistically significant difference was found on FMS scores between males who played and males who did not play football ( $t(41) = 2.23, p = .02$ ). Specifically, males who played football demonstrated a higher FMS score than males who did not play football. Similarly, a significant difference was found between females who played volleyball and those who did not ( $t(55) = 1.91, p = .03$ ). Females participating in volleyball had higher FMS scores relative to those of non-participants.

Because males and females reported playing basketball and track, we compared FMS scores using the complete sample as well as examining FMS scores across gender (see Table 3). Of the 39 basketball participants, 17 were males and 22 were females. Results again show that participants who competed in basketball scored significantly higher on the FMS test ( $t(98) = 1.90, p = .03$ ). Interestingly, the effect size for females was larger than those observed for males. Similar results emerged for track. Participants who competed in track in high school showed significantly higher FMS scores than non-participants ( $t(98) = 1.78, p = .04$ ). Males ( $n = 18$ ) and females ( $n = 22$ ) displayed similar effect sizes.

**Table 3**  
**FMS Scores by Gender across Sports**

Sport	Athletes		Non-Athletes		<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Football (Male Only)	15.29	2.37	13.55	2.72	.68
Volleyball (Female Only)	15.13	2.71	13.88	2.20	.51
Track (Overall)	14.95	2.34	14.03	2.64	.36
Males	15.00	2.57	13.96	2.72	.39
Females	14.91	2.20	14.09	2.63	.33
Basketball (Overall)	15.00	2.19	14.02	2.71	.39
Males	14.71	2.54	14.19	2.79	.19
Females	15.23	1.90	13.89	2.69	.55

*Comparison of FMS scores using the complete sample as well as examining FMS scores across gender.*

### Discussion

The purpose of this study was to determine if the number of seasons played and number of different sports an individual participated in (high school sponsored varsity sports) was associated with their FMS scores as university students. The secondary objective was to investigate which high school sponsored varsity sports had a significant impact on FMS scores for both males and females, due to the differences in sports played by each gender. To date, there is no data providing information on whether previous athletic participation influences performance on the FMS. The primary finding of the current study supported the authors' hypothesis that the more sport seasons and number of sports participated in during high school, the higher one would score on the FMS.

The current study provides empirical evidence, from a sizeable group of active male and female university students, that the number of high school sport seasons and sports played is positively correlated with performance on the FMS. The data show a statistically significant association between a university student's FMS score related to the number of high school sport seasons and sports played. To date, there is a lack of normative FMS data for specific sports, particularly in various age groups. Several studies have identified mean FMS scores in specific sport and age populations

including: collegiate female soccer players = average FMS score of 13.6, female collegiate volleyball players = average FMS score of 15.3, elite track and field athletes = average FMS score of 15.4, youth boys ice hockey = average FMS score of 12.6, and female collegiate basketball players = average FMS of 14.6 (Chapman et al., 2014; Chorba et al., 2010; Parenteau et al., 2014). Many of the studies were conducted on a smaller sample size of athletes with a more homogenous group of individuals (due to participants being on the same sports teams, and likely participating in the same training program). Although our data indicates an overall FMS score, we cannot make direct comparisons to studies that have analyzed homogenous samples, due to the heterogenous nature of university students in the present investigation. However, it is plausible to assume that another group of physically active university students with mixed athletic backgrounds would score similarly to the current sample.

The results of the current study indicate that participation in high school football, basketball, or track for males and volleyball, basketball, or track for females was associated with higher FMS scores as university students. This may suggest that the unique training and biomechanical movements in multiple planes of movement required of these sports results in improved overall mobility and stability. As a result, we postulate that multiple sport participation will result in higher scores on the FMS and potentially reduce the risk of injury. Results also suggest participating in more sports and sports seasons was associated with greater FMS scores. Clinicians may recommend multiple sport participation as a way to potentially increase FMS scores. While not all high school athletes go on to participate in collegiate sports, the data presented are valuable because many high school athletes participate in recreational sports and leisure fitness pursuits during their undergraduate education. The FMS is an assessment tool utilized to determine the level of functional movement capabilities of an individual. Thus, the higher one's score on the FMS, the possibility exists that this individual is more prepared to undergo the physical stressors involved in such endeavors as a result of their previous athletic experience. Future research discerning this relationship is warranted. Future research should also focus on tracking FMS scores in high school athletes and continuing to track scores as they transition to college in order to measure injury rates, performance, and make further comparisons.

The current study included a large and relatively equal number of both male and female participants. A limitation of the study was that the investigators did not assess how many years had passed since each participant last played high school sports. An increased length of time between last playing sports in high school and performing the FMS may potentially impact a participant's score. Also, the questionnaire did not ask the students to identify previous injuries sustained in high school which may have affected FMS scores as college students. The large sample sizes allowed for meaningful comparisons to be made between FMS scores

and number of high school sport seasons played. However, participants included only young, physically active individuals; therefore, direct relationships may not be applied to the general population, but only to populations with similar ages and physical activity levels/backgrounds.

In conclusion, playing multiple sports and multiple sport seasons in high school was correlated with higher FMS scores in university wellness students. Participation in high school football, basketball, or track for males and volleyball, basketball, or track for females was associated with higher FMS scores as university students. The results shown in this study highlight the potential benefit of participating in multiple youth sports which could increase FMS scores, potentially leading to decreased injury risk or improved performance. Further research is needed to support these findings.

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**CRAIG TRIPLETT** holds the Doctor of Physical Therapy degree and is current an Assistant Professor of Exercise Science at Black Hills State University in Spearfish, South Dakota. Craig is a practicing physical therapist and Certified Strength and Conditioning Specialist.

**COREY SELLAND** holds the Doctor of Philosophy degree and is current an Assistant Professor of Exercise Science at Black Hills State University in Spearfish, South Dakota. Corey is an American College of Sports Medicine Certified Exercise Physiologist.

**DANIEL JENSEN** holds the Doctor of Physical Therapy degree, is an Assistant Professor of Exercise Science at Black Hills State University in Spearfish, South Dakota, and is a practicing physical therapist.

**CHRISTOPHER POOLE** holds the Doctor of Philosophy degree, is an Instructor of Exercise Science at Black Hills State University in Spearfish, South Dakota, and is a Certified Strength and Conditioning Specialist.

**NATHAN DEICHERT** is an Associate Professor of Psychology at Black Hills State University in Spearfish, South Dakota.



*Refereed Article*

# Activity Levels of Children Attending a University Summer Camp

*Andrea Cullers and Maria Bruggeman*

*Only one in three children nationwide are physically active every day. During the summer months, elementary aged children spend a greater proportion of their time in sedentary or light activities. Summer is an opportunity for children to attend camp, with approximately 14.3 million children attending summer camps each year. The purpose of this study was to measure the activity level of children participating in a university sponsored children's activity camp (CAC). Children attending the camp participated in tennis, racquetball, bowling, Frisbee, golf, swimming, canoeing, archery, fishing and other activities throughout the week. Children attending the CAC were between the ages of 7 and 12 years. Camp participants were divided into four different groups based on age (Red 7-8 years old, Green 8-9 years old, Blue 10-11 years old, and Purple 12 years old). Twenty-eight children participated in the study. Over the three-day camp period, participants as measured by the Movable activity device, averaged  $7,800 \pm 2,500$  movements and  $5.2 \pm 3.2$  miles per day. There was not a statistically significant difference in movements between groups as determined by one-way ANOVA ( $F(3,77) = 2.198, p=0.095$ ). However, there was a statistically significant difference in miles between groups as assessed by one-way ANOVA ( $F(3,77) = 7.502, p<0.001$ ). This study provides camp leaders with insight into the movement patterns of the campers. By learning more about the children participating in the CAC they can develop an intervention targeted at both the parents and the children to encourage increased activity over the summer months.*

*Keywords:* children, activity, exercise, summer camps

Childhood obesity rates have nearly tripled since 1970 (Fryar, Carroll & Ogden, 2014). With obesity rising, nearly one in five school-aged children is obese (Fryar et al., 2014). Children with obesity are at an increased risk for serious health conditions later on in life such as heart disease, type 2 diabetes, metabolic syndrome, and several types of cancer (Jelalian & Mccullough, 2012). Not only are health problems a concern with childhood obesity, but mental health is also affected. Children that are obese are more likely to get bullied and picked on by normal weight peers



(Geel, Veddar, & Tanihon, 2014).

Only one in three children nationwide are physically active every day (U.S. Department of Health and Human Services, 2016). Studies have concluded that young children are not regularly involved in the daily 60 minutes of moderate to vigorous physical activity recommended by the Physical Activity Guidelines for Americans (Jelalian & McCullough, 2012; Wolfenden, 2011). Sixty minutes a day of physical activity is recommended in children because it contributes to their physical, mental and cognitive development. The U.S. Department of Health and Human Services Center for Disease Control and Prevention has recommended physical activity guidelines for children and adolescents that are important to living a healthy lifestyle (2008). These guidelines include 60 minutes of moderate-to-vigorous physical activity (MVPA) daily for children age 2 and older.

During the summer months, elementary aged children spend a greater proportion of their time in sedentary or light activities (Tovar, Lividini, Economos, Folta, Goldberg & Must, 2010). This increase in sedentary activities contributes to children gaining a larger amount of body weight during the summer months than during the school year (von Hippel PT, Powell, Downey & Rowland, 2007). Physical fitness improvements during the school year are often lost during the summer break and a decrease in fitness levels is seen (Carrell, Clark, Peterson, Eickhoff, & Allen, 2014). Summer is also an opportunity for children to attend camp, with approximately 14.3 million children attending summer camps each year (Afterschool Alliance, 2010). Children attending camps are more active than those at home (Tovar et al., 2010). Summer camps can provide an opportunity for children to be active with their peers.

The purpose of this study was to measure the activity level of children who participated in a southwest Missouri university's children's activity camp (CAC). This observational study provides information regarding the amount of movement children performed during the summer camp.

## Methods

The CAC was a 4-day camp put on by the Kinesiology Department and students majoring in Physical Education or Health Promotion and Wellness. The camp was 12-5pm Monday thru Thursday during the first week of June. Children attending the camp participated in tennis, racquetball, bowling, Frisbee, golf, swimming, canoeing, archery, fishing, and other activities throughout the week.

Children attending CAC were between the ages of 7 and 12 yrs. The Institutional Review Board at the university approved the study. Parents of the participants enrolled their child in the camp and paid the registration fee. Camp participants were divided into four different groups based on age (Red 7-8 yrs old, Green 8-9 yrs old, Blue 10-11 yrs old, and Purple 12 yrs old). A simple randomization method was used, each group's campers

were listed alphabetically and the researcher contacted the parent of every-other-child on the list to inquire about participation. Children had to be considered healthy and able to complete all camp activities and able to attend all 4 days of the camp to participate. Parents that indicated an interest in participating had an information letter, consent form and child assent form mailed to them. Additionally, on the first day of camp these materials were available for parents and children participating in the study.

On the first day of camp parents whose children were participating in the study arrived 30 min early to review and sign the parental consent and child assent forms. Children were provided with a Movband 1 device (<https://shop.movable.com/devices.html>). Forty moveable devices were initially available for use. This device is worn on the wrist and looks similar to a watch and functions like a pedometer tracking distance and measures body movements on 3-axis (side-side, up-down, back-front). Number of movements and miles were recorded from each device at the end of each day and the Movband was reset.

After camp was completed, data from each device was analyzed using IBM SPSS Statistics 24. Descriptive statistics, t-tests to assess between group differences and a one-way ANOVA with Tukey Post-hoc tests was completed.

## Results

Of the forty Movbands, 12 of batteries would not hold a charge for the 5-hour camp day. Data was not collected on children that were assigned to those 12 watches. Twenty-eight children participated in the study, 6 from the Red, 8 from the Green, 7 from the Blue, and 7 from the Purple Group. Fourteen males and fourteen females completed the study. The number of males and females were evenly distributed in each group of campers participating in the study.

Over the three-day camp period participants averaged  $7,800 \pm 2,500$  movements and  $5.2 \pm 3.2$  miles per day. The mean and standard deviation of miles and movements completed by each group are presented in Table 1.

There was not a statistically significant difference in movements between age groups as determined by one-way ANOVA ( $F(3,77) = 2.198, p=0.095$ ). A Tukey post hoc test revealed that there was no significant difference in the number of movements completed by each group. However, males accumulated more movements than female campers ( $p<0.001$ ) during the 3-day time period.

**Table 1**  
**Mean Movements and Miles of Children Participating in a Summer Activity Camp**

Groups	Number	Movements	Miles
Red	6	8883 ± 2259	5.3 ± 2.2 <sup>a</sup>
Green	8	9300 ± 2977	7.4 ± 4.1 <sup>b</sup>
Blue	7	5783 ± 953	3.0 ± 1.0 <sup>c</sup>
Purple	7	7079 ± 1748	4.9 ± 2.3 <sup>a,b,c</sup>

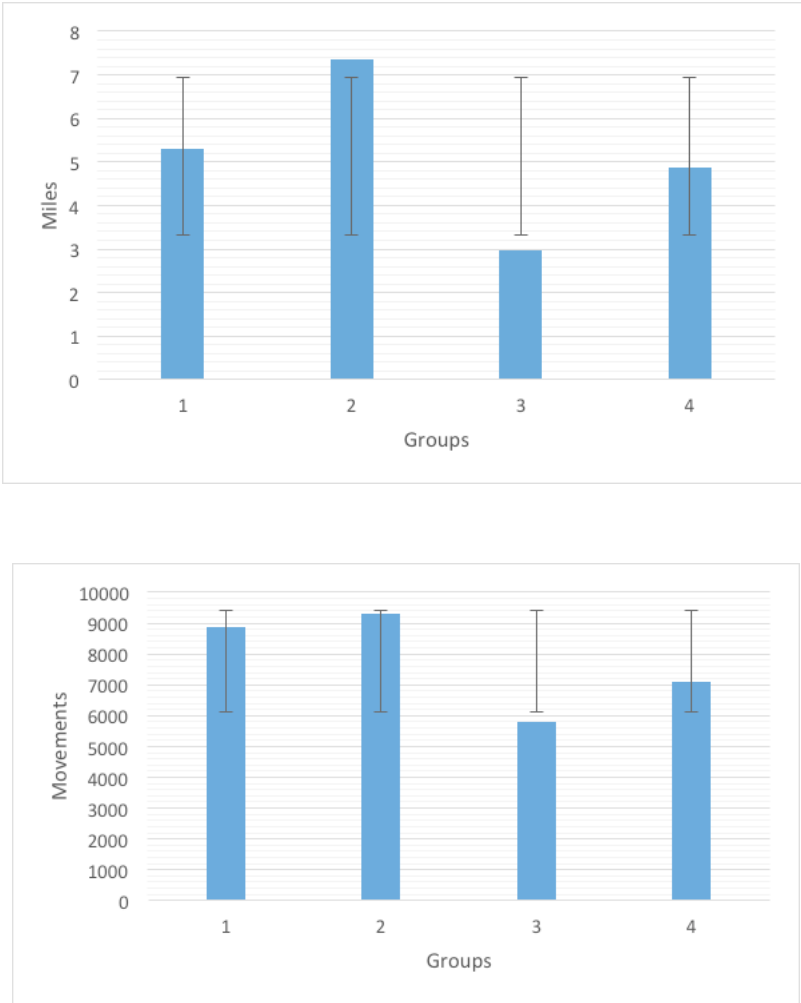
*Note.* Means ± standard deviations, no significant difference in movements among the groups as measured by ANOVA. ANOVA and Tukey's post hoc analysis measured significant differences in miles among the groups. Superscripts illustrate group differences.

There was a statistically significant difference in miles between groups as determined by one-way ANOVA ( $F(3,77) = 7.502, p < 0.001$ ). A Tukey post hoc test revealed that there was a significant difference in the number of miles completed by the Red and Purple group ( $p = 0.003$ ) the Green and Purple group ( $p < 0.001$ ), and the Blue and Purple group ( $p = 0.13$ ) Figure 1 illustrates the differences in miles seen between the groups. Males also accumulated more miles than females ( $p < 0.001$ ).

## Discussion

Previous research has reported that 60 min of MVPA is correlated with 11,000 -12,000 movements as measured by an accelerometer (Colley, Janssen, & Tremblay, 2011; Adams, Johnson & Tudor-Locke, 2013). None of the children in our study met that level of movement. However, the campers only wore the watches from 12:00pm to 5:00pm so accumulating over half the recommended movements during that time-period does illustrate how active the children were while at camp.

Other studies have reported that females have a lower activity level compared to males during the summer months (Tovar et al., 2010). For each age group females were significantly less active than the male participants were ( $p < 0.001$ ). Both genders participated in the same activities during the camp day but there were periods of free play built into the day, which may have been times when females were less active than the males.



*Note: Group 1 Red, 2 Green, 3 Blue, 4 Red. Means, standard deviations indicated by error bars.*

**Figure 1**  
*Daily Average of Movements and Miles of Children 7-12 Attending a Summer Activity Camp*

It is interesting that there were significant differences in miles but not movements among the groups. This could be from the way in which the Movband calculates movements and miles differently. Movements are calculated on 3-axis and many of the camp activities were upper body movements only: fishing, archery, and canoeing.

Student counselors at the CAC are majoring in Physical Education or Health Promotion and Wellness and are trained to teach activities. A goal of the activities that are taught is for there to be little waiting in line and have 2 or more options available so that campers are not sitting or standing for periods of time. However, on 2 of the 3 days campers rode on buses for 10-15 min periods 3 times during the day to be transported to golf and bowling activities. On one camp day campers rode on the bus 25 min each way to an off-camp site for fishing, archery and canoeing. These bus rides may have contributed to lower movement counts. Outdoor temperatures and training of camp staff have been shown to affect participation and activity during camp sessions (Beets, Weaver, Beighle, Webster, & Pate, 2013).

The campers participating in CAC are predominately Caucasian and middle to upper socioeconomic status. Cleland and colleagues (2008) reported that lower SES and ethnic minorities both have lower activity levels during the summer months. The camp is \$100/wk limiting participation to families with discretionary income. The original study design was to have 40 campers wear the Movbands for all 4 days of camp, however due to technical problems with charging the watches only 28 campers were able to wear the devices for 3 camp days. The camp has approximately 100 campers so by reducing the participation rate from 40% to 28% generalizability has been reduced.

Charging and downloading problems with the Movables was experienced and the authors were unable to receive technical support for the device because the company that owned Movables was purchased and the purchaser no longer supports the device.

This study provided the camp leaders with insight into the movement patterns of the campers. This knowledge gained can help direct the training of the counselors so to engage female campers more in the activities. Additionally, the data obtained from the study will aid the camp in creating activities that may result in higher participation from the Blue group (10-11 yrs), which was the group with the lowest movements and miles recorded during the camp.

Kinesiology faculty and students will continue conducting research with the CAC, learning more about the relationship of parental knowledge of childhood activity recommendations and fitness levels of the campers. Another area of question we would like to explore is if the campers decrease their activity levels after camp is over. By learning more about the children participating in the CAC we can develop an intervention targeted at both the parents and the children to encourage increased activity over the summer months.

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*ANDREA CULLERS holds the Ph.D. and R.D. degrees and is an Assistant Professor in the Kinesiology Department at Missouri Southern State University.*

*MARIE BRUGGEMAN hold the Master of Science degree and is an Assistant Professor in the Kinesiology Department at Missouri Southern State University.*

*Refereed Article*

# Personal Trainers' Knowledge, Attitudes, and Behaviors Toward Dietary Supplements

*Gina Blunt Gonzalez and Dayna Seelig*

*Personal trainers not only provide physical training for clients, but also counsel clients on a variety of other health-related topics such as stress management, nutrition, and weight control. This places the personal trainer in a prime position to give advice, recommend, or counsel clients on dietary supplements. The purpose of this study was to better understand personal trainers' knowledge, attitude and behaviors toward dietary supplements, both for their use and recommending supplements to their clients. Thirteen trainers in fitness centers, community centers, and personal training studios in a subsection of Eastern Kentucky were recruited to participate in a one-on-one interview. Responses were coded and analyzed for themes. Participants reported a wide range of behaviors with some avoiding supplements and others recommending supplements to all clients. Personal trainers used personal experience with the product, anecdotal evidence, known adverse effects, and dietary need when determining the safety and efficacy of a product. Greater effort should be made by certifying agencies and formal educational programs to ensure personal trainers have the tools to help clients make informed choices while protecting themselves from liability when it comes to dietary supplements.*

Keywords: supplements, ergogenic aids, personal trainers

Dietary supplement sales have grown in the past two decades and today represent a multi-billion dollar industry (Radimer, 2004). The Council for Responsible Nutrition reports that approximately 68% of adults use dietary supplements and this percentage has remained consistent over the past five years (Council for Responsible Nutrition [CNR], 2015). According to the Dietary Supplement Health and Education Act of 1994, dietary supplements include the following categories: vitamins, minerals, herbs or other botanicals, amino acids, or any dietary substance for use by man to supplement the diet (Bass & Young, 1996). The most common dietary supplements are vitamin and mineral combinations, followed by specialty supplements (e.g. glucosamine, omega 3 fatty acids), herbs and botanicals (e.g. green tea, Echinacea), and sports nutrition and weight management



(e.g. protein and creatine; CNR, 2015).

Motivations for dietary supplement use are complex and may be related to a variety of social, psychological, knowledge, and economic factors (Dwyer, 2008). In the health and wellness industry, dietary supplements are marketed to prevent disease, improve appearance, enhance sports performance, and aid in sleep, recovery and weight management. These marketing efforts have promoted the belief that dietary supplements are synonymous with health and fitness. In a study by Morrison, Gizis, and Shorter (2004), 84.7% of persons who exercised at a commercial gym took at least one supplement and 93.4% of these individuals had been taking them for at least one year. Reasons given for taking supplements included muscle building, health and prevention of illness, endurance, weight loss and sports performance. Sands (2012) also found similar results when surveying 44 fitness center participants. The majority of participants took at least one supplement and the most common reasons for taking supplements included: to feel better and increase energy, build muscle and strength, prevent disease, improve athletic performance, weight gain and inadequate diet.

Although the Food and Drug Administration (FDA) regulates some aspects of dietary supplements such as labeling and claims, it is the responsibility of the manufacturer to oversee research and testing to ensure a supplement is reasonably expected to be safe prior to marketing (United States Department of Health and Human Services, 2012). The FDA is responsible for taking action against a product on the market only after it has been shown to be unsafe. Due to this lack of strict oversight, there remain many questions regarding supplement efficacy and safety in the form of adulteration, interactions, and harm to the user (Cole & Fetrow, 2003). In 2014, the FDA had concerns at 62% of the dietary supplement manufacturing facilities in the US and abroad (Consumerlab.com, 2015). Infractions were related to safety and negative interactions and included lack of appropriate testing for ingredient verification, not establishing specifications for the composition of the dietary supplement, and non-compliance with FDA mandated Good Manufacturing Practices.

Personal trainers are charged with developing and implementing exercise programs for clients, as well as providing information on a variety of other health-related topics such as proper nutrition and weight control. Because of their unique role in the wellness industry, personal trainers find themselves in a key position to recommend, prescribe, or counsel clients on dietary supplements. Some personal trainers choose to increase their income by selling dietary supplements, and employers may require their personal training staff to promote or sell supplements as part of their job description. However, personal trainers must consider the ethical dilemma of recommending or selling an expensive product, which may have questionable safety and efficacy. Furthermore, it is unknown how an individual's physiology, medical conditions, and medications may interact with particular supplements (Waller & Hagerman, 2005). These interactions can lead to a range of adverse events from nausea, headache, and dizziness, to stroke, tachycardia and sometimes death (Haller, 2008). Adverse events can place the personal trainer at risk for lawsuits and there have been cases of trainers being sued for selling or prescribing

supplements (Pristin, 2006; Archer, 2004).

Several professional fitness organizations such as the American Council on Exercise and the Aerobics and Fitness Association of America have published position statements whereby it is outside the scope of practice for the personal trainer to sell or prescribe dietary supplements without the requisite qualifications (American Council on Exercise, n.d.; American Fitness Association of America, 2000). The National Strength and Conditioning Association has published standards and guidelines stating strength and conditioning specialists should only recommend supplements that have been scientifically proven to be effective, or at least not cause harm (Triplett, Williams, McHenry, & Doscher 2009). However, it is well known that many personal trainers do recommend and sell supplements. The reasons for or against prescribing or selling dietary supplements is largely unknown in this population, however, it may be related to the perceived professional scope of practice, general attitude toward supplements or perceived knowledge base. In a study by Blunt and King (2010), professionals at a state health and physical education conference were asked about their motivations, attitudes, knowledge and practices surrounding dietary supplements. Participants included health, kinesiology, and physical education faculty and students, as well as a small group of coaches and personal trainers. Two-thirds of the participants felt they were knowledgeable about dietary supplements, however, the majority did not feel they were qualified to give advice or prescribe them. This contrasts with the practices of personal trainers who do feel qualified to recommend or sell supplements. The current study aims to explore the beliefs and practices of personal trainers through self-reported knowledge, attitudes and personal and professional behaviors.

## **Methods**

The study was an exploratory mixed methods approach to understanding personal trainers' perceived knowledge, personal and professional behaviors, and attitudes regarding safety and efficacy of common dietary supplements. The study was approved by the university Institutional Review Board prior to implementation. First, a list of fitness centers, community centers, and personal training studios in a subsection of Eastern Kentucky was generated. Maximum variation purposive sampling was utilized to recruit participants from a variety of backgrounds. Recruitment included both male and female personal trainers from urban and rural areas, those who worked in public and private venues and those who were self-employed. Potential participants were contacted by phone and asked to participate in a 30-45 minute one-on-one interview about dietary supplements. Eligibility included those who were 18 years and older and self-identified as a personal trainer.

Prior to the interview, permission was obtained to audio record the conversation and consent was obtained through a signed consent form. Participants were reminded that their participation was voluntary and at any time could decline to answer a question.

A one-on-one semi-structured interview was conducted that consisted of qualitative and quantitative questions developed by the principal

investigator. The interview questions focused on aspects of the participant's personal training career (e.g. years as a personal trainer, type of clientele, background, and services offered) and addressed their knowledge, attitude and behaviors toward dietary supplements. Questions focused on their personal views and usage as well as their professional viewpoints and practices. The quantitative questions asked participants to provide their opinion of the safety and efficacy of several categories of supplements. They were asked to rate each category on a Likert scale of 1-5 with 1 being very unsafe or very ineffective and 5 being very safe or very effective. Once they ranked each category, they were asked to qualitatively describe why they chose that ranking.

Once interviews were completed, the audio file was transcribed and coded, assessed for completeness, modified as needed to correct inaccuracies and combined with observation notes to analyze for themes. The data from the Likert scale questions was examined quantitatively using basic descriptive statistics and analyzed within the context of the qualitative data and themes.

In order to increase validity, member checks were conducted on a random subsample of the participants (n=5). The participant was sent their full transcript along with the researcher's interpretation and themes. They were asked to analyze the information for completeness and report any inaccuracies in the transcript or in the themes. This information was included in the final analysis.

## Results

### Participant Characteristics

A total of 13 participants (3 females and 10 males) volunteered to be interviewed for the study, and five declined to participate. Participants included individuals from corporate training facilities or franchise settings (n=3), however, the majority were from small training studios or private gyms (n=10). The time in the personal training profession ranged from 6 months to 35 years with an average of 9 years in the field.

*Education, certification and backgrounds.* Backgrounds were varied and included: no formal education (n=2), some college level health courses (n=3), and bachelor's (n=8) or master's degree (n=4) in a health-related field. Eight participants held a personal training/fitness instructor certification from a national organization. Two participants did not currently hold a degree or a national certification. Three participants had previous or current involvement in fitness or bodybuilding competitions.

*Description of personal training businesses.* The majority (n=10) of participants worked in small privately owned studios or small fitness centers, however, five had previous experience working in large fitness center franchises. All described their business as one-on-one private, semi-private, small group personal training, or weight loss education programs. Their clientele ranged in age from 7-83 with the typical client between 20 and 60 years old. Client goals included weight loss, training for athletic events, bodybuilding, youth fitness, injury prevention, and general health. Other services provided beyond physical training included nutritional counseling, stress management, goal setting, fitness assessments, and

basic therapies such as e-stim and myofascial release.

### Participant Perceived Knowledge

The participants were asked to describe how knowledgeable they felt about dietary supplements. Six described themselves as very knowledgeable, above average, or experts, three said they had some knowledge or average knowledge, and four said they had very little knowledge of supplements with the exception of the basics. Participants stated they stay updated on dietary supplements through the use of scientific sources such as peer reviewed articles, cross referencing information from a variety of sources such as the manufacturer and bodybuilding.com, and the use of anecdotal evidence from other trainers/athletes or their own personal use. Finally, three of the participants said they take a natural approach and avoid supplements altogether.

### Behaviors: Patterns of Promoting or Prescribing Supplements

Participants were asked if they recommended or prescribed supplements to clients. There were three major themes in their responses: avoiding promotion or prescription, taking a conservative approach, and promoting a variety of supplements as part of their overall training program to all clients.

*Themes 1 and 2: Avoiding supplements or taking a conservative approach.* Participants gave several reasons for avoiding or taking a conservative approach to the promotion or prescription of supplements including scope of practice issues and lack of necessity.

Scope of practice was cited as the main reason for those participants who avoided supplements or promoted them with caution. Participants mentioned the possibility of legal ramifications if someone were to have an adverse reaction to the supplement. One participant stated

*I never prescribe, it's against the law, Do I give recommendations? Do I tell them what I would do if I were in their situation? Yes I do that. (Participant 3)*

another said

*If someone were to ask me specifically 'hey what do you think about this, I'll tell them my opinion'...but it's not part of the program. (Participant 2)*

Another reason given for taking a conservative approach was lack of necessity for the average person's training routine. These participants stated that if a client has a sound nutrition program, then supplements are a waste of money and have no effect. One participant stated:

*What I try to do with all of my clients and I really stress with them is to first get their proper eating down, get a good meal plan established and after that we can start talking about supplements. But there's no point in it if they're not going to eat right to begin with. (Participant 1)*

Other participants said they only promote a supplement that cannot be obtained by a person's regular eating patterns. One participant stated:

*And the other thing I tell people is that like me, I can't eat fish, so I eat the fish oil pill and that's a good way to supplement something and accomplish a task that you normally couldn't do on your own.*

*Other than that, people ask about protein to go above and beyond, and I always say 'you know it would be better to save your money and buy real food. Use supplements if you can't satisfy the need naturally either by time or physical issues. (Participant 10)*

**Theme 3: Promoting supplements as part of a training program.** Some of the participants stated that clients cannot get results from the training alone and supplements are a necessary part of their training program. However, only one of the participants sold supplements as part of their business. The others only recommend, promote or prescribe as part of the training program. Some of the participants recommended a general "cookie cutter" set of supplements to all clients. For example this may include a protein/amino acid, multivitamin and fish oil supplement to all of their clients regardless of their training level or goals. Others recommended specific supplements based on the client's goals. One participant stated:

*Yes, it depends what their problem is. If they're trying to grow, have low energy levels, ...or are looking for something to stimulate energy...it's based on what the individual needs. (Participant 5)*

A pattern that was seen throughout the responses of those who recommended supplements was personal use and anecdotal evidence of safety and effectiveness. Participants said they would only recommend supplements that they have used in past with favorable results or anecdotal evidence by other trainers, or clients to judge the supplement's effectiveness. For instance, one participant stated:

*Yes I typically will only recommend what I've used in the past. I don't feel comfortable recommending something that I have not personally put into my body and can't give reference to. (Participant 8)*

and another stated:

*I don't want to have someone try something if I haven't tried it out first. I want to be a product of the product so that I have an understanding of what's going on. Obviously everybody's bodies are different and they're going to adapt differently, but I wouldn't feel right telling someone to take a vitamin or something if I haven't tried something similar. It doesn't mean I'm going to go out and try everything because I may not need it. (Participant 5)*

One participant also stated that if a client has a question about a supplement that they haven't tried, they will put them in touch with a person who has experience with that product to gain information on it's effects. (Participant 8)

### **Behaviors: Participant's Personal Use of Supplements**

All of the participants answered that they currently take supplements or have taken them in the past. The most commonly reported supplements were protein powders and vitamin and mineral combinations. Protein powders included individual amino acids, branched chain amino acids and protein shakes or weight gain supplements. Vitamins and minerals included those taken in single (e.g. vitamin C, vitamin B) or in combination as a multivitamin/mineral. Other popular supplements reported were creatine, preworkout or energy supplements, fish oil, liver tablets, glucosamine and chondroitin, antioxidants, probiotics, herbal supplements (e.g. alfalfa, garlic) and thermogenics or fat inhibitors.

### Attitudes: Perceived Safety and Effectiveness of Dietary Supplements

Several categories of supplements were presented to the participants and they were asked to give their perception of safety and efficacy of each of the categories. There were asked to rate each category on a scale of 1-5 with 1 being very unsafe or very ineffective and 5 being very safe or very effective. Once they rated each supplement, they were asked to verbally provide reasons for their numerical score. Means and standard deviations for each category of supplement are provided in Table 1.

**Safety.** The highest rated supplement categories included vitamins and minerals, fish oils, and probiotics. The most common reasons given for rating these supplements highest were personal experience, the supplement is a required nutrient, and no known adverse effects.

The lowest rated supplement categories were energy and weight loss. The most common reasons given for these low ratings were personal experience, misuse or abuse of the supplement, known adverse effects, and unsure of long term effects.

**Effectiveness.** The highest rated supplement categories were probiotics, protein, and creatine. The most common reasons given for rating these supplements highest were personal use, anecdotal evidence, and dietary need for the supplement.

The lowest rated categories were melatonin, glucosamine, and weight loss. The most common reasons for rating these supplements lowest were personal experience, anecdotal evidence, adaptation to the product, and more effective alternatives are available.

**Table 1**  
**Means And Standard Deviations Of Perceived Safety And Efficacy Of Supplement Categories**

Category	Safety		Efficacy	
	M	SD	M	SD
Vitamins/minerals	4.34	0.85	4.08	0.89
Protein	4.00	1.08	4.27	0.95
Creatine	3.19	1.03	4.13	1.05
Weight loss	2.23	1.18	2.54	1.14
Energy	2.34	1.14	4.00	0.98
Fish oil	4.31	.097	4.08	0.89
Probiotics	4.12	.083	4.43	0.79
Melatonin	3.44	1.24	3.76	1.15
Glucosamine	3.79	1.07	3.67	0.98



## Discussion

Personal trainers are part of a health and wellness team of professionals who provide guidance to clients with regard to physical activity, nutrition and health product selections. They have various defined scopes of practice depending on the state in which they work, professional certifications they hold, and level of formal education.

The study results showed that the participants demonstrated a wide range of perceived knowledge, personal and professional behaviors, and attitudes regarding the use of dietary supplements. Patterns of responses suggested that those who had the most formal college education described themselves as having the least perceived knowledge and those who had the least amount of formal college education described themselves as having the most perceived knowledge. Of the six that described themselves as very knowledgeable, only one had a college degree in the health and wellness field. All of the participants that described themselves as having some knowledge or very little knowledge had a bachelor's or master's degree in the health and wellness field. Supplements may not be covered in-depth in health and exercise science degree programs due to questions regarding scope of practice. However, even personal trainers who see supplements as being outside of their scope of practice may feel pressure from clients, employers or the industry to sell or recommend them as part of a total wellness program. One participant with an advanced degree who described themselves as very knowledgeable said:

*I would say my knowledge is higher now in dietary supplements than when I graduated from my undergraduate degree. The reason for that is we would go through the courses in college and were told minimal, in my opinion, about dietary supplements other than 'don't recommend them, you don't know what's in them, it doesn't matter what the label says, FDA doesn't regulate this'.*

This participant also stated

*"if you said the word supplement to me, I was thinking Xenadrine, Metabolife, Ripped Fuel and others like those. It didn't occur to me that things like Vitamin B and multivitamins were forms of supplements.*

*(Participant 5)*

Professional patterns of promoting or prescribing supplements were also varied and ranged from taking a conservative approach to selling and recommending them as part of and overall training program. Some trainers avoided prescribing them because it was "against the law" but then said they would give recommendations if a client asked. Others said they would only promote a supplement if the client was not able to get it from their normal diet. Scope of practice was the main reason cited for those who promoted them with caution. Many personal trainers often struggle to understand the scope of practice for their profession, especially when it comes to diet, nutrition and supplements. Even though many degree and certification programs explicitly describe selling or prescribing dietary supplements as being outside of the personal trainer's

scope of practice, trainers continue to get mixed messages from the wellness and personal training industry. Clients may expect the personal trainer to be knowledgeable and able to recommend appropriate supplements to support their overall fitness goals. As previously discussed, some trainers are required to sell supplements as part of their job duties without any education or training. Personal trainers may also choose to sell supplements as a way to increase revenue. All of these situations pose ethical as well as legal issues for the personal trainer.

Personal trainers were asked to rate their perception of safety and effectiveness of common categories of dietary supplements. Trainers were more likely to rate a supplement as safe and effective if they had personal experience with it, if the supplement contained required dietary nutrients and if there was anecdotal evidence. Supplements were more likely to be rated unsafe or ineffective based on personal experience, and anecdotal evidence. Although, participants said they stay up to date on dietary supplements through use of scientific sources and peer review articles, no one cited these as reasons in their ratings of safety or effectiveness. Likewise, no one stated that their perception was shaped through college courses, certifications or professional workshops. Primary certification programs, as well as many prescribed university curricula, provide for some education related to nutrition, but rarely any in-depth education regarding nutritional supplements beyond vitamins and minerals. Some certification programs such as the National Strength and Conditioning Association provide supplement and nutrition resources in the form of articles, webinars and other continuing education programs.

### **Strengths and Limitations**

The study has several strengths in design including use of participants from a variety of training establishments, backgrounds, and employment types. This allows a variety of viewpoints and practices in the field, since viewpoints may differ in those who work in large urban commercial fitness centers when compared to small rural businesses. Finally, the use of semi-structured interviews allowed for full exploration of each participant's responses.

Although a wide variety of personal trainers volunteered to participate in the study, several others did not return phone calls and had concerns about expressing their opinions on this. These opinions may have reflected a different attitude than those participants that agreed to be interviewed causing a bias. The study also included opinions and self-reported data on what some consider a sensitive subject. Therefore, it is possible that some participants were reluctant to share complete data or may have



modified opinions for purposes of the study. Finally, participants were from a small area in Eastern Kentucky, which could also create some cultural bias on the practices and opinions.

### Conclusions

Greater effort should be made by certifying agencies and formal educational programs to ensure personal trainers have the tools to help clients make their own informed choices when it comes to dietary supplements. It is imperative personal trainers receive the type of education that will serve both their profession and their clients well. Understanding how to read research, translate that information into practice, and create documents to cover informed consent are key skills that should be included as part of an updated curriculum for programs like health education, exercise science, wellness and physical education. Providing resource education related to supplements allows the trainer to provide ongoing credible resources to the client for discussion with their physician, pharmacist, nurse practitioner, registered dietitian or other appropriate health care provider. It could also provide protection related to lawsuits when combined with a waiver of liability. Providing research-based information to the client and recommending discussion with a health care provider would allow the trainer to meet the job obligations to discuss supplements with the client while placing the final recommendation with the health care provider that would have detailed health and medication records.

The purpose of this study was to conduct face-to-face interviews with personal trainers to understand their knowledge, attitude and behavior toward dietary supplements, both for personal use and recommending supplements to their clients. Understanding these patterns and intentions may eventually help to develop additional guidelines for personal trainers and other health care providers. The data will also be useful in the university classroom to help design applicable curricula for future professionals in the health and wellness field such as exercise science and health promotion majors.

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**GINA BLUNT GONZALEZ, Ph.D.**, is an Associate Professor of Exercise Science in the Department of Kinesiology, Health, and Imaging Sciences at Morehead State University. She received her Ph.D. in Exercise Science from the University of Mississippi and her M.A. and B.S. degrees from the University of Central Florida. Dr. Gonzalez teaches a variety of undergraduate and graduate health and exercise science courses such as programming for special populations, exercise program leadership, nutrition, and research methods and statistics. Dr. Gonzalez has several other ongoing research interests including behavioral interventions to increase physical activity, the use of technology for health and fitness instructions, and motivation and goal orientation in rock climbers. She regularly presents at state, regional, and national conferences, and has been awarded several internal and external federal grants on these topics.

**DAYNA S. SEELIG, Ed.D.**, recently retired, was a Professor in the Department of Kinesiology, Health and Imaging Sciences as a faculty member teaching in the following programs: undergraduate exercise science, undergraduate health promotion and graduate online Wellness Promotion. Dr. Seelig received her Ed.D. from the University of Kentucky in the area of Exercise Physiology and was selected for both the Outstanding Graduate Student Award and Convocation Speaker by the College of Education at UK. Her primary research interests are supplement education, childhood obesity and youth strength and conditioning, presenting nationally and regionally on these topics. Dr. Seelig was an American Council on Education (ACE) Fellow who spent a year at Georgia College and State University, located in Milledgeville, Georgia under the mentorship of President Dorothy Leland. Dr. Seelig served 4 years as the Chair of the Department of Health, Physical Education and Sport Sciences, Director of the University Wellness Center, and as a tenured Professor of Exercise Science at Morehead State University.

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*Editors, 2018*

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