

THE PREVALENCE OF FORMAL EDUCATION, CERTIFICATION, AND
CONTINUING EDUCATION SPECIFIC TO RESISTANCE TRAINING AMONG
PUBLIC HIGH SCHOOL PHYSICAL EDUCATORS IN CALIFORNIA.

A Thesis

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by

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Abstract
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Statement of Problem

Along with the increasing usage of resistance training as an exercise modality for physical education there may be safety concerns. Physical educators and physical education teaching education students may not be prepared to address these concerns, nor are they seeking alternative preparations outside of their formal education.

Source of Data

Questions pertaining to formal education, continuing education, and certifications specific to resistance training amongst High School Physical Educators were addressed via an online survey tool.

Conclusions Reached

The majority of subjects surveyed reported taking courses specific to the instruction of resistance training during their formal education. However, the majority of subjects do not acquire certifications specific to the instruction of resistance training. Their seems to be a trend, the majority of subjects who completed formal education specific to resistance

training also sought secondary education via certifications and/or continuing education conferences.

_____, Committee Chair
Dr. Michael Wright

Date

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Chapter 1

INTRODUCTION

There is a growing interest in resistance training as an exercise modality for the youth. A prior study shows that 87.6% of high schools across 453 U.S. school districts were equipped with weight rooms (Lee, Burgeson, Fulton, & Spain, 2007). With regard to the increasing number of weight rooms across high schools, one would expect that physical education teachers are increasing the teaching of resistance training and utilizing resistance training more often as an exercise activity. In fact, the physical education content standards for California suggest that students meet and exceed basic levels of endurance, power, speed, & strength; while establishing personal fitness goals and create strength and conditioning programs based on principles of training (Bruton & Ong, 2006). In order for high school students to meet these standards the physical education teachers must be well versed in designing, supervising, and implementing strength and conditioning programs for youth (McGladrey, Hannon, Faigenbaum, Shultz, & Shaw, 2014). However, according to McGladrey et al. (2014) the majority of high school physical educators do not possess the minimal knowledge to design, supervise, and implement, resistance training within their teaching curriculum. McGladrey et al. (2014) reported many confounding variables that may lead this lack of knowledge, the majority of physical educators did not have certification specific to resistance training instruction, and the majority of Physical Education Teaching Education (PETE) students reported that their college programs did not require education classes specific to resistance training

instruction. According to Lee, et al. (2007) 88.4% of the high schools across 453 U.S. districts taught health-related fitness as a part of their physical education curriculum, in which resistance training was an essential component. Research recommends physical education teachers seek out extra certification specific to resistance training that requires up to date continuing education to benefit their skills in utilizing a health-related fitness physical education curriculum (McGladrey et al. 2014; Bulger & Housner, 2009).

Problem Statement

1. Many PETE programs may not require coursework specific to teaching resistance training. (McGladrey et al., 2014).
2. Research has suggested that it may be beneficial for physical education teachers to obtain resistance training/fitness specialist certifications but they may not be doing so. (McGladrey et al., 2014; Bulger & Housner, 2009).
3. Physical education teachers may be failing to continue their education by attending professional training programs and conferences specific to resistance training.
4. Physical education teachers may be failing to meet the California physical education content standards.

Purpose Of Study

The purpose of this study is to report how many well qualified, current physical education teachers that instruct resistance training are in California based on the following criteria. This study will assess by survey the number of physical education resistance training instructors who have the following education or certification.

1. Possess high quality resistance training/personal fitness training certification.
2. Completed college level coursework specific to instruction of resistance training.
3. Maintain continuing education specific to resistance training instruction.

Significance of Study

Since the majority of high schools are equipped with weight rooms and they implement a health-related physical fitness curriculum with resistance training being an essential component it is imperative that physical educators be qualified to design, supervise, and implement resistance training programs. However, research is suggesting that physical educators are lacking in the knowledge necessary to implement a health-related physical fitness education curriculum. Further research is necessary to find out where physical education teachers are lacking the knowledge of concepts related to resistance training. This research will lead to the development of programs which will benefit the delivery of a health-related physical fitness curriculum. Furthermore, this research will help pave the way for more opportunities for physical education teachers that will develop skills specific to resistance training instruction. These problems can be solved by offering more certification programs through Physical Education Teaching Education (PETE) programs, and making resistance training courses mandatory of PETE curriculums.

Limitations

1. Surveying subjects online will elicit a significantly less response rate than via mail this may lead to a low response rate (Deutkens, 2006).

2. Low response rate will be a poor measure of the average population.
3. There may be potential for erroneous information due to lack of honesty from subjects being surveyed.

Delimitations

1. Surveying subjects online may elicit a less response rate in some studies, but most of those studies have been in general surveys not educational surveys.
2. Surveys will be sent out more than once along with reminders of completion.

Exploratory Statements

1. What is the norm amongst high school physical educators who instruct resistance training that involve themselves with certifications, and continuing education specific to the design, implementation, and supervision of resistance training?
2. What is the level of education based on courses completed specific to the design implementation, and supervision of resistance training?
3. To what extent are high school physical educators within the public school setting involving themselves with certifications specific to the instruction of resistance training?

Vocabulary

Physical education, resistance training, health-related physical fitness,

Chapter 2

REVIEW OF THE LITERATURE

Introduction

Current recommendations suggest that children and adolescents should engage in at least 60 minutes of moderate to vigorous physical activity that is considered developmentally appropriate for their age to promote health and ideal bodyweight (Faigenbaum et al., 2009). Children and adolescents are encouraged to remain physically active through athletics or physical education. Ferkel, Judge, Stodden and Griffin (2014) believe that one method to effectively decrease obesity is to promote long term physical activity behaviors in children and adolescents. To help promote long term physical activity the (National Association for Sport and Physical Education) NASPE standards state that high school age adolescents should be able to design, implement, and adjust their own physical fitness program based on health related physical fitness components (McGladrey et al., 2014). Because NASPE holds the standard that high school aged students should be able to organize their own exercise regimen; physical educators need to have the adequate education on how to teach their students to organize and design exercise programs (McGladrey et al., 2014). A recent study examined the resistance training knowledge of current physical educators, sport coaches, and PETE students (Physical Education Teaching Education) using a ninety-question exam developed via the Delphi technique (McGladrey et al., 2014). The Delphi technique incorporates

formulating a panel of experts within the field that collaborate together to formulate a collective consensus of examination questions to be used to test knowledge of other individuals (McGladrey et al., 2014). They found that only 16% of individuals tested proved to have the minimal knowledge necessary to organize, and supervise exercise and strength and conditioning programs at the youth level. Interestingly, 88.4% of U.S. high schools across 453 U.S. School districts taught a health related fitness class where resistance training was an integral part of their curriculum and as of 2006, 87.6% of high schools and 46.1% of middle schools across 453 U.S. school districts were reported being equipped with a weight room (McGladrey et al., 2014). In the McGladrey et al. (2014) study, physical educators or sport coaches who were certified in resistance training or personal training, and taught resistance training to athletes or students had the best pass rate, 50% as compared to all groups tested. It seems that having a certification may or may not predict the knowledge of resistance training principles in sport coaches or physical education teachers. This research suggests that physical education teachers lack the knowledge required to design, implement, and supervise resistance training programs (McGladrey et al., 2014). Coaches and teachers who instruct resistance training should have practical experience working with youth, a NCCA (National Commission for Certifying Agencies) recognized resistance training certification, and the minimum of a four year degree in the exercise science or physical education field (Faigenbaum et al., 2009). If quality instruction, supervision, age appropriate equipment, and a safe training

environment is not available then adolescent children should not partake in resistance training due to increased injury risk (Faignebaum et al., 2009).

There is a plethora of personal training and resistance training certifications that a person may obtain through exhaustive testing and evaluation procedures. The completion of specific certifications may help predict knowledge of resistance training. A study done by Malek, Nalbone, Berger, and Coburn (2002) showed that formal education and certification was the best predictor of knowledge pertaining to exercise prescription and training of special populations such as youth. Furthermore, Malek et al. (2002) also found that participants having a certification from (American College of Sports Medicine) ACSM and the (National Strength and Conditioning Association) NSCA had tested better across all fitness principles being tested. Consequently, the ACSM and NSCA are two of the few organizations that offer advanced certification that requires a minimum of a four year degree from an accredited college. According to McGladrey (personal communication, December 1, 2014) in their research they only asked if participants had certifications from one of the following organizations NSCA, ACSM, ACE (American Council on Exercise), (National Certification Corporation) NCC, United States American Weightlifting) USAW, and (National Academy of Sports Medicine) NASM. They also had an “other” category, but the McGladrey et.al, (2014) study does not clarify what certifications are superior, or more desirable to employers or professional organizations.

The purpose of this review of literature is to determine the qualifications an individual needs to coach or teach resistance training, determine the type of certifications

that are specific to resistance training/fitness instruction, and report the recommendations that are being made to help physical education teachers teach or instruct fitness/resistance training. Lastly, an analysis needs to be done in order to report if these recommendations/qualifications are being met in the public high school setting.

Physical Education in the School Setting

Between 90% of high schools and 57% of elementary schools in the United States require certified physical education teachers to instruct a physical education program at their institutions (Quinn & Wikgren, 2011). However, half of the states grant temporary emergency certificates to teach physical education and the minimum requirement for temporary certification is possession of a bachelor's degree in any field (Quinn & Wikgren, 2011). Furthermore, 59% of all states substitute other activities for physical education such as marching band, (Reserve Officers' Training Corps) ROTC, and interscholastic sports (Quinn & Wikgren, 2011). Because of the record breaking statistics in obesity physical education programs are utilizing a health-related physical fitness model for physical education (Castelli & Williams, 2007). One study showed that 87.6% of high schools across 453 U.S. school districts were equipped with weight rooms (Lee et al., 2007). Of those schools 88.4% of the high schools across 453 U.S. districts taught health-related fitness as a part of their physical education curriculum, in which resistance training was an essential component (Lee et al., 2007). Castelli and Williams (2007) tested the knowledge of health-related physical fitness amongst 73 public middle school

physical education teachers in the state of South Carolina. Amongst those teachers tested only 38% of them met or exceeded the standards that were set by the state for ninth graders knowledge of health-related physical fitness (Castelli & Williams, 2007).

According to Castelli and Williams (2007) the majority of physical education teachers had difficulty with designing exercise programs based on principles of training. A more recent study tested the health-related physical fitness knowledge amongst 89 in service physical education teachers with a mean score of 23.6 (57.6%) \pm 4.5 these findings show a deficiency in health-related fitness knowledge (Santiago, Disch & Morales, 2012).

Fitness Education and High School Physical Education Teachers

The NASPE organization develops many standards and guidelines that are required or recommended of physical education teachers. According to Quinn and Wikgren (2011) the best way to combat obesity is to teach activities that promote lifelong behaviors that improve health related physical fitness. Quinn and Wikgren (2011) recommend that high school students be taught a curriculum that includes instruction on the proper way to design and modify personal weight training programs, and design personal aerobic training programs based on heart rate and target heart rate zones. There are three standards that are supposed to be upheld by physical educators specific to weight training and fitness/advanced aerobic activities (Bruton & Ong, 2006). Standard one mentions that students should be able to be competent in the knowledge of and demonstrate a variety of motor skills and movement patterns that accompany various

physical activities (Bruton & Ong, 2006). The guidelines under standard one suggest that students should be able to demonstrate and assess a variety of lifting techniques that comply with first, second, and third class levers (Bruton & Ong, 2006). Standard two states that students should achieve higher levels of fitness that corresponds with health and performance (Bruton & Ong, 2006). The guidelines of standard two suggest that students should be taught to design their own strength training and conditioning program based on physical fitness goals (Bruton & Ong, 2006). Standard two suggests that students should also be able to meet physical fitness standards and exceed those standards set by scientifically based physical fitness assessments (Bruton & Ong, 2006). Students should attain higher levels of endurance, strength, speed, and power (Bruton & Ong, 2006). The standards specific to advanced aerobic training suggest that students be taught to design personal fitness programs in preparation for competitive aerobic activities (Bruton & Ong, 2006). Standard three states that students should be able to apply psychological/sociological concepts and principles to learning physical activity and performance (Bruton & Ong, 2006). The guidelines to be met in standard three include modifying physical fitness for special populations and understanding the risks and benefits of participating in fitness/resistance training throughout a lifetime (Bruton & Ong, 2006). This last guideline has been quite important especially since the publication of the Thomas Mackenzie and James Sallis landmark article in 1991 that outlined the role of physical education and its impact on public health that suggested a shift from sport skill related physical education to health related physical activity physical education

(Webster et al., 2015). Furthermore, students are supposed to be taught these standards in the high school setting. However, the McGladrey et al. (2014) study suggests that the majority of physical educators lack the knowledge to design strength and conditioning programs. In the research done by McGladrey et al. (2014) coaches and physical educators had a mean score of 59.65 ± 17.19 on program implementation knowledge whereas PETE students scored 56.43 ± 18.40 . Program safety knowledge was the lowest sub scale score, with sport coaches/physical education teachers with a mean score of 51.31 ± 15.82 and 50.49 ± 15.88 for PETE students (McGlagrey et al., 2014). Interestingly enough the individuals tested also reported a lack of academic course work completed specific to resistance training instruction (McGlagrey et al., 2014). Of the physical education instructors/sport coaches only 35.5% of males and 32.7% of females reported completing coursework specific to resistance training instruction (McGlagrey et al., 2014). Furthermore, only 33.8% and 35.0% of males and females in the PETE student group reported having to complete coursework specific to resistance training as a part of their academic curriculum (McGlagrey et al., 2014). These findings show that individuals lacking in formal education and certification specific to resistance training instruction may not have sufficient knowledge to design, implement, and supervise resistance training that has been shown to benefit the health and fitness of adolescent children.

Interestingly enough Webster et al. (2015) mentioned, the Mackenzie and Sallis article published back in 1991 called for a shift from sport skill related physical education to health related physical education, stating this change would impact public health

specifically related to obesity. Twenty-one years later Ferkel et al. (2014) still report that there is a deficiency in knowledge pertaining to health related fitness spanning across elementary and college age individuals. Along with this deficiency in health related fitness knowledge there is an increase in physical inactivity (Ferkel et al., 2014).

According to the Center for Disease Control and Prevention in 1991 five U.S. states had an obesity rate between 15-19 percent (CDC, 2015). In 2013 no state has an obesity rate less than 20 percent (CDC, 2015). According to this data there has not been any decrease in the obesity rate since the Sallis and Mackenzie article mentioned by Webster et al. (2015). However, Webster et al. (2015) did review several articles since the 1991 Sallis and Mackenzie article which made several recommendations which will prepare physical education teaching candidates in instructing a more public health aligned physical education curriculum. One major recommendation includes PETE students acquiring specialized training and certification to become fitness specialists (Webster et al., 2015). Bulger and Housner (2009) suggest that PETE students seek certifications through professional organizations such as ACSM, NSCA, and ACE in addition to their teacher preparation. In addition to certification Webster et al. (2015) suggests that PETE students be trained to promote physical activity. This includes completing classes as a part of their PETE curriculum that instructs students on how to instruct physical fitness. For example, weight training and aerobic activity. PETE programs may be producing college graduates that have exceptional understanding of science, however they lack the necessary skills to apply their knowledge to promote physical activity (Bulger, Housner, & Lee, 2008).

Interestingly enough, Ayers and Housner (2008) surveyed 116 PETE programs across the United States and found that of the 116 programs only 1.2% offered certification in strength and conditioning and aerobic instruction.

Resistance Training/Personal Fitness Certifications

Resistance training /personal fitness certification is usually not required of physical educators; however, it may be beneficial. The McGladrey et al. (2014) study had utilized a Delphi technique which incorporates formulating a panel of experts within the field that collaborate together to formulate a collective consensus of examination questions to be used to test knowledge of other individuals to develop a ninety exam questionnaire (McGladrey et al., 2014). One of the qualifications needed to be an expert for the panel was to possess a resistance training certification such as the NSCA-CSCS (Certified Strength and Conditioning Specialist), and/or the USAW (United States of America Weightlifting) level 1 Sports Performance Coach. The NSCA requires individuals to hold their CPR (Cardio Pulmonary Resuscitation) and AED (Automated External Defibrillator) certification as well as to obtain a Bachelor's degree from an accredited college before receiving their CSCS credential from the National Strength and Conditioning Association (NSCA, 2014). In order to receive the CSCS credential, candidates that fulfill the prerequisites mentioned above must complete a two part 190 question examination (NSCA, 2014). The CSCS exam consists of two parts, part one consist of two domains exercise science and nutrition, and part two consists of four

domains. The domains are exercise technique, program design, organization and administration, and testing and evaluation (NSCA, 2014). The passing criteria for the CSCS exam is based on 70 scaled score units in both test sections (NSCA, 2014). In order to receive the USAW Sports Performance Coach certification a weekend long course must be completed with the United States of America Weightlifting (Teamusa.org, 2014). The course is 13-14 hours in duration with up nine hours being practical hands on training with an introduction to Olympic Weightlifting (Teamusa.org, 2014). The passing criterion for the USAW sports performance coach certification includes a final testing after the 14 hour course that must be completed over one weekend (Teamusa.org, 2014). The American College of Sports Medicine (ACSM) is another one of the top certifying organizations for fitness and health professionals (ACSM.org, 2015). The ACSM offers a wide array of certifications broken into three groups' which consist of health fitness, clinical, and specialty (ACSM.org, 2015). The health fitness category is most important for this research, this category offers three certifications: certified personal trainer, certified group exercise instructor, and certified exercise physiologist (ACSM.org, 2015). This is an advanced certification that requires a four year degree in exercise science (ACSM.org, 2015). Much like the NSCA certifications acquiring these certifications requires an exhaustive examination process and possible education (ACSM.org, 2015). Mcgladrey et al., (2014) found that of the groups examined, individuals who reported possessing a resistance training certification/personal fitness certification had a pass rate of 50%. Individuals who reported attending professional training programs in resistance

training scored higher than individuals who did not mean score 63.52 ± 14.05 as compared to 56.13 ± 13.67 (McGladrey et al., 2014). Malek et al., (2002) found that individuals that had required a certification from NSCA or ACSM scored better overall on the Fitness Instructors Knowledge Assessment (FIKA) exam. Having either of these certifications was a strong predictor of fitness knowledge $r = 0.73$ $p < 0.001$ (Malek et al., 2002). McGladrey et al., (2014) did not publish any data on what certifications the individuals examined held unlike Malek et al. (2002). Therefore, it is hard to determine the level of certifications held by the individuals examined by McGladrey et al., (2014). However, Malek et al., (2002) did find that having an ACSM and NSCA certification was a strong predictor of fitness knowledge. Therefore, attaining a high level certification from either the NSCA or ACSM, in combination with attending professional training programs specific to resistance training, much like the ones needed for CEU's to maintain these high level certifications may lead to acquiring the knowledge necessary to design, implement, and supervise safe resistance training programs. As mentioned before there is a plethora of certifications from various organizations that any individual may obtain to work in the fitness industry. The ISSA (International Sports Science Association) is another organization that offers multiple fitness certifications. ISSA is accredited under DEAC (Distance Education Accrediting Commission) and they offer an online Associate of Arts degree in exercise science as well as multiple certifications (issaonline.edu, 2016). ISSA's certifications include personal training, group fitness, and strength and conditioning to name a few (issaonline.edu, 2016). Each certification requires a

course/untimed open book examination that can be completed online (issaonline.edu, 2016). The National Academy of Sports Medicine (NASM) who recently acquired Aerobics and Fitness Association of America (AFAA) through a merger both work independently of each other. NASM offers only a personal trainer certification along with many specialization courses that can be added to become a master trainer (nasm.org, 2016). AFAA does both personal trainer and group exercise instructor certifications, both of which can be completed online (afaa.com, 2016). The National Federation of Personal Trainers (NFPT) offers a personal training certification that merely requires an examination that must be completed at specific locations that vary throughout the United States (nfpt.com, 2016). The American Fitness Professionals and Associates (AFPA) organization has a plethora of personal trainer/fitness certifications and specialty credentials (store.afpafitness.com, 2016). All certifications can be obtained by passing an online or mail in examination (store.afpafitness.com, 2016). Of all the certifying organizations mentioned the NSCA and ASCM are the only two non-profit organizations that publish peer reviewed research.

Physical Education and Continuing Education Criteria

After an exhaustive search there are no uniform guidelines on what continuing education physical educators are required to have by state. However, according to education-portal.com physical education teaching requirements include a four year degree and licensure that varies from state to state. In addition, most education boards

require a licensure renewal every 3-5 years by earning continuing education credits.

However, fitness and resistance training certifications that are certified under the National Certifying Commission Agency (NCCA) all require continuing education. For example the NSCA requires 6.0 CEU's (continuing education units) to be completed every 3 years in order to recertify (NSCA, 2014). The 6.0 CEU's are measured in contact hours, this equals the actual clock hours that are involved to finish the CEU's (NSCA, 2014). One contact hour equals 0.1 CEU's and ten contact hours equals 1.0 CEU's (NSCA, 2014). Attending workshops, clinics, seminars, symposia, and conferences that are specific to fitness/strength and conditioning and are preapproved by the NSCA qualify for CEU's (NSCA, 2014). The ACSM requires its professionals to acquire anywhere from 45-60 CEU's every three years much like the NSCA (ACSM.org, 2015). In order to recertify the USAW certification every year one must take an online quiz through the USAW website (teamusa.org, 2014). There is two allowable attempts, if not passed the course must be retaken (teamusa.org, 2014). NASM requires 2.0 CEU's or 20 total credit hours every two years to recertify for their personal training certification (nasm.org, 2016). Individuals certified under AFAA regardless of the personal training or group exercise instructor certification must complete 15 CEU's for recertification (afaa.com, 2016). The ISSA organization requires 20 CE hours every 2 years for recertification (issaonline.edu, 2016). The NFPT does not require CEU's the first year of certification, however after that there is an annual 2.0 CEU or 20 credit hours to recertify annually (nfpt.com, 2016). AFPA requires 16 CEU's every 2 years to recertify regardless of which of the several

certifications held (store.afpafitness.com, 2016). Additionally, in order to teach physical education at a public high school in the state of California one must complete their bachelor's degree in physical education and obtain a single subject teaching credential (ctc.ca.gov, 2015). An intensive search through records leads to the conclusion that physical education teachers only have to renew their certification every five years, and they are not required to complete continuing education in the state of California (ctc.ca.gov, 2015).

Principles of Knowledge Specific to Resistance Training

Resistance training has been around for many centuries dating back as far as ancient times in Egyptian tombs with hieroglyphics depicting strength contests (Ratamess, 2012). During the mid-1800s and early 1900s an era of strongman occurred and the culture of resistance training flourished around the nation (Ratamess, 2012). Competitive lifting sports began in the late 1800s with Olympic style weightlifting being at the forefront (Ratamess, 2012). Later more iron sports were developed such as bodybuilding in the early 1900's and powerlifting later evolved in the 1950's (Ratamess, 2012). Today resistance training uses many of the techniques developed from bodybuilding, weightlifting, and powerlifting (Ratamess, 2012). With the rise of sports offered at the high school level many high schools today are equipped with weight rooms. Faigenbaum and Westcott (2000) suggest that a strong musculoskeletal system prepares youth for various physical activities and reduces the risk of injury. Some express concerns with youth participating in weight training such as stunted growth, and

decreased bone formation; however, if done properly, these concerns are unwarranted (Faigenbaum and Westcott, 2000). The majority of injuries related to youth resistance training are the result of accidents that have potential to be prevented with strict safety guidelines and quality supervision (Meyer, Quatman, Khoury, Wall, & Hewett, 2009). Since bone mass is accrued during the childhood/adolescent period this is an ideal time to strength train to enhance bone density and strength (Faigenbaum & Westcott, 2000). It is important when instructing strength training for youth that proper exercise technique is taught and reinforced (Faigenbaum & Westcott, 2000). When developing strength training programs for youth it is essential that a program maintains adequate progression which recognizes the child's skill before exercise prescription (Faigenbaum and Westcott, 2000).

Youth Resistance Training and its Safety

According to Faigenbaum et al. (2009) the acceptance of resistance training pertaining to youth is becoming widely universal amongst sport organizations and medical and fitness professionals. In fact school based programs are being designed to enhance health related physical fitness components (Faigenbaum et al., 2009). As mentioned before the NASPE standards state that students should be training regularly to enhance muscular strength, power, and endurance coinciding with both health and performance (Bruton & Ong, 2006). Additionally, private fitness clubs and sport conditioning programs are becoming more involved with youth as a market (Faigenbaum

et al., 2009). The number of members between the ages of 6 and 17 are continuing to increase (Faigenbaum et al., 2009). The NSCA currently holds the position that properly designed and supervised resistance training programs for youth are safe and can enhance performance, muscular fitness, and reduce risk related to sport injury (Faigenbaum et al., 2009). A study conducted by Myer et al. (2009) compared the data of injuries between adult and adolescent individuals presented in emergency rooms that were a direct result of resistance training. The Myer et al. (2009) study analyzed the data of 4,111 patients, among the 8-13 years old category 77.2 % of those injuries were considered accidental, the majority of these injuries were to the hand and foot. Prior to the Myer et al. (2009) study during the era between the 1970s and 1980s youth resistance training was considered unsafe (Faigenbaum et al., 2009). This was due to the fact that during this era the National Electronic Injury Surveillance System (NEISS) analyzed injury data that was related to exercise and equipment and inferred that these activities were unsafe for youth to partake in (Meyer et al., 2009). According to Meyer et al. (2009) it was erroneous to infer that exercise was unsafe because of the high injury rate associated with exercise and equipment (Faigenbaum et al., 2009). In fact Faigenbaum et al. (2009) states that many of the injuries were caused by lack of qualified supervision, excessive load, inept training, and poorly designed equipment. During a one year period resistance training had fewer injuries as compared to sports 0.7% of 1576 injuries whereas soccer, basketball, and football had 2%, 15%, and 19% respectively (Zaricznyj, Shattuck, Mast, Robertson, & D'Elia, 1980). One longitudinal study followed 70 youth athletes 7-16

years of age competing in the sport of Olympic Weightlifting over a one year period (Faigenbaum, Myer, Naclerio, & Casas, 2011). Within that year 1,224 competition lifts were performed without any reported injuries that required limited training or medical intervention (Faigenbaum, Myer, Naclerio, & Casas, 2011). Several studies and professionals all agree that resistance training can be safe with adequate load, progression, and most importantly qualified supervision (Faigenbaum et al., 2009; Faigenbaum et al., 2011; Haff, 2003; Myer et al., 2009). This research suggests that resistance training can be safe for youth; however, it must be supervised by a qualified adult who has the education and certification necessary to design, implement, and supervise safe resistance training programs. When designing youth resistance training programs research shows that all types of equipment and exercise modes can be utilized if safely instructed (Lloyd, et al., 2013; Faigenbaum et al., 2009). This includes free weights, machine weights, body weight, medicine balls, and elastic bands, all of which have been reported safe and effective in school based/clinical exercise programs for youth (Lloyd, et al., 2013; Faigenbaum et al., 2009). However, when selecting exercises it is highly important that considerations are taken based on age, body size, experience, and equipment availability (Lloyd, et al., 2013; Faigenbaum et al., 2009). Even the most advanced exercises can be utilized such as Olympic lifting and variations that require exceptional technical skill as long as progressive teaching techniques are utilized by a qualified professional (Faigenbaum & McFarland, 2008). When instructing any level of

exercise to youth participants the most important point to be stressed is safety (Faigenbaum & Mcfarland, 2008; Faigenbaum et al., 2009).

Youth Resistance Training and its Benefits

Young children and adolescents can benefit from regularly participating in resistance training (Faigenbaum et al., 2009) Noticeable benefits may be apparent for youth who partake in regular resistance training such as gains in muscular strength, power, and other benefits that impact physical health (Faigenbaum et al., 2009; Lloyd et al., 2013; Vehrs, 2005). In children and adolescents, however, the majority of strength gains are due to neural adaptations and not muscular hypertrophy (Vehrs, 2005). It is impossible to completely eradicate all sport/physical activity related injuries; however, emphasis on strength and conditioning may decrease these risks (Lloyd et al., 2013). Despite original misconceptions that resistance training is harmful for skeletal maturation childhood may actually be the best time to build bone mass and structure through weight bearing activities since childhood is the opportune time to build bone mineral density (Lloyd et al., 2013). In the past misconception lead to the fear that children who participate in weight bearing activities such as resistance training could suffer catastrophic injuries to a growth plate (Lloyd et al., 2013) This misconception is untrue and was not supported by scientific reports which indicate that mechanical stress placed on growth plates from activities such as weightlifting may actually enhance bone formation and growth (Lloyd et al., 2013). Weight bearing activity applies mechanical

stress to bone resulting in migration of osteoblasts to the stressed bone surface, which then begins to remodel bone and increase strength by secreting proteins in the spaces between bone cells (Bachele & Earle, 2008). According to Almstedt, Canepa, Ramirez, & Shoepe (2011) if individual's male or female alike do not reach peak bone mass in their youth they are at risk of developing osteoporosis. Research suggests that multi-joint exercises that load the axial skeleton work best for enhancing bone density and bone mineral content (Baechle & Earle, 2008). The concept of specificity of loading explains that using exercises that load a specific skeletal region will result in structural changes in the bone of that region (Bachele & Earle, 2008; Kohrt, Bloomfield, Little, Nelson, & Yingling, (2004). In fact a recent study took several females and had them undergo a 12 week maximal strength training program with the squat exercise, the results indicate that total hip and lumbar spine bone mineral density increased by 1.0 and 2.2% (Mosti, Carlsen, Aas, Hoff, Stunes & Syversen, 2014). The childhood obesity rate has been drastically rising along with concern due to the health complications associated with obesity (Lloyd et al., 2013). Children and adolescents who are overweight or obese are two times as likely to be injured when participating in sports or physical activity as compared to their normal weight peers (Lloyd et al., 2013). One study placed forty-eight children on an 8 week periodized resistance training program with a frequency 3 days a week without nutritional intervention (McGuigan, Tatasciore, Newton, & Pettigrew, 2009). The subjects had a significant decrease in absolute percent body fat 2.6% and a 5.3% increase in lean body mass (McGuigan et al. 2009). Furthermore, a meta-analyses

done by Smith, et al. (2014) found that amongst 110 studies muscular fitness had a positive relationship with decreased body fat percentage, decreased metabolic and cardiovascular disease risk, and enhanced bone health and self-esteem.

Youth Resistance Training Guidelines

Most importantly children and adolescents should be first instructed on spotting techniques, proper use and storage of equipment, weight room safety, and sensible loading parameters of exercise (Faigenbaum et al., 2009). Exercise technique should always be stressed over the load of the exercise itself (Faigenbaum et al., 2009). Furthermore, instead of competing between one another children and adolescents should be instructed to embrace improvements based on technique over strength (Faigenbaum et al., 2009). Advanced exercises should be taught with safe, progressive instruction by a qualified professional (Faigenbaum & McFarland, 2008). For example when instructing weightlifting exercises how to safely lose a bar or implement should be stressed first in the programming of technique to reduce the risks of injury (Faigenbaum & McFarland, 2008). Advanced lifts with a barbell should be supplemented with a wooden dowel early during the instructional period (Faigenbaum & McFarland, 2008). Once children and adolescents are ready to regularly train after understanding the safety and inherent risks associated with exercise they seem to respond quite favorably to moderate to light loads with moderate to high volume (Faigenbaum & Wescott, 2000). Most resources suggests somewhere around 1-3 sets of anywhere between 6-15 repetitions of moderate to light

loads (Faigenbaum et al, 2009; Faigenbaum & Wescott, 2000; Lloyd et al. 2013). It is suggested that longer rests 2-3 minutes between sets should be advised especially with exercises that demand advanced technique (Faigenbaum et al., 2009). Children and adolescents should train at light to moderate intensities, resources suggest less than 80% or even 70% of their estimated 1RM (Faigenbaum & McFarland, 2008; Lloyd et al., 2013). Faigenbaum et al. (2009) suggests children and adolescents are taught to embrace technique over strength gains, therefore it may be unnecessary to test the 1RM. Thus, it would seem effective to leniently prescribe training loads based on quality judgement rather than testing the 1RM. However, according to Faigenbaum et al. (2009) testing the 1RM has been deemed safe and effective in both clinical and non-clinical trials involving adolescents though it is quite time consuming and requires adequate supervision and may be unwarranted in a group setting with only one instructor. Along with exercise selection: intensity, volume, rest, and frequency also needs to be taken into consideration. Research suggests that children and adolescents can experience strength gains with little as one resistance training workout per week; however, a frequency of 2-3 non-consecutive times per week is suggested especially to increase practice with exercises to develop motor coordination (Lloyd et al., 2013). At this age children and adolescents have the opportune time to increase motor coordination so they need high levels of OTR (opportunities to respond) as mentioned by Metzler (2011) which provides individuals with repetitive, correct performance utilizing positive and corrective feedback (Lloyd et al., 2013). It is highly important that when designing exercise programs for youth considerations are

taken not only to decrease the risk of injury but also overtraining. Systematically varying an exercise program can increase performance gains and decrease risk of overtraining (Faigenbaum et al., 2009). Researchers suggest that periodized training programs may be more stimulating to children, which may increase adherence to an exercise program (Moraes, Fleck, Diaz, & Simao, 2013). Research is lacking on the effects of periodization with children and adolescents (Moraes et al., 2013). However, research does show that periodized training may be beneficial for adults in long term training (Baker, Wilson, & Carlyon, 1994). There are currently two types of periodization models, linear periodization and undulating periodization (Miranda et al., 2011). Linear periodization typically follows an entire year or macrocycle that is broken down into several mesocycles and microcycles where intensity and volume vary to enhance performance for a specific competitive period (Miranda et al., 2011). Undulating periodization is the variation of intensity and volume from work out to work out; this style of periodization is used to maintain higher performance during longer periods of competition (Miranda et al., 2011). Baker et al., (1994) found there was no difference of strength gains in either style of periodized training and non-periodized training in a short term study. However, Baker et al. (1994) suggests that periodization is important in long term training especially since an increase in lean body mass is an important mechanism for strength gains in weight trained individuals. As mentioned before prepubescent children and adolescents will not make large gains in muscle mass; daily undulating periodized resistance training has been shown to alter body composition in overweight/obese

children (McGuigan et al., 2009). This research suggests that periodization can be used to enhance adherence to exercise programs and decrease the risks of overtraining. However, professionals should not utilize periodization in order to induce specific adaptations like muscular growth that an adult may experience with training. According to Baker et al. (1994) there is a relationship between lean body mass increase and strength gains and therefore periodizing training programs are essential to adaptations in muscular growth and gains in strength for experienced resistance trained individuals. However, as mentioned before utilizing periodization for youth is important for reducing the monotony of training since gains in hypertrophy will be very minimal in prepubescent children, and therefore should not be the ultimate goal of a periodized resistance training program unlike one designed for an adult.

Recent Injury Data regarding High school Weight Training

According to the Consumer Product Safety Commission, from 2011-2015 there was a total of 1,525 non-sport related physical activity injuries reported from schools (CPSC, 2016). These injuries were amongst the age group between 14-17 years of age (CPSC, 2016). Of these 1525 injuries 741 or 48.590% of injuries were directly related to the use of free-weight equipment (CPSC, 2016).

Validity of Online Surveying

After an exhaustive research on the validity of online surveying the only research found discrediting online surveying came from business research (Wiersma, No year). This research mentioned people could fill out surveys twice or robotic computer programs may hack the survey and place erroneous answers (Wiersma, No year). However, this data was based off polling online research that was sent off to a large amount of the population. The research in this current study is not sent off to a large general population. This online survey will be sent out to a very specific population of educated professionals. Malware and accidental double response is unlikely when surveying a specific educated population.

Summary

Recent research shows that physical education teachers lack the knowledge required to design, implement, and supervise resistance training programs (McGladrey et al., 2014). Furthermore, out of the categories being tested subjects scored lowest in safety knowledge with a mean score of 51.31 ± 15.82 (McGladrey et al., 2014). These subjects also scored poorly in conceptual knowledge and program implementation knowledge 59.18 ± 16.90 and 59.65 ± 17.19 (McGladrey et al., 2014). This suggests that physical educators may need additional knowledge of principles in designing and implementing safe and effective strength training programs (McGladrey et al., 2014). Physical educators who did possess a resistance training or personal fitness training certification

had a 50% pass rate compared to a 26% pass rate by those who did not (McGladrey et al., 2014). This suggests that physical educators who do acquire resistance training /personal fitness certification may not have the knowledge to design, implement, and supervise resistance training programs either (McGladrey et al., 2014). However, McGladrey et al., (2014) did not clarify what certifications were held by the individuals who held the highest pass rate. Other research suggests that ACSM and NSCA certifications may be at a higher standard (Malek et al., 2002). Individuals with certification from ACSM and NSCA scored much better on the Fitness Instructors Knowledge Assessment exam as compared to those with other certifications (Malek et al., 2002). These findings suggest that physical educators may lack the ability to design and implement strength and conditioning programs.

Physical educators should acquire high standard certification and/or seek out continuing education specific to resistance training. This will lead to a higher standard in quality, design, supervision, and implementation to instruct resistance training. Certification and continuing education specific to resistance training/strength and conditioning should be maintained in order to offer the highest quality of standards set by NASPE. Especially since the California physical education content standards suggest students acquire higher levels of strength, speed, power, and endurance which are all performance related components. Research has shown that there is a gap in the knowledge that is necessary to design, supervise, and implement safe and effective resistance training programs in the physical education setting as a part of a health-related

physical education curriculum (McGladrey et al. 2014; Castelli & Williams, 2007; Satniago, eta al. (2012). More research is necessary to see if the majority of physical educators lack formal education, certification, and continuing education specific to strength and conditioning. Therefore the purpose of this research study is to report the amount of formal education, certification, and continuing education specific to resistance training amongst physical education teachers. This information can help determine where changes need to occur and if pre-service and/or in-service programs should be developed to extend educational opportunities to physical education teachers and PETE students alike. The hypothesis of this research is that physical educators lack the formal education, certification, and continuing education necessary to instruct resistance training in school aged children.

Chapter 3

METHODS

Design

This study is of a cross-sectional descriptive design and will consist of surveying credentialed high-school physical education teachers in the public school setting that either instruct a weight training class, or utilize resistance training in their physical education curricula.

Subjects

Subjects surveyed were current high school credentialed physical education teachers. Subjects were required to complete an informed consent clause approved by the Institutional Review Board of CSU, Sacramento. The only data that was analyzed came from Subjects who were credentialed physical education teachers in the public high school setting that taught resistance training or utilized resistance training as a part of their physical education curricula.

Procedures

The participants were surveyed with use of online surveying sent out via Qualtrics online survey system during the month of October year 2016. According to Deutskens (2006) online surveys illicit a significantly less response then mail surveys. However, since surveying online is much more economical and not dependent on geographical

location a larger amount of surveys were sent out. Surveys along with the informed consent was emailed to approximately 1,309 high school administrators in the California area to be forwarded to physical education departments. Over 700 other subjects were potentially recruited for surveying via social media outlets through the California Association of High School Physical Education Recreation and Dance (CAHPERD) organization's Facebook page. Reminders to complete the survey were emailed out weekly during the month data collection took place.

Instruments

The survey was developed using the Qualtrics online survey system (<http://www.qualtrics.com/>). The surveys were sent out to all high school physical education departments across the state of California. The survey began with a few questions that eliminated certain population. For example physical education instructors who are not credentialed and those who do not teach in the public high school setting were not qualified to take the survey. The survey eliminated individuals who did not teach a weight training class or utilized resistance training as a part of their physical education curricula. Several questions were asked to determine if they meet criteria that research suggests is necessary to supervise, implement, and design resistance training programs. This survey tool was designed to determine how many physical education teachers completed coursework, obtained certification, and continued education specific to the instruction of and designing of resistance training programs. The survey was in

circulation at the beginning of year 2016 between January and April. Each month a reminder was sent out asking to complete the survey. The following questions were used on the survey.

1. Do you currently teach physical education in the public high school setting?
2. Are you a credentialed physical education teacher?
3. What is the highest degree you have obtained?
4. Do you instruct resistance training courses or utilize resistance training as a part of your physical education curricula?
5. Do you possess any certifications outside of your education that is specific to resistance training or personal fitness training?
6. What Certifications do you hold (check all that apply)
 - ACSM ○ NASM
 - NSCA ○ USAW
 - ACE ○ Other_____
7. Did you complete any coursework during your education that was specific to teaching or designing resistance training programs?
8. How many courses did you complete in your undergraduate or graduate coursework that were specific to instruction or design of resistance training programs?

9. Do you currently obtain any continuing education by going to conferences, watching webinars, or completing training programs that are specific to instruction or designing of resistance training programs?

Chapter 4

RESULTS

Subjects

In all 84 responses recorded 61 subjects fulfilled the criteria of being a credentialed physical education teacher that either instructs a resistance training class or utilizes resistance training as part of their curriculum. Table 1 represents the level of education obtained by the subjects within this study that fulfilled the criteria.

Data

Approximately 65.574% of all subjects surveyed reported not having any resistance training certifications. However, most subjects 70.492% did record having completed at least one course specific to the instruction of resistance training during their educational career. Despite the majority of subjects completing coursework specific to the instruction of resistance training only 34.426% report completing continuing education specific to resistance training. Table 2 represents the educational level in comparison to certifications reported, courses completed, and continuing education completed.

Furthermore, of all the subjects reporting that they acquired certification specific to resistance training only 30.000% of all certifications held were from organizations that produce peer reviewed research, specifically the National Strength and Conditioning Association (NSCA) and American College of Sports Medicine (ACSM). Out of all

certifications held only 30% were specifically acquired through the completion of hands on instruction of resistance training. Of the 21 subjects that acquired certification 28.571% held multiple certifications. Table 3 represents the number and type of certifications held in comparison to level of education. Results indicate that 40.304% of all physical education teachers who indicate taking courses specific to instructing resistance training have also sought certifications specific to the instruction of resistance training. 68.421% of resistance training certified high school physical educators report seeking continuing education. Table 4 represents this data in comparison to education level. In comparison to formal education specific to the instruction of resistance training not completed by high school physical educators only 20% of all subjects acquired certifications. Furthermore, 80% of the certified subjects indicate not completing continuing education specific to the instruction of resistance training. Table 5 represents the level of education in comparison to not receiving formal education specific to instruction resistance training, nor seeking continuing education or certification within that field.

Table 1

High school physical education teachers and number of degrees held

Associate's degree	Bachelor's degree	Master's degree	Doctorate degree
0	32	26	3

Table 2

High school physical education teachers' educational level and certification, course completion, and continuing education comparison

Education level completed	N	Acquired Certification	Acquired coursework	Acquires continuing education
Associate's Degree	0	N/A	N/A	N/A
Bachelor's Degree	32	13	22	12
Master's Degree	26	7	21	7
Doctorate Degree	3	1	0	2

Note. N equals the amount of subjects who acquired the degree in the left column.

Table 3

High school physical education teacher's certifications obtained comparison

Education level	N	NSCA	ACSM	NASM	USAW	ACE	Other
Associate's Degree	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bachelor's Degree	13	3	0	2	0	2	9
Master's	7	4	1	0	3	0	4
Doctorate	1	1	0	0	1	0	0

Note. Some individuals reported having multiple certifications N represents how many reported being certified. All columns to the right indicate number of certifications in which some subjects held multiple.

Table 4

High school physical education teachers holding certifications and coursework completed comparison

Education Level	N	One course	Two courses	Three or more courses	Certifications held	Continuing education completed
Associates Degree	0	N/A	N/A	N/A	N/A	N/A
Bachelor's Degree	22	5	10	7	11	9
Master's Degree	21	8	4	9	7	3
Doctorate Degree	3	2	1	0	1	1

Table 5

High school physical education teacher's comparison of certification and formal/continuing education

Education Level	No courses completed	Certified	Does not complete continuing education
Associate's Degree	N/A	N/A	N/A
Bachelor's Degree	7	2	6
Master's Degree	5	0	4
Doctorate Degree	3	1	2

Chapter 5

DISCUSSION

The research findings suggest that the majority of physical education teachers who instruct resistance training do acquire formal education specific to the instruction of resistance training. However, most physical education teachers who instruct resistance training do not acquire certifications, nor continuing education specific to the instruction of resistance training. This is interesting considering the fact there is major safety concerns among resistance training in the high school setting. Research indicates a trend, subjects who acquired more formal education specific to resistance training tend to seek out certification, and continuing education specific to the instruction of resistance training. Subjects who did not acquire formal education specific to the instruction of resistance training show a trend of not acquiring certification or completing continuing education either. This may indicate that individuals who acquire more formal education specific to the instruction of resistance training may seek further knowledge in that area. This knowledge is sought by acquiring certification and continuing education specific to the instruction of resistance training. This research reaffirms that formal education is important, not just during the educational career, but as a lifelong process in always seeking self-improvement. The majority of certifications held were not from non-profit organizations that publish peer reviewed research. These organizations include the

American College of Sports Medicine (ACSM) and the National Strength and Conditioning Association (NSCA). Many individuals believe these two organizations are the leading authority on resistance training and exercise instruction. This was made apparent in the research done by Malek, et al. (2002) which indicated personal trainers certified by either the NSCA or ACSM scored higher on the FIKA (Fitness Instructor Knowledge Assessment) exam. Coincidentally most certifications held did not have any formal, hands on training specific to resistance training. Both of these types of certifications were held by the leading individuals who developed the examinations in the McGladrey et al. (2014) where the majority of physical educators, PETE (Physical Education Teaching Education) students and sport coaches were found not possessing the knowledge necessary to instruct resistance training efficiently. Malek et al (2002) found a trend that ACSM and NSCA certified individuals may possess more knowledge pertaining to the instruction of resistance/fitness training. Furthermore, McGladrey et al. (2014) showed that acquiring certifications may have benefits to the knowledge specific to the instruction of resistance training. This recent research may indicate a trend that more formal education specific to the instruction of resistance training may lead professionals to acquiring certifications and continuing education specific to the instruction of resistance training amongst high school physical education instructors. More formal education may lead to the acquirement of lifelong professional development and certification specific to the instruction of resistance training. More research needs to be conducted in order to decide if more formal education yields the seeking of further

professional development and certification/licensure specific to the education acquired. The majority of subjects reported not receiving continuing education specific to the instruction of resistance training. It seems that the majority of physical education instructors are not required to complete continuing education. More importantly physical education instructors are not required to complete any continuing education specific to the areas they instruct. As mentioned before there is no specific requirements that physical education instructors need to complete to maintain licensure as an instructor. This seems to vary from state to state, however, there are no set standards or guidelines in place. The findings suggest there is no quality control in education received by physical education instructor's post education. The knowledge acquired from receiving certifications that are specific to the instruction of resistance training align quite well with the guidelines set for physical education standards. Certifications specific to instruction of resistance training seem to have overall better quality control in continuing education. The majority of subjects who were certified reported receiving continuing education specific to resistance training. Research suggests that more formal education received specific to resistance training may lead to certification obtainment, and thus will lead to receiving continuing education specific to resistance training instruction. This research reaffirms what other research has suggested, more formal education specific to the instruction of resistance training is necessary, and educational programs should promote or offer access to certifications specific to resistance training. More research is necessary to answer why the lack of certain areas of education does not warrant seeking further

knowledge to enhance professional development. Further research should investigate what colleges offer multiple classes on resistance training instruction and do they offer any other outlets to obtaining certifications specific to resistance training instruction. In closing there still seems to be safety concerns in resistance training due to the lack of qualified supervision. With the increase in resistance training as a mode of exercise for physical education, there is little that physical education teachers are doing to prepare themselves with the skills necessary. It is recommended that more formal education and in-house fitness/resistance training certification are required within collegiate institutions to better prepare physical education instructors.

References

- ACSM.org (2015, May) Get certified. retrieved from: <http://certification.acsm.org/get-certified>
- Aafaa.com (2016, June) Certified. retrieved from: <http://www.aafa.com/recertify>
- Almstedt, H.C., Canepa, J.A., Ramirez, D.A., & Shoepe, T.C. (2011). Changes in bone mineral density in response to 24 weeks of resistance training in college-age men and women. *Journal of Strength and Conditioning Research*, 25(4) 1098-1103.
- Ayers, S.F., & Housner, L.D. (2008). A descriptive analysis of undergraduate PETE programs. *Journal of Teaching in Physical Education*, 27 51-67.
- Bacechle, T.R., & Earle, R.W. *Essential of strength and conditioning* Champaign, IL: Human Kinetics.
- Baker, D., Wilson, G., & Carolyn, R. (1994). Periodization: The effects on strength of manipulating volume and intensity. *Journal of Strength and Conditioning Research*, 8(4) 235-242.
- Bruton, S., & Ong, F. (2006). Physical education model content standards for California public schools. Sacramento, CA: California Department of Education.
- Bulger, S.M., Housner, L.D., & Lee, A.M. (2008) Curriculum alignment. *Journal of Physical Education, Recreation & Dance*, 79(7), 44-49, DOI: 10.1080/07303084.2008.10598215

- Bulger, S.M., & Housner, L.D. (2009). Relocating from easy street: Strategies for moving physical education forward. *Quest*, 61 442-469.
- Castelli, D., & Williams, L. (2007). Health-related fitness and physical education teachers' content knowledge. *Journal of Teaching in Physical Education*. 26. 3-19.
- Center for Disease Control and Prevention (2015, March). Obesity trends among U.S. adults between 1985 and 2010 Retrieved from:
<http://www.cdc.gov/obesity/data/adult.html>
- Center for Disease Control and Prevention (2015, March). Obesity prevalence maps Retrieved from: www.cdc.gov/obesity/data/prevalence_maps.html
- Consumer Product Safety Commission (2016, January). United States consumer product safety commission: NEISS data. Retrieved from: <https://www.cpsc.gov/Research-Statistics/NEISS-Injury-Data>
- Ctc.ca.gov (2015). Single subject teaching credential: Requirements for teachers prepared in california retrieved from: <http://www.ctc.ca.gov/credentials/leaflets/cl560c.pdf>
- Deutskens, E, Jong, A., Ruyter, K, & Wetzels, M. (2006). Comparing the generalizability of online and mail surveys in cross-national service. *Springer* 17(2) 119-136.
- Faigenbaum, A.D., & McFarland (2008). Relative safety of weightlifting movements for youth. *Strength and Conditioning Journal*, 30(6) 23-25.

- Faigenbaum, A. D., Myer, G., Naclerio, N., Casas, A.A. (2011). Injury trends and prevention in youth resistance training. *Strength and Conditioning Journal*, 33(3) 36-31.
- Faigenbaum, A.D., Kramer, W.J., Blimkie, C.J.R., Jefreys, I., Micheli, L.J., Nitka, M., & Rowland T.W. (2009). Youth resistance training: Updated position statement paper from the national strength and conditioning association. *Journal of Strength and Conditioning Research*, 23(5), S60-S79.
- Faigenbaum, A.D., & Westcott, W.L. (2000). *Youth strength training*. Champaign, IL: Human Kinetics.
- Ferkel, R.C., Judge, L.W., Stodden, F.D., & Griffin, K. (2014) Importance of health-related fitness knowledge to increasing physical activity and physical fitness. *The Physical Educator*, 71, 218-233.
- Haff, G.G. (2003) Roundtable discussion: Youth resistance training. *Strength and Conditioning Journal*, 25(1) 49-64.
- Issaonline.edu (2016, April) Continuing education requirements. Retrieved from: <http://www.issaonline.edu/continuing-education/requirements.cfm>
- Kohrt, W.M., Bloomfield, S.A., Little, K.D., Nelson, M.E., & Yingling V.R., (2004). Physical activity and bone health. *Medicine & Science In Sport and Exercise*, 36(11), 1985-1996.

- Lee, S.M., Burgeson C.R., Fulton J.E., Spain C.G. (2007). Physical education and physical activity: results from the school health policies and programs study 2006. *Journal of School Health*. 77 435-463.
- Lloyd, R.S. et al. (2013). Position statement on youth resistance training: The 2014 international consensus. *British Journal of Sports Medicine* (0) 1-12.
- Mackenzie, T.L., Sallis, J.F., Beets, M.W., Beighle, A., Erwin, H, & Lee, S. (2012) Physical educators role in public health: Steps forward and backward over 20y years and hope for the future. *Research Quarterly for Exercise and Sport*. 83(2), 125-135.
- Malek, M. H., Nalbone, D. P., Berger, D. E., & Coburn, J. W. (2002). Importance of health science education for personal fitness trainers. *Journal of Strength and Conditioning Research*, 16(1), 19-24.
- McGladrey, B.W., Hannon, J. C., Faigenbaum, A.D., Shultz, B. B., & Shaw, J.M. (2014). High school physical educators' and sport coaches' knowledge of resistance training principles and methods. *Journal of Strength and Conditioning Research*, 28(5), 1433-1442.
- McGuigan, M.R., Tatasciore, M., Newton, R.U., & Pettigrew, S. (2009) Eight weeks of resistance training can significantly alter body composition in children who are overweight or obese. *Journal of Strength and Conditioning Research*, 23(1) 80-85.

- Metzler, M.W. (2011). *Instructional models for physical education*. Scottsdale, AZ: Holcomb Hathaway.
- Miranda, F., Simao, R., Rhea, M., Bunker, D., Prestes, J., Leite, R.D., Miranda, H., Salles, F. B., & Novaes, J. (2011) Effects of linear versus undulatory periodized resistance on maximal and submaximal strength gains. *Journal of Strength and Conditioning Research*, 25(7) 1824-1830.
- Moraes, E., Fleck, S.J., Dias, M.R., & Simao, R. (2013) Effects on strength, power, and flexibility in adolescents of nonperiodized vs. daily nonlinear periodized weight training. *Journal of Strength and Conditioning Research*, 27(12) 3310-3312.
- Mosti, M.P., Carlsen, T., Aas, E., Hoff, J., Stunes, A.K., & Syversen, U. (2014). Maximal strength training improves bone mineral density and neuromuscular performance in young adult women. *Journal of Strength and Conditioning Research*, 28(10) 2935-2945.
- Meyer, G.D., Quatman, C.E., Khoury, J., Wall, E.J., & Hewett, T.E. (2009). Youth versus adult “weightlifting” injuries presenting to United States emergency rooms: Accidental versus non-accidental injury mechanisms. *Journal of Strength and Conditioning Research*, 23(7) 2054-2060
- Nasm.org (2016, April) Personal training certification. Retrieved from:
<http://www.nasm.org/become-a-personal-trainer/recertification#recertfaq>
- National Strength and Conditioning Association, NSCA Certification Handbook (2014). Retrieved from:<http://www.nasca.com/WorkArea/DownloadAsset.aspx?id=36507222996>

Nfpt.com (2016, April). Continuing education. Retrieved from:

<http://store.afpafitness.com/all-certifications/>

Quinn, S., & Wikgren, S. (2011). *Physical education for lifelong fitness*. Champaign, IL: Human Kinetics.

Ratamess, N.A. (2012). *ACSM's foundations of strength training and conditioning*. Indianapolis, IN: American College of Sports Medicine.

Santiago, J.A., Disch, J.G., & Morales, J. (2012). Elementary physical education teachers' content knowledge of physical activity and health-related fitness. *The physical Educator* 69 395-412.

Smith, J.J., Eather, N., Morgan, P.J., Plotnikoff, R.C., Faignebaum, A.D., & Lubans, D.R. (2014). The health benefits of muscular fitness for children and adolescents: A systematic review and meta-analysis. *Sports Med* 44 1209-1223. DOI 10.1007/s40279-014-0196-4

Store.afpafitness.com (2016, April). All Certifications. Retrieved from:

<http://store.afpafitness.com/all-certifications/>

Teamusa.org (2014, December) Sports performance certification. Retrieved from:

<http://www.teamusa.org/USA-Weightlifting/Coaching/CertificationRequirements/Sports-Performance-Coach>

Vehrs, P.R. (2005). Strength training in children and teens: Dispelling misconceptions part one. *ACSM'S Health and Fitness Journal* 9(4) 8-12.

Webster, C.A., Webster, L., Russ, L., Molina, S., Lee, H., & Cribbs, J. (2015). A systematic review of public health-aligned recommendations for preparing physical education Wiersma, W. (no year). The validity of surveys: Online and offline. Oxford Internet Institute. 1-13.

Wiersma, W. (No year) The validity of surveys: Online and offline. *The oxford Internet Institute. 1-13.*

Zaricznyj, B., Shattick L., Mast, T., Robertson, R. & D'Elia G. (1980). Sports-related injuries in school-aged children. *American Journal of Sports Medicine, (8)* 318-324.