2001

Developing a resistance training program for middle school students without access to a weightroom

Rod Allen Apel

DEVELOPING A RESISTANCE TRAINING PROGRAM FOR MIDDLE SCHOOL STUDENTS WITHOUT ACCESS TO A WEIGHTROOM

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

Of the Requirement for the Degree

Master of Arts

in

Education:

Kinesiology

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ABSTRACT

The development and incorporation of resistance training programs has previously been reserved for high school and college physical education curriculums and athletic teams. Past beliefs were that middle school aged children had not matured enough to safely and effectively participate in this type of activity. Recent research has indicated that a modified resistance training program can have positive fitness and health benefits that can safely and effectively be delivered to children of all ages. Yet middle school educators to date, have been reluctant to incorporate resistance training models into their physical education programs. This may be due to beliefs such as risk of injuries, inadequate facilities and equipment, lack of teacher preparation, and that children are physiologically unable to benefit from these activities.

This project is a plan to implement quality resistance training programs for preadolescent aged students. It will also act as a resource to give educators additional options in addressing the declining trend in the physical fitness levels of today's youth. It includes strength and conditioning activities specifically

designed for the preadolescent child. The target institution for this program is the middle school setting, which typically has limited facilities, inadequate budgets, and no access to a weight room facility.

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CHAPTER ONE

INTRODUCTION

According to Kuntzleman and Reiff (1992) children are heavier today than in previous years. The Centers for Disease Control and Prevention (CDCP, 1997), state that many children in this country already have risk factors for chronic disease, and the prevalence of overweight children is at an all-time high. A 100% increase in the prevalence of childhood obesity in the United States has occurred since 1980. Presently over 25% of children are currently classified as obese. Six million American children are currently overweight to the point of endangering their health, with an additional five million on the threshold.

As presented by Cooper (1991) the sedentary lifestyles of the children of today is responsible for both their poor fitness levels and their increased likelihood for poor health in the future. Studies show that there is insufficient physical activity in our school's physical education programs, and that we are spending the time set aside for physical activity engaged in activities which are not necessarily increasing the

fitness levels of our students. Ross and Gilbert (1985) state that most middle school physical education programs focus on sports and games, which may not promote fitness. While a curriculum that includes sports and games can be effective, more often than not these activities allow only a select few to be physically active. While these games promote competitiveness for a select few, they really do not do a great deal to enhance students' fitness levels as a whole. Lacy and LaMaster (1990) found that junior high school students were involved, on average, in fitness activities for fewer than five minutes in a 34-minute class period. In another study by Parcel, Simons-Morton & Bee (1987) it was found that in a thirty-minute class the students were vigorously active for an average of only two minutes. In a study by Mckenzie, Marshall, Sallis & Conway (2000) where middle school physical education classes were observed, it was found that students spend an average of only 50 minutes weekly in moderate activity and 20 minutes weekly in vigorous activity. These average activity levels fell well short of Healthy People 2010 objectives. As presented by Healthy People 2010 objectives, middle school students need about 150 minutes of moderate activity weekly and 50 minutes of vigorous

activity weekly to elicit any sort of physiological benefits.

Physical education is recognized as the most widely available resource for promoting physical activity among children and adolescents (Sallis & Mckenzie, 1991). The Surgeon General (1996) states that regular participation in a program of physical education for children can lead to both intermediate and long-term health benefits. Physically active children can maintain healthy bones, muscles, and joints. Physical activity can help children control weight, build lean muscle, and reduce fat. Physical exercise can delay the development of high blood pressure and reduce feelings of depression, stress and anxiety. Recent brain research has demonstrated a link between physical activity and improved academic recall, alertness and attentiveness (Niemann, 1999).

One of the major benefits of physical activity is that it helps individuals improve their physical fitness. Fitness can be defined as the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure time pursuits (President's Council on Physical Fitness and Sports, 1971). Five basic components of fitness that are

essential for good health are muscular strength, muscular endurance, cardiorespiratory endurance, flexibility and body composition. A second set of attributes, referred to as skill or sport-related physical fitness, includes power, speed, coordination, agility, balance, and reaction time. These attributes are not only important for good health, but are important for athletic performance or physically demanding jobs such as military service or rescue and emergency services.

Purpose of This Study

The purpose of this project is to develop a resistance-training model, which incorporates a circuit training format for use and implementation in the middle school setting. This model can be used as a daily fitness activity, a unit, or a once-a-week activity to be used in conjunction with other activities. A properly administered resistance-training program has the potential to improve many health and skill-related fitness measures. It can result in increased muscular strength, and endurance. It can result in increased bone density, improved body composition, lower blood pressure, increased cardiorespiratory fitness, heightened resistance to

injury, enhanced psychological well being as well as a multitude of other health and fitness outcomes (Faigenbaum, 2001). A resistance-training program can also greatly improve a students skill-related attributes such as power, speed and agility, balance, coordination and reaction time.

A resistance-training program is also purposeful in that it offers an innovative and well-rounded approach to fitness that can be utilized across the life span. All too often the past approaches to fitness grow boring and tiresome to students. Students grow weary of doing the "same old" mile run or various other long distance runs as a means of improving fitness. While running contributes to students cardiorespiratory fitness, it fails to address many of the other important health and fitness variables such as upper body strength and endurance. A study by Rupnow (1985) has shown that along with the decrease in other fitness measures, upper body strength in both boys and girls is declining. With this in mind it becomes clear that physical educators need fresh, new options and methods for developing a well-rounded fitness program for students to use later in life.

Significance of This Study

This project is significant for many reasons. First, in the past, resistance-training programs have been reserved for high school and college sport teams, or advanced physical education classes whose members were from athletic teams. Past beliefs were that middle school children were physically unprepared to participate in this method of training. It was believed that children did not yet possess the physiological make-up to safely and effectively share in this type of training. Recently, sources such as The National Strength and Conditioning Association, the American Orthopedic Society for Sports Medicine, and the American Academy of Pediatrics, have suggested that children can benefit from a properly prescribed and supervised resistance training program. Secondly, this project is significant in that the suggested programs are designed to be used with a minimal need for sophisticated equipment. Most of the exercises and activities prescribed can be done with simple equipment at minimal cost. Lastly, access to a weight room is not needed to follow this model. Almost any open space will be suitable.

Assumptions

The following assumptions were made regarding this project:

1. The physical education instructor possesses a general understanding of anatomy and physiology. The instructor should know the names of the muscles in the body, their functions, and have a basic understanding of strength training principles.
2. The instructor has or possesses the skills to motivate students. Resistance training can often be strenuous and this may discourage some students from putting forth the appropriate effort needed for success. It is hoped that with proper encouragement and motivational techniques these students will be able to overcome these barriers and realize the true physiological benefits that can be derived from this type of program.
3. The instructor needs to be skilled in the delivery and presentation of the material. Material needs to be presented in a thorough and easy to understand format. This will ensure that students

understand what is being taught, and will result in the successful performance of skills.

4. The physical educator has organized the program in such a manner as to provide for individual differences in fitness levels and abilities of individual participants. This is accomplished by offering students resistance movements that offer similar benefits, but at varying degrees of difficulty.
5. Although a weight room is not required for this program to be effective, a suitable area for implementation will be necessary. Areas such as indoor or outdoor basketball courts would be ideal. The designated area needs to be well lit, free of hazards, and have a non-slip surface to help eliminate the possibilities of injuries to participants .
6. The instructor knows how to properly administer fitness testing effectively according to state guidelines.
7. The teacher takes the necessary steps to assess the program. The instructor will use state and

national norms where appropriate to assess program effectiveness.

Limitations

The following limitations apply to this project:

1. It was noted that the majority of physical education classes in Southern California have large class sizes (40-60 students). Alterations were made to accommodate these sizeable classes. This can limit some of the exercises and the organization of the program.
2. Time constraints must also be noted. Most physical education classes are 50 minutes with only about 35 minutes of actual teaching time. This poses a challenge to physical educators. A suitable physiological benefit has to be realized for the students with only a limited amount of time to work with. The class size and time limitations were addressed by incorporating a circuit training method. With this method a larger number of students can successfully participate at once.

3. Often teachers are unwilling to change. The belief that resistance training for the preadolescent child is detrimental to the child's health and safety can be changed with the implementation of a basic resistance training program. The information presented in the literature review helps to establish a foundation for program change.
4. Although it is assumed that most middle school physical education teachers have a general knowledge of resistance training, the teaching of complex, multi joint resistance movements may not be part of the professional preparation background of many physical education teachers.

Definition of Terms

1. Adolescence is the period of life from puberty to maturity.
2. Agility refers to the ability of the body to change direction quickly.
3. Balance refers to stability produced by an even distribution of weight on each side of the vertical axis of the body.

4. Body composition refers to the relative proportion by weight of lean tissue and fat.
5. Body Image refers to the way one perceives his or her body.
6. Cardiorespiratory endurance is the ability of the body to utilize oxygen efficiently, resulting in an improvement in endurance.
7. Childhood obesity refers to a condition were a child under the age of 15 has a body fat percentage over 20% if male and 30% if female.
8. Chronic disease refers to an incurable condition which one hopes to control.
9. Circuit training refers to a system of training where participants perform exercises and then rotate in a prescribed sequence to a variety of other exercise stations. This method of resistance training has benefits over other methods in that it is efficient, can offer up a great deal of variety, and it can cater to large groups of students.
10. Coordination refers to the harmonious functioning of the parts of the body for the most effective results.

11. Epiphyseal plate is the end of a long bone, which ossifies separately later becoming ankylosed to the main part of the bone.
12. Flexibility is the range of motion at a particular joint.
13. Health related measures or hypertension are measures of fitness that include cardiorespiratory fitness, muscular endurance, muscular strength, body composition, and flexibility.
14. High blood pressure refers to blood pressure over 140/90.
15. Homeostasis refers to a normal state of equilibrium.
16. Lactic acid is acid present in the muscle tissue produced during physical exertion.
17. Lean tissue refers to the tissue of the body composed of muscle.
18. Multi-joint exercises refer to resistance exercises that require a variety of joint movements to be utilized and synchronized at one time. These exercises are generally reserved for more experienced participants.
19. Muscular endurance is the ability of the body to exert muscular force over a given period of time.

20. Muscular Strength is the ability of the body to exert maximal muscular force during a one-repetition maximum.
21. Physical fitness is a state of well being that helps people live their daily lives with vigor and reduces their risk for health problems.
22. Physiology refers to the function of the body and the study of the different systems of the body.
23. Power refers to the ability of the body to exert force over time.
24. Preadolescent child is the period of human development between the ages of 9 to 12 proceeding adolescence.
25. Prepubescent child is defined as a child, male or female, from age 8-13 who has not yet developed secondary sex characteristics according to Tanner's classification of childhood development.
26. Reaction time refers to the time it takes the body to react to a stimulus.
27. Repetitions are defined as one complete movement of an exercise.

28. Resistance training or strength training is defined as the use of resistance methods to increase one's ability to exert or resist force.
29. Self-Esteem is defined as the feeling one has for his or herself.
30. Sets are defined as a group of repetitions performed continuously without stopping.
31. Skill-related measures are measures of fitness that include power, speed, balance, coordination, reaction time and agility.
32. Speed refers to the ability to move the muscles with maximal rate of contraction.
33. Static stretch is a stretch that does not require voluntary muscle activity.
34. Tanner classification of childhood development refers to a scale of classification that ranks the physical maturation level of children based on individual development of secondary sex characteristics.

What follows in the next chapter of this project is a review of the literature citing the key components to the development of resistance training program. These components include:(1) benefits to a child who

participates in a resistance training program;(2) important safety guidelines to be followed; and (3) program design.

CHAPTER TWO

REVIEW OF THE LITERATURE

It is a common belief among parents, teachers, and coaches of the past and present that prepubescent children are unable to derive any physiological benefit from resistance training. It is believed children in the age group have bodies that are physiologically and anatomically too immature to realize such benefits. It is also a popular belief that children in the middle school age range are subject to severe risk of injury by participating in this type of activity. The following chapter presents data about benefits that can be gained by adolescents through resistance training.

Benefits of Resistance Training in Children

Over the last ten years resistance training for children has gained acceptance among medical, educational, and scientific professionals. Nevertheless, it has not enjoyed pervasive application in school programs (Kraemer & Fleck, 1993). It is not uncommon to hear parents and coaches reciting a list of the reasons why they feel their son, daughter, or athletes should not participate in resistance training. A few of the common misconceptions

about resistance training are that it stunts growth, can cause acute injury to the muscles or bones, hypertension, or fractures from weakening of the bone due to traumatic forces caused by the resistance (Kraemer & Fleck, 1993). Another commonly held belief is that children cannot derive any physiological benefits from resistance training programs due to physical immaturity. Even though these are commonly held beliefs, and have been for some time, there is little or no scientific data to support these claims. Appropriately prescribed youth resistance training programs are relatively safe when compared to other sports and activities in which children compete (Fleck & Kraemer, 1997). The research has shown that there are positive outcomes as a result of participation in resistance training.

Growth and Development

Statural Development.

The concern that resistance training will impede the statural development of children is without scientific merit. Current research indicates no evidence regarding a decrease in stature in children who perform strength training in a controlled environment (Faigenbaum & Kraemer et al., 1996). The myth that resistance training stunts growth seems to have been

formulated from previous reports that indicated that children in remote areas of Japan who performed heavy lifting were short in stature (Kato & Ishiko, 1964). However, in this study, etiological factors such as poor nutritional consumption were not taken into account. Also, the children studied performed heavy labor in mountainous terrain for several hours daily. If proper nutritional guidelines are adhered to, physical activity, including resistance training, may actually have a favorable effect on growth at any stage of development (Bailey & Martin, 1994).

Bone Development. Bone development according to Conroy et al. (1992), may be enhanced with resistance exercise as increases in muscle strain, strain rate, and compression are all important variables in bone remodeling. In a study by Conroy et al. (1992) young, elite, junior Olympic weight lifters demonstrated bone density values that were greater than age and weight matched control group. This coincides with several studies (Conroy et al.1992; Morris, Naughton, Gibbs, Carlson & Wark, 1997; Viridakis, Georgis, Korkotsidis, Ntalles & Proukakis, 1990) in which resistance training has been shown to increase the bone mineral density in

children lessening their likelihood of experiencing osteoporosis later on in life. According to Johnson, Miller & Slemenda (1992) an increase in bone mineral density by three to five percent during childhood and adolescence can reduce one's future risk of fractures by 20 to 30 percent. In a recent study by Morris et al. nine to ten year old participants taking part in a "high impact" physical activity program, which included strength training three times per week, showed significant improvements in bone mineral density when compared to a control group. Clearly, we need to develop ways of fostering gains in bone mineral mass in children for future rewards since the cost of caring for patients with osteoporosis has reached an annual cost of $13.8 billion with the incidence predicted to triple in the next 40 years (Morris et al.).

Muscular Strength, Endurance and Hypertrophy.

Another reason resistance training has not been recommended for children is due to the belief that children may not respond with increases in muscular strength, endurance, or hypertrophy because of their immature hormonal systems (Legwold, 1982). This belief has surfaced because boys lack adequate circulating

androgens prior to puberty while girls never have enough androgens unless introduced through anabolic means (National Strength and Conditioning Association [NSCA]position paper, 1994). It is, therefore, believed that muscular strength gains, or hypertrophy, are impossible. Recent research has shown otherwise by dispelling this myth and supporting the notion that children can increase muscular strength and endurance through the use of resistance training. Studies by Cahill (1978), Mcgovern (1983), Blimkie (1989,1993), and Sewell and Michelli (1984), specifically limited to the prepubescent child, all demonstrated gains in strength in children through resistance training. Children as young as six years old have benefited from resistance training through a variety of training modalities such as free weights and body weight calisthenics (Faigenbaum, Westcott, LaRosa-Loud & Long, 1999; Falk & Mor, 1996). As reported by Faigenbaum, Zaichowsky, Westcott, Micheli & Fehlandt (1993) strength gains of approximately 30 to 50% have been typically observed in untrained, pre-adolescent children following 8 to 20 week resistance training protocols. Gains of 74% have also been reported. Overall, as found by Faigenbaum et al. (1993), it seems

that the relative percentage improvement in muscular strength in preadolescents is quantitatively similar to, if not greater than, gains made by older populations.

What causes strength improvements in children? Scientific evidence indicates that neural adaptations produce the majority of strength gains observed in children (Ramsay, Blimkie, Smith, Garner & Macdougall, 1990). Therefore, as presented by Ramsay et al., by improving the functional ability of the nervous system, rather than by dramatically increasing muscular size, children make gains in muscular strength. It appears that preadolescents have more potential for an increase in strength owing to neural factors such as; changes in motor unit coordination, increases in motor unit activation, firing, recruitment, and coordination of the muscle groups, which all lend themselves to increases in strength development (Ramsay et al.). Hypertrophy is more difficult to achieve in children than adults, and it appears that muscle growth may start after adolescence when female and male adult hormonal profiles start to emerge (Kraemer & Fleck, 1993). Even though increases in the quantity of muscle may not occur in children of all ages, many other changes in the muscle, nerve, and

connective tissue of children suggest an increase in the quality of muscle tissue and the neuromuscular unit (Ramsay et al. 1990).

Hypokinetic Disease

Another concern for resistance training as it relates to the prepubescent child is that it can lead to chronic hypertension. However, in findings by Faigenbaum (1993), regular participation in such activities has no adverse effect on the resting blood pressure of children. In fact strength training may actually lower the resting blood pressure of children provided that sub-maximal loads are used and proper exercise procedures are followed (Hagberg et al., 1984). A resistance training program of low intensity and high repetitions has been recommended for hypertensive adolescents who wish to undertake this type of training (Zahka, 1987).

Injury Prevention

Smith, Andrish and Micheli (1993) found that up to 50% of all injuries sustained by children while playing organized sports are preventable if they were better prepared to play those activities. It has been documented that appropriate strengthening of muscle and other tissue can decrease the severity of common sport injuries in

adults and adolescents by better preparing them for activity (Hejna, Rosenberg, Buturusis & Krieger, 1982). If strength gains and reduced risk of injury through resistance training can indeed be made in adults and adolescents as these data imply, then it would seem logical benefits could occur in the prepubescent child as well (NSCA Position statement, 1994). According to Faigenbaum (2001) by strengthening ligaments, tendons, and bones, enhancing muscle strength and endurance, resistance training may decrease the incidence of injuries among children in athletics. Studies by Cahill (1978) and Dominguez (1978) have demonstrated decreased injury rates in adolescents who have participated in resistance training programs as part of a conditioning protocol. According to Hejna et al. bone density increases via resistance training may be one of the primary mediating factors involved in why resistance training prevents injuries in young athletes. In addition, the literature indicates that the better conditioned an athlete is the more accelerated the recovery process from injury (NSCA position paper, 1994). Resistance training, undoubtedly, would play a viable role in this process.

Epiphyseal Plate Fractures. Acute injuries refer to a single trauma to the skeletal system or bone causing injury. The reticence for pre-adolescent children to participate in resistance programs has grown in part from concern of injury occurring in the epiphyseal plates (Markiewitz & Andrish, 1992). The epiphysis is the weak link in the young skeleton because the cartilage, which makes up the plate, is weaker than the bone (Bright, Burnstein & Elmore, 1974). Even so, some evidence suggests that the growth plate may actually be stronger in children than adolescents (Micheli, 1988). Although injuries to the epiphyseal plate have occurred before in isolated incidents, all were associated with adolescents lifting maximal or near maximal weights over the head either in unsupervised settings or competing in weight lifting competitions. An epiphyseal plate fracture has not yet been reported in any prospective youth resistance-training program that was appropriately designed and competently supervised (Pearson, Faigenbaum, Conley & Kraemer, 2000). In a study by Hamill (1994) the risk of an epiphyseal plate fracture while strength training is minimal. Furthermore, it generally appears that the risks associated with youth resistance training are not any

greater than those in any other sports or recreational activities in which children participate. According to Baechle & Earle (2000), if children are taught to resistance train properly, the risk of an epiphyseal plate injury is minimal.

Muscle Strains. Another acute injury thought to disproportionately effect prepubescent children as a result of resistance training is muscle strains. Muscle strains are the most common acute injury in adult as well as prepubescent weight trainers (Fleck & Kraemer, 1997). However, this problem is not disproportionately more common in children than adults, and can usually be avoided by proper warm-up and by following proper principles of resistance training (eg. not attempting too much weight for a given number of repetitions, or performing several sets before the true training set is performed).

Fractures of the Bone. Fractures are another acute injury thought to be a major risk factor of a prepubescent resistance-training program, but this is not substantiated by the research. Findings by Drinkwater (1995) suggest that childhood may be the period during which the bone-modeling process responds best to the mechanical loading of physical activities. This includes strength training.

This gain in bone mineral density results in less risk of a fracture and may prevent skeletal frailty in adulthood as well.

Health Related Benefits

Body Composition. In addition to growth, development, and injury prevention, resistance training in prepubescent children has the potential to positively influence health related measures. One such measure is body composition. Since the prevalence of childhood obesity in the U.S. continues to increase, the potential benefits of resistance training on body fat levels is an important issue. Several studies (Faigenbaum et al., 1993; Sailors & Borg, 1987; Siegel, Camnione & Manfred, 1989) have reported a decrease in fatness, as measured by skin fold thickness, following resistance training in children. In one study conducted by Faigenbaum (2001) at the youth strength-training center in Massachusetts, it was suggested that overweight children enjoy strength training because it is not aerobically taxing. During thirty minutes of strenuous resistance training their heart rates were routinely in the 130 to 150 beats per minute range, thus it can be speculated that training with

moderate loads and a high number of repetitions may facilitate long-term fat loss (Faigenbaum, 2001).

Cardiorespiratory Health. Heightened cardiorespiratory responses can also be realized through resistance training especially when a circuit training method is implemented (Gettman & Pollock, 1981). Circuit programs consist of a series of resistance training exercises performed one after another with minimal rest (Fleck and Kraemer, 1997). A study by Gettman and Pollock (1981) showed that circuit training for 8 to 20 weeks increased maximal oxygen consumption by approximately 4-8%. Resistance training programs characterized by moderate loads and a relatively high number of repetitions have also been found to have a favorable effect on the blood lipid profile of prepubescent children (Weltman, Janney, Rians, Strand & Katch, 1987).

Psychosocial Benefits

Data from Faigenbaum (1995) suggest that the effect of resistance training extends beyond physical measures and includes improvements in well-being and mental health. Resistance training gives young athletes a sense of mastery by improving their fitness and performance (Martinez, 1997). Parents have

observed that their children were more likely to do their homework and household chores following resistance training participation (Faigenbaum et al., 1993). One study by Holloway, Beuter, and Duda (1988) involving untrained adolescent girls found that girls displayed improvements in general self-esteem following a 12-week resistance-training program. Other findings support the contention that the psychological benefits of resistance training may depend on the intensity and duration of training, and may be most apparent in children who begin training with below average measures of psychological well being and strength (Faigenbaum, Zaichkowsky, et al., 1996).

It was also witnessed in prepubescent resistance training that the children who participated had improved attitudes towards lifetime physical activity. It was found by Westcott (1992) that children's attitudes toward physical education, physical fitness, and lifelong exercise improved following a conditioning program that included resistance training. It was observed by Rians et al. (1987) that the socialization and mental discipline exhibited by children participating in resistance training was similar to the characteristics of children

participating in team sports. It seems, as presented by Telama, Yang, Laakso, and Viikari (1997), that children participating in physical activities and sports are more likely to be active later in life.

Guidelines and Safety Principles

The following are guidelines to follow to ensure the resistance training program is followed safely and without risk of injury. Factors involved are the physiological and psychological state of the participant, personnel, equipment and environment.

Mental and Emotional Readiness

Faigenbaum, Kraemer, et al. (1996) found that in order to begin resistance training a child must be mentally and emotionally ready to comply with coaching instruction. If a child is ready for participation in sports, he or she is prepared for some type of resistance training (Faigenbaum, Kraemer et al., 1996). Since millions of American children participate in organized sport annually, this seems to apply to almost any child.

Preparedness of Personnel

Another important factor is preparedness of personnel. According to a position paper by The National

Strength and Conditioning Association (1994), the supervisor of a resistance training regime should possess appropriate levels of knowledge in the area of resistance training and conditioning. They must be able to demonstrate the proper techniques of each exercise in the program, maintain the equipment, and set the program up in a competent and comprehensive manner (NSCA position paper, 1994). Faigenbaum, Kraemer, et al.(1996)found that the program should be closely supervised by experienced fitness professionals who act as good role models showing support and encouragement to help maintain interest. Teachers must have a thorough understanding of training guidelines and safety procedures (Faigenbaum, 2001). Exercises must be clearly explained in language children can understand and properly demonstrated on safe equipment (Faigenbaum, 2001). The teacher must also be effective at giving easy-to-follow explanations and learning cues for acquisition of proper form.

Facility and Equipment

The facility and equipment are also important factors contributing to an effective and safe program. The resistance training area should be well lit, clean and large enough to permit movement throughout the entire

premises without risk of tripping over equipment or coming into physical contact with another person (N.S.C.A. Position Paper, 1994). Faigenbaum, Kraemer et al. (1996) concluded that the exercise environment should be safe and free of hazards. The floor should provide good support and traction. Equipment should be safe and in good working order and of the right size for children (Faigenbaum, Kraemer et al., 1996).

Program Design

Resistance training programs should be one part of a well-rounded exercise program for children (Baechle & Earle, 2000). The program should be used as a piece of the puzzle to supplement other fitness activities, games and sports. Children should not be expected to perform an adult program. This could cause possible dangers with inappropriate exercise demands put on the participants (Fleck & Kraemer, 1997). Resistance training programs for children should be based on individual needs and abilities, and children should be encouraged to ask questions and feel comfortable seeking assistance (Faigenbaum, 2001).

Focus of the Program

The focus of a prepubescent resistance-training program should not be on competition and using large amount of weight, but on participation with lots of movement and positive reinforcement (Faigenbaum, 2001). The focus should remain on developing proper form and technique rather than on the amount of weight lifted (Faigenbaum & Polawski, 1999). Faigenbaum and Polawski (1999), stated that poor technique can put abnormal stress on muskuloskeletal tissues and lead to an injury.

Warm-up

Proper warm-up and flexibility should be performed before resistance training (Niemann, 1999). This warm-up comes in two parts. The first section is the general warm-up component. The general warm-up must be administered to the students to protect against injury, to ready them for a greater amount of flexibility, and to raise the body's internal temperature through light activity before stretching commences (Niemann, 1999). As indicated by Cornelius (1985), a general warm-up period consists of five minutes of slow jogging or riding a stationary bike.

Flexibility

The second important aspect of the warm-up is the flexibility component. Stretching decreases the likelihood of muscle strains, and injuries by increasing the elasticity of the tendons and muscles; Stretches should be initiated following the general warm-up and before the actual resistance training begins; Stretches should be held for thirty seconds to the point of mild discomfort, but pain should be avoided (Niemann, 1999). If a student is experiencing pain they are stretching too far and should reduce their range of motion. The stretches should focus on all parts of the body.

Learning New Movements

When learning a new exercise, participants must always start with light load to allow appropriate adjustments to be made (Faigenbaum & Polawski, 1999). Recommendations by Faigenbaum and Polawski (1999) are for an exercise program to start with one set of 10 to 15 repetitions of a variety of exercises. Beginning a resistance program with one set of 10-15 repetitions allows for positive changes in muscular performance, and also provides opportunity for children to feel good about their performance.

Program Recommendations

It has been recommended (Faigenbaum and Kraemer,1996) that children should perform a variety of exercises that focus on the upper body, lower body, abdominals, and lower back. A well organized basic training program for children need not be any longer than 20 to 60 minutes per training session, three times per week with the program getting more advanced as the child develops into adolescence and adulthood (Fleck and Kraemer, 1996). Additional recommendations by Baechle and Earle (2000) are for the beginner to participate in two to three sessions of resistance training per week with at least one day of rest between episodes. Most of the studies that have substantiated strength increases in the prepubescent child had the frequency set at two to three sessions of resistance training weekly (Appendix A). These data suggests that children should use moderate loads, and high repetition (i.e., 13 to 15 repetitions), which may be more beneficial then heavier load, lower repetition protocols (Faigenbaum, Westcott, et al., 1999).

Progressions

As children get stronger it is important to increase their resistance, the number of repetitions, or

the number of sets so continual gains can be realized (Faigenbaum, 2001). Increases in weight, reps, and sets must be done gradually as one must be careful not to overtax the system (Faigenbaum, Westcott et al., 1999). In general, when the subject is prepared for increases in the training stimulus increases in weight, reps, and sets should be no more than about 5 to 10%(Faigenbaum 2001).

Equipment

An effective resistance-training program does not have to consist of sophisticated equipment or a state-of-the-art facility. Positive physiological benefits can be realized by using one's own body weight as resistance (Fleck & Kraemer, 1997). These programs can be set up as circuits moving from one exercise to the next, or in a set-repetition manner performing all three sets before moving to the next exercise (Fleck and Kraemer, 1997). As presented by the National Strength and Conditioning Association (NSCA position paper, 1994) an effective resistance training program should always include exercises using the athlete's body weight as resistance, or by using simple equipment like sand bags and rubber tubing. In a study by Baumgartner and Wood (1984) it was shown that with only calisthenics as a training stimulus

increases in muscular strength were apparent in children grades three through six.

Cool Down

The cool down period is done at the end of the exercise session to return the body to its normal level of homeostasis (Niemann, 1999). It usually consists of light activity (jogging, stretching, light cycling, etc.). It is important to get students accustomed to using cool down activities as they have many physiological benefits that have importance now and later on in life. A cool down keeps blood from pooling in the extremities, clears out lactic acid which reduces soreness, and can reduce the incidence of muscular cramping (Niemann, 1999). Three to five minutes should be set aside for an appropriate cool down (Niemann, 1999).

CHAPTER THREE

MIDDLE SCHOOL RESISTANCE TRAINING PROGRAM

Background Information

This resistance-training program is designed for use in any middle school physical education setting. Most of the resistance exercises are body weight or partner resisted exercises where little or no equipment is necessary. However, some of the exercises are best done with equipment. In the event that equipment is recommended, it is minimal, inexpensive, and in most cases consists of items easily made or readily available in most physical education storage rooms (Appendix B). This was an important consideration as the majority of the middle school facilities in Southern California do not have weight training facilities, extravagant budgets, or state-of-the-art equipment.

This program has been designed to be used as part of a well-rounded physical education program. It is intended to be used in a physical education curriculum in conjunction with other components of physical education including sports and games, combatives, dance, individual activities, and a variety of fitness activities. This

particular program is quite flexible and can be used as often as is appropriate. It can be used as a unit, or as a weekly supplement to your existing program (Appendices C and D).

Psychomotor, Cognitive, and Affective Outcomes

By using resistance training as a tool to enhance the fitness levels and well-being of the middle school student, a myriad of positive outcomes can be realized. The following section outlines the specific psychomotor, cognitive, and affective outcomes that can be attained:

Psychomotor:

1. Students will display an improved level of performance in the areas of health-related fitness including muscular strength, muscular endurance, flexibility, cardiorespiratory fitness and body composition.
2. Students will effectively perform proper lifting technique for a variety of resistance movements.

Cognitive:

1. Students will understand the benefits and positive effects throughout one's lifespan as a result of participating in a resistance-training program.

Affective:

1. Students will demonstrate an improved level of confidence in fitness activities.

Program Guidelines

Organization

Circuit Method. Most middle school physical education classes in Southern California have between 35-55 students, which makes organization of the resistance-training program a key component. Perhaps the best way to organize these large classes is to utilize the circuit method. The circuit method requires that the teacher have stations situated around a facility. Students rotate in a specified sequence, perform the resistance exercise at the station for a specified period of time and sets, and then the teacher cues a rotation to a different station (Appendix E). At each station, if equipment is used, there should be enough equipment available for everyone involved. It should provide varying degrees of difficulty and ranges of resistance. Students can then choose from the equipment based on their performance capabilities (Appendix F).

Organization Options. From the circuit method several options can be developed. Students can be grouped in pairs, and rotate in a similar fashion as discussed above. As one partner is performing the resistance movement the other partner is resting or providing assistance to their respective partner. This allows for more variability of exercises and it also caters to larger classes (Appendix G). This method can also be utilized in a more challenging fashion. Instead of the partner resting in between sets, he or she would perform additional exercises during what had been formally designated as a rest period. This can result in a greater effect on the cardiorespiratory aspect of fitness as well as enhancing muscular strength and endurance benefits (Appendix H).

Frequency of Resistance Program

Ultimately it is up to the discretion of the physical educator to determine how often and by what method resistance training is infused into their curriculum. However, data from past research has shown what frequency is most effective. Several studies have found increases in strength in the prepubescent child with a frequency of two to three resistance workouts weekly

(Appendix A). A model training session for a prepubescent child as recommended by the National Strength and Conditioning Association (NSCA position paper, 1994) is three times a week. For the best results, the beginning resistance trainer should train two to three times per week with at least one rest day between workouts (Baechle & Earle, 2000). Therefore, this project reflects that recommendation (Appendix C).

Time Requirements

The typical middle school class in Southern California lasts 50 minutes. Generally, a resistance-training program can be comfortably fit into a 50-minute class period, and with modification it can fit into almost any length class period. In the typical 50-minute class period, students generally need about five to seven minutes at the beginning of class and five to seven minutes at the conclusion of class to change clothes. This reduces their participation time by approximately 10-14 minutes.

Classes that utilize this resistance-training model are organized into six parts, as described below:

1. general warm-up (3-5 minutes)
2. stretching (5-minutes)

3. explanation and demonstration (2-4 minutes)
4. resistance training protocol (23-27 minutes)
5. cool-down (2-3 minutes)
6. closure (1-2 minutes)

General Warm-up

Since most middle schools do not have access to exercise bikes or similar equipment, a light jog or comparable activity will work. There are a variety of warm-up activities one can incorporate into a program (Appendix I). Particular attention needs to be paid to the exertion levels of the students. A warm-up is designed to be slow, controlled, and prepare the body for stretching and more strenuous activity.

Flexibility

After the warm-up is completed, the students are then ready for the stretching phase of the program. A model program would consist of exercises that stretch the upper body and lower body equally (Appendices J and K). Stretches should be held ten to thirty seconds to the point of mild discomfort. Close attention needs to be paid to this to ensure students are not bouncing or forcing the stretch as this can cause injury.

Explanation of the Activities

Following the warm-up is the time designated for the instructor to explain the activity and demonstrate the resistance movements. This will require more time in the beginning when the program is new and students are just learning the resistance movements. This step can also be used to familiarize students with the benefits of participation in a resistance program (Appendix L). Careful consideration needs to be paid to detail during this step to ensure that students understand the benefits, are performing the movements safely, and are performing the necessary functions to derive the maximum benefits from resistance movements.

Demonstration to Students

To heighten student retention, the physical educator should first demonstrate the new resistance movement. This could then be followed by additional demonstrations accompanied by an explanation of each sub-skill. Next would be additional demonstrations of the total movement followed by a discussion of the muscles exercised by such a resistance movement, variations in the equipment to cater to students of different strength levels, and safety precautions. Each resistance movement has a variety of

different levels of difficulty to address the individual needs of all students. Additionally, it is important that students start with the least difficult progression and then progress towards more difficult tasks. This would then be concluded by a question and answer session where students could clarify the information given, and speak to any safety concerns. A complete list of resistance movements, their degree of difficulty, teaching cues, safety concerns, and what muscles are utilized during each lift are in Appendix M.

Teaching Methods

Pairing Students. Once all questions have been answered for a particular movement, the teacher will decide on the next step in the teaching process. One option is to pair students so they can critique each others movements. For this approach, equipment would not be necessary as students are only practicing the movement and attempting to get comfortable with the technique. The physiological benefits would come later. Similar to this approach, but more advanced, would be for the instructor to wait until he or she has introduced three or four new movements and then the students could practice. Although this approach is more time efficient, students would be

expected to absorb a great deal of new information in a relatively short period of time. Thus adversely affecting retention.

Group Practice. The last technique for the students would be to simply have them stand up after each demonstration session is complete and practice each movement as a group while the instructor observes. This technique allows the teacher to engage in individualized instruction and encouragement. This is the most time efficient approach and may be the most suitable for some instructors.

Resistance Training Protocol

Introductory Learning Circuits. Once the warm-up is completed and students are familiar with each movement, it is then time to implement the actual resistance exercises into a introductory circuit. During this circuit, students rotate from station to station performing the movements on the teacher's command. When students are just learning a circuit, it is generally a good idea to have them start with two sets of simple lifts. Students should use the lightest weight available for 10-15 repetitions while alternating with a partner. Alternating with a partner during this familiarization phase is

especially advantageous as the partner who is resting can critique and correct any problems with their partner's form. Four sample introductory circuits (Appendix N) can be used that include all of the resistance movements (Appendix M). There are no time constraints put on the students during the learning phase as the goal here is quality, not quantity. The four introductory circuits are organized from least difficult to most difficult. Some of the movements require equipment such as sand bags, or plastic pipe (PVC). If you do not have access to these materials substitute exercises are listed. It is a good idea to go through all four introductory circuits before actually implementing the program. Generally speaking, it will take approximately four class periods to go through the teaching phase of the program followed by four days of introductory circuits. An example of how those eight days might be organized can be found in Appendix O.

Implementation of the Program. There are an infinite number of implementation possibilities which would help in achieving maximum physiological benefit. As discussed earlier, it is a good idea to utilize these resistance training circuits two to three times a week in your physical education curriculum (Appendix C.). It is also

appropriate to implement this program as a free standing unit (Appendix D).

Actual Program. The actual program (Appendix P) includes a sixteen-day plan which is designed to be followed in sequence. Listed on each daily plan is the amount of time that should be spent performing each individual movement, the amount of time that should be spent rotating from partner to partner, and the amount of time that should be spent changing from station to station. Day one is devoted strictly to upper body training. Day two is devoted exclusively to lower body training. Day three is devoted to the entire body, while day four addresses the entire body as well but with the students performing exercise during their resting phase. This adds some additional stress to the body to help develop the cardiovascular system more effectively. The cycle then repeats itself but with either increased sets, rest periods shortened, or the length of time exercising increased to gradually make the program more difficult.

Once all sixteen workouts have been successfully completed, it is appropriate to begin the routine over again at any point. Changes can be made in the lifts used, order of lifts, or number of stations. This is

appropriate as long as student safety is not jeopardized and enough equipment is available.

Cool Down

The cool down at the end of the exercise session will simply be used as a means to return the students activity level back to a normal range. This will reduce the likelihood of cramps and excessive lactic acid buildup, which can later lead to severe soreness. There are a variety of cool down activities available to the teacher (Appendix Q). Most of these activities do not involve fancy equipment or a great deal of explanation. The majority are activities already utilized in most physical education programs. Particular attention needs to be paid to the exertion levels of the students during the cool down. A cool down is designed to be slow, and controlled to aid the body in returning to its normal activity levels.

Closure

Closure occurs at the very end of the class period and it can be used for a variety of important issues. Closure can be used to address any mistakes in technique and form that were prevalent in class that particular day. It can also be used to check the understanding of the

student to make certain they fully understand what was accomplished in class that particular day. Closure can be used to inform the students or remind them of the benefits they can expect to achieve by full participation in the resistance program. This procedure should be done quite often, as students should know the potential benefits of participating in a resistance-training program both from an educational standpoint and a motivational perspective. Lastly, closure can be used to address any safety concerns students may have.

CHAPTER FOUR

ASSESSMENT

Psychomotor

To determine whether or not this new program has been successful, the stated outcomes must be assessed. One such outcome from the psychomotor domain was for the students to display an improved level of performance in the areas of health related fitness including muscular strength, muscular endurance, flexibility, cardiorespiratory fitness and body composition. To determine this, one can compare student results using the Fitnessgram Test. This test can be administered at the beginning of the unit and again at the end of the unit to determine changes in fitness levels. Values for push-ups, curl-up, sit and reach, trunk lift and the mile run could be examined to note any significant changes. An individual's scores could then be compared pre and post.

Another outcome from the psychomotor domain was for the students to understand how to effectively perform proper lifting technique for a variety of resistance movements. This could be evaluated visually by the teacher observing the form and technique of the students

using the criteria presented in Appendix M. This could be an ongoing process throughout the year or it could be conducted at the end of the unit.

Cognitive

In the cognitive domain, one of the desired outcomes was for students to know the benefits and positive effects of participating in a resistance training program. For this, a written assessment could be developed and administered at the end of the year (Appendix R).

Affective

For this domain, it was hypothesized that by participating in a resistance training program students would develop an improved level of confidence towards fitness activities. A simple questionnaire can be administered to the students at the beginning and end of the program (Appendix S).

Summary

Research has shown that the fitness level of America's youth is declining and could be enhanced with new and innovative programs. Resistance training offers a new, safe, and proven method of supplementing our schools

programs to help alleviate this decline in youth fitness. Incorporating a resistance training component into a middle school physical education program will provide physical educators with an additional method to promote the fitness levels of middle school students. It is hoped that the information presented here will encourage physical education teachers to seek out resistance training as an effective means of improving the physical fitness levels of students in the middle school setting.

APPENDIX A:

STRENGTH TRAINING STUDIES IN PREPUBESCENT CHILDREN

Reference	Age/ Grade	Training mode	Frequency per week)	Strength increases
McGovern 1984	grade 4-6	weights	3	yes
Pfeiffer and Francis 1986	8-11	weights	3	yes
Sewell and Micheli 1986	10-11	weights	3	yes
Funato, Fukunaga, Asami, and Ikeda 1987	6-11	isometrics	3	yes
Vrijens 1978	10.4	weights	3	yes
Faigenbaum 1993	10.8	weights	2	yes
Baumgartner and Wood 1984	grade 3-6	calisthenics	3	yes

APPENDIX B:

LIST OF EQUIPMENT

This list of equipment is optional, but will assist in the development of a comprehensive program. The equipment listed easily accommodates a class of 60.

- Plastic Pipe (PVC)

  PVC cut into four-foot lengths can be used to replicate a regular Olympic weight lifting bar. They can easily be made heavier or lighter by inserting one or two pieces of rebar inside the pipe and sealing the ends of the pipe with PVC caps.

  Quantity:
  4-4' pieces of PVC
  4-4' pieces of PVC with one piece of rebar in each tube
  4-4' pieces of PVC with two pieces of re-bar in each tube

  Substitute:
  Use broom sticks or wooden dowels can also be substituted for PVC.

- Surgical Tubing
  Surgical tubing is flexible tubing that offers resistance.

  Quantity:
  5-10 5-foot pieces (handles on the end optional)

- Sand Bags
  Bags filled with sand to act as weights.

  Quantity:
  4-bags filled with five and ten pounds of sand

- Jump ropes

  Quantity:
  10-ropes

- Plyo Balls
  Balls used for various exercises.

  Quantity:
  2-2 pound balls
  2-4 pound balls
  2-6 pound balls
  2-8 pound balls

  Substitute:
  Any gym balls (eg. Soccer, basketballs)

APPENDIX C:

SAMPLE WEEKLY PHYSICAL EDUCATION PLANS UTILIZING RESISTANCE TRAINING

Three-times per week:

Monday	Tuesday	Wednesday	Thursday	Friday
Resistance Training	Sport or Game Activity	Resistance Training	Sport or Game Activity	Resistance Training

Two-times per week:

Monday	Tuesday	Wednesday	Thursday	Friday
Resistance Training	Sport or Game Activity	Running Assignment	Resistance Training	Sport or Game Activity

*24-48 hours of rest is recommended between resistance training days

APPENDIX D:

SAMPLE FOUR-WEEK PLAN FOR A RESISTANCE TRAINING UNIT

Monday	Tuesday	Wednesday	Thursday	Friday
Teacher goes over lower body Circuit	Teacher goes over upper body Circuit	Student practice	Upper body circuit	lower body circuit

(Week #1-students perform 2-light sets of 10-15 repetitions)

Monday	Tuesday	Wednesday	Thursday	Friday
Upper Body Circuit	Lower Body Circuit	Teacher introduces new lifts/ Student practice	Lower Body Circuit	Upper Body Circuit

(Week #2-students perform 2-sets of 10-15 repetitions)

Monday	Tuesday	Wednesday	Thursday	Friday
Lower Body Circuit	Upper Body Circuit	Teacher Choice Day	Lower Body Circuit	Upper Body Circuit

(Week #3-students perform 3-sets of 10-15 repetitions)

Monday	Tuesday	Wednesday	Thursday	Friday
Lower Body Circuit	Upper Body Circuit	Teacher Choice Day	Lower Body Circuit	Upper Body Circuit

(Week #4-students perform 2-sets of 1-minute of continuous repetitions)

*Means the activity for this day is chosen by the teacher.

APPENDIX E:

SAMPLE RESISTANCE TRAINING CIRCUIT

This circuit consists of eight stations with equipment for eight groups of six students (48 students total) rotating to each station. On the teacher's cue the students perform the resistance movement at their respective station for one minute and rest 30 seconds. This sequence is repeated two more times. Following the completion of the third set, students have 30 seconds to rotate to the next station.

Station One: SQUATS
Muscles Worked: Quadricep, Gluteus maximus, hamstring
Equipment: (2) wooden dowels (for beginner students)
(2) 4'. long pieces of PVC pipe with one piece of ½ inch rebar in the center of the PVC pipe with caps glued on either end (for intermediate students)
(2) 4' long piece of PVC pipe with two pieces of ½ inch rebar in the center of the PVC pipe with caps glued on either end (for advanced students)

Station Two: FRONT LUNGES
Muscles Worked: Quadriceps, Gluteus maximus, hamstrings
Equipment: None

Station Three: BACK LUNGES
Muscles Worked: Quadriceps, Gluteus maximus, hamstrings
Equipment: None

Station Four: TOE RAISES
Muscles Worked: Soleus, gastrocnemius
Equipment: None

Station Five: PUSH-UPS
Muscles Worked: Pectoralis minor, Pectoralis major
Equipment: None

Station Six: INCLINE PUSH-UPS (feet propped up on a bench or step)
Muscles Worked: Pectoralis minor, Pectoralis major
Equipment: None

Station Seven: CRUNCHES
Muscles Worked: Abdominals
Equipment: None (mats optional)

Station Eight: BACK HYPEREXTENSIONS
Muscles Worked: Lower back musculature
Equipment: None (mats optional)

APPENDIX F:

EXAMPLES OF PROGRESSIONS IN EQUIPMENT TO ALLOW FOR VARYING DEGREES OF STUDENT ABILITY

Bar Implement to Replicate an Olympic Bar: PVC Pipe

Progressions:

Beginner: PVC pipe
Intermediate: PVC pipe/capped/ one piece of rebar in the center
Skilled: PVC pipe/capped/ two pieces of rebar in the center

Balls used for various lifts:

Progressions:

Beginner: volleyball, soccer ball, basketball
Intermediate: 4-pound plyo-ball
Skilled: 6,8, or 10 pound plyo-ball

Implement to Replicate a Dumbbell or Barbell:

Progressions:

Beginner: bag filled with 2-pounds of sand
Intermediate: bag filled with 4-pounds of sand
Advanced: bag filled with 6, 8, or 10-pounds of sand

APPENDIX G:

SAMPLE RESISTANCE TRAINING CIRCUIT

WITH A PARTNER

This circuit consists of eight stations with equipment for eight groups of eight students (64 students) rotating to each station. On the teachers cue one of the partners performs the resistance movement for one minute. This process is repeated for the partner. This is followed by a second one-minute set by each partner.

STATION ONE: SQUATS

Progression: BEGINNERS: parallel squats with bodyweight
INTERMEDIATE: parallel squat with partner supplying pressure to the top of the shoulders
ADVANCED: parallel squat with partner on back

STATION TWO: BACK LUNGES

Progression: BEGINNERS: bodyweight
INTERMEDIATE: partner supplying light pressure to the top of the shoulder while standing in front of their partner
ADVANCED: partner supplying medium-heavy pressure to the top of the shoulder

STATION THREE: FRONT LUNGES

Progression: BEGINNER: bodyweight
INTERMEDIATE: partner supplying light pressure to the top of the shoulder while standing behind their partner
ADVANCED: partner supplying medium-heavy pressure to the top of the shoulder

STATION FOUR: TOE RAISES

Progression: BEGINNER: bodyweight
INTERMEDIATE: partner supplying pressure to the shoulder
ADVANCED: toe raise with partner on the back or supplying heavy pressure to the top of the shoulder

STATION FIVE: PUSH-UPS

Progression: BEGINNER: bodyweight
INTERMEDIATE: partner supplying light pressure evenly to the upper back
ADVANCED: medium pressure applied evenly to the upper back

STATION SIX: INCLINE PUSH-UPS

Progression: BEGINNER: bodyweight
INTERMEDIATE: partner supplying light pressure evenly to the upper back
ADVANCED: partner supplies pressure to the upper back

STATION SEVEN: CRUNCHES

Progression: BEGINNER: bodyweight
INTERMEDIATE: (same)

ADVANCED: (same)

STATION EIGHT: BACK HYPEREXTENSIONS (with partner holding feet)

Progression: BEGINNER: bodyweight
INTERMEDIATE: (same)
ADVANCED: (same)

APPENDIX H:

SAMPLE RESISTANCE TRAINING CIRCUIT WITH EXERCISE DURING THE REST COMPONENT

Directions:

Participants are partnered up with each set lasting one minute. There is a fifteen second rotation period after each set.

Station #1:

Push-ups rotated with rope jumps

Station #2:

Incline push-ups rotated with squat jumps

Station #3:

Body weight resistant squats rotated with jump ropes

Station #4:

Body weight calf raises rotated with jumping jacks

Station #5:

Front lunges rotated with rear lunges

Station #6:

Crunches rotated with single leg hops

Station #7:

Back hyperextensions rotated with jumping jacks

Station #8:

Trunk twists with plyo ball rotated with step-ups

APPENDIX I:

WARM-UP ALTERNATIVES

Alternatives:

- ✓ Jogging
- ✓ Jumping Rope
- ✓ Jumping Jacks
- ✓ Walking
- ✓ Stair Climbing
- ✓ Skipping
- ✓ Stationary Cycling (if available)
- ✓ Rowing Machine (if available)
- ✓ Front Lunges (step forward and reach alternating legs)
- ✓ Rear Lunges (step backward and reach alternating legs)
- ✓ Treadmills (if available)

APPENDIX J:

SAMPLE STRETCHING PROTOCOL

Shoulders and Chest
Straight Arms Behind Back or Seated Lean Back - 30 seconds

Posterior of the Arm
Behind Neck Stretch - 30 seconds

Upper Back
Cross Arm in Front of Chest or Arm Straight Up Above - 30 seconds

Lower Back
Spinal Twist- 30 seconds each side x each side = one minute

Hips
Forward Lunge- 30 seconds each side x each side = one minute

Torso
Side Bend With Straight Arms or Side Bends With Bent Arms - 30 seconds

Groin
Straddle or Butterfly - 30 seconds

Anterior Thigh
Side Quadricep Stretch - 30 seconds

Posterior of the Thigh
Sitting Toe Touch or Standing Toe touch - 30 seconds

Calves
Wall Stretch - 30 seconds

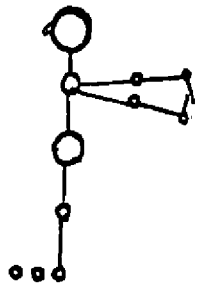
Total time: Six minutes

APPENDIX K:

STRETCHING TECHNIQUES AND MUSCLES UTILIZED

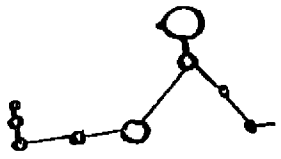
Shoulders And Chest

Straight Arm Behind Back



- standing place both arms behind back
- extend elbows and interlock hands
- slowly raise the arms and keep the elbows straight

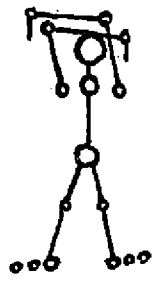
Seated Lean Back



- sitting with legs straight and arms extended place
- palms on floor
- point fingers away from body
- slide hands backward and lean backwards

Posterior Of The Arm

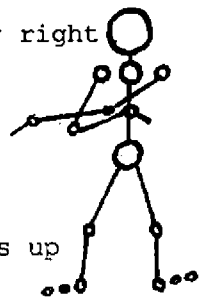
Behind-Neck Stretch



- standing adduct right shoulder and flex the elbow
- reach right hand down toward left scapula
- grasp right elbow with left hand and pull elbow behind head
- repeat for other side

Upper Back

Cross Arm in Front of Chest



- stand with left elbow slightly flexed and arm across body
- grasp upper arm just above the elbow, placing right hand on the posterior side of the upper arm
- pull left arm across chest

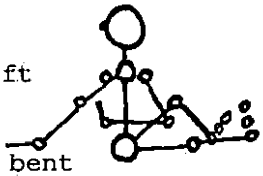
Arm Straight Up Above

- slowly straighten arms above head with palms up

- continue to reach upward wit hands and arms
- while reaching upward, slowly reach slightly backward

Lower Back

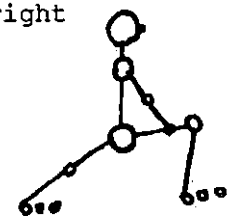
Spinal Twist



- sitting down with legs straight and upper body vertical, place right foot on the left side of the body
- place back of left elbow on right side of bent knee
- push right knee to the left with left elbow while turning head to the right as far as possible
- repeat for the other side

Hips

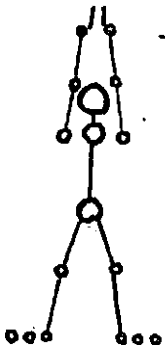
Forward Lunge



- standing take a long step forward with right leg and flex right knee
- keep right foot lat on the floor
- keep back leg straight
- slowly lower hips forward and downward

Torso

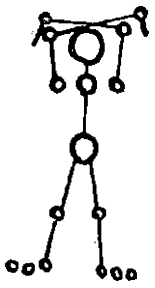
Side Bend With Straight Arms



- with feet 16 inches apart interlock the fingers with the palms away from the torso and facing outward
- reach upward with straight arms
- lean from waist to the left and right side

Side Bend With Bent Arms

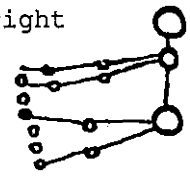
- stand with feet 16 inches apart and flex the right elbow raising it above your head
- reach the right hand down toward the left shoulder
- grasp the right elbow with the left hand
- pull elbow behind head
- repeat for the other side



Groin

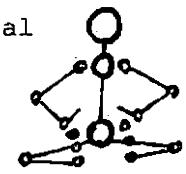
Straddle

- sit with the upper body almost vertical and legs spread
- with both arms, grasp the toes of the right foot and pull on the toes slightly
- pull chest toward right leg
- repeat for the other side



Butterfly

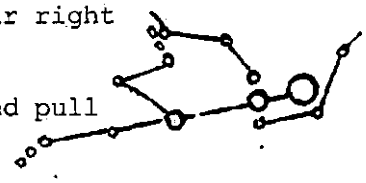
- sitting with the upper body nearly vertical flex both knees
- bring the soles of the feet together
- pull feet toward body



Anterior Thigh

Side Quadricep Stretch

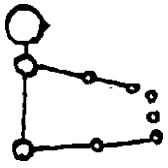
- lie on the left side with both legs straight
- flex right leg at the knee and move your right heel towards the buttocks
- grasp front of ankle with right hand and pull toward buttocks



- repeat for the other side

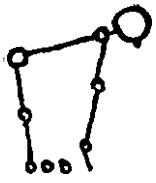
Posterior of the Thigh

Sitting Toe Touch



- sit with upper body nearly vertical and legs straight
- lean forward using hip flexion and grasp the toes
- slightly pull toes toward the upper body

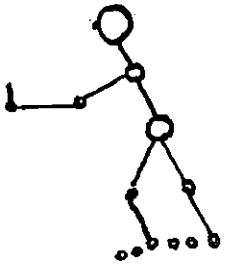
Standing Toe Touch



- in a standing position bend over and reach for your toes
- every attempt should be made not to bounce

Calves

Wall Stretch



- standing facing a wall with feet shoulder width apart
- lean forward, placing hands on the wall
- step back two feet with stretch leg while flexing opposite knee
- extend knee of stretch leg and lower heel to the floor to apply stretch

APPENDIX L:

BENEFITS OF PARTICIPATION IN A RESISTANCE TRAINING PROGRAM

- Increase in muscular strength
- Increase in muscle tissue
- Decreased body fat due to an increase in metabolism as a result of increases in muscle tissue.
- Healthier and stronger bones as a result of the compression forces put on your bones through resistance training.
- Increased energy and endurance due to the fact that your body is stronger and more efficient.
- Heightened self-confidence levels as you look and feel better.
- More resistance to injury as a result of strengthened tendons, ligaments and bones.

APPENDIX M:

RESISTANCE EXERCISES, MUSCLES USED, TECHNIQUE, EQUIPMENT AND SAFETY CONCERNS

UPPER BODY

CHEST:

Knee Push-ups: (Beginner)

Muscles Used: pectorals (primary), deltoids, triceps

Technique: place hands slightly wider than shoulder width

- body should form a straight line from knees to shoulder
- movement in a low and controlled manner
- lower your body two to four inches from the ground

Equipment: none

Safety Concerns:

- students need to perform movement in a slow and controlled manner

Pushups: (Intermediate)

Muscles Used: pectorals (primary), deltoids, triceps

Technique: place hands slightly wider then shoulder width

- body should form a straight line from knees to shoulder
- movement in a slow and controlled manner
- lower your body until you nearly touch the ground (2-4 inches)

Equipment: none

Safety Concerns:

- students need to perform movement in a slow and controlled manner

Incline Push-Ups: (Advanced)

Muscles Used: pectorals (primary), deltoids, triceps

Technique: place hands slightly wider then shoulder width

- feet should be propped up 6-10 on a step or other implement
- body should form a straight line from knees to shoulder
- movement in a slow and controlled manner
- lower your body until you almost touch the ground (2-4 inches)

Equipment: 6-10 step or implement to incline the feet

Safety concerns: only attempted by students who have mastered push-ups

- body should be lowered slow and controlled
- shoulders in-line with the feet as to not stress lower back

Plyo Ball Push: (Beginner to Advanced)

Muscles Used: pectorals (primary), deltoids, triceps

Technique: stand with feet slightly wider than shoulder-width

- hold a plyo ball or similar implement near your chest
- step forward extending your elbows out pushing the ball

Equipment: Beginners: gym balls i.e. basketballs, soccer balls

Intermediate: 2, 4 or 6 lb. Plyo balls

Advanced: 6 or 8 lb. Plyo balls

Safety concerns: beginners should start with the lighter balls

UPPER BACK:

Low pull: (Beginner to Advanced)

Muscles Used: Upper back musculature

Technique: sitting or standing upright with chest out and back flat

- gripping a towel on either end pull it towards your sternum with your partner resisting from a point in the middle of the towel
- partner can supply light or heavy pressure dependent on the ability level of the student

or

- fold a piece of surgical tubing into two equal halves
- grip each end while your partner supports the middle
- position your body far enough back so the tubing is tight
- from either end pull towards your sternum

Equipment: towels, surgical tubing

Safety Concerns: partner needs to supply even pressure

- students need to realize this is not a tug of war activity

Partner Assisted Pull-ups (Beginner to Intermediate)

Muscles Used: Latissimus Dorsi muscles (primary), posterior deltoid, biceps

Technique: grip bar above the head with palms facing towards the body

- grip should be slightly wider then shoulder width
- with partner supporting knees, body is pulled towards the bar in a straight up fashion
- body is kept straight or slightly arched as chin is pulled toward the bar
- partner applies assistance by applying upward force to the knees as needed
- pause is initiated at the top before body is lowered slow and under control

Equipment: pull up bar

Safety Concerns: partners need to apply even pressure as needed

- body needs to be lowered slow and under control to avoid excessive pressure on the shoulders and biceps

Pull-ups (Advanced)

Muscles Used: Latissimus Dorsi (primary), posterior deltoid, biceps

Technique: grip bar above the head with pals facing towards the body

- grip should be slightly wider than shoulder width
- body is kept straight or slightly arched as chin is pulled toward the bar
- pause is initiated at the top before body is lowered slow and under control

Equipment: pull-up bar

Safety Concerns: only attempted by students who have mastered the assisted pull-ups

- body needs to be lowered slow and under control to avoid excessive pressure on the shoulders and biceps

LOWER BACK:

Hyperextensions: (All Levels)

Muscles Used: lower back musculature (erector spinae)

Technique: with partner supporting the back of the heel student lays on the ground with their hands behind their back

- student raises the shoulders and upper back roughly four to six inches off the ground and then returns them back down in a slow and controlled manner
- partner supplies constant pressure to the back of the ankle

Equipment: none

Safety Concerns: students need to return body in a slow and controlled manner as to not cause injury

- partners need to supply constant pressure to the backs of the ankles for the duration of the movement

Good Mornings: (Advanced)

Muscles Used: lower back musculature (erector spinae)

Technique: subject stands holding a ball or stick behind their head

- feet should be less than shoulder width
- subject leans forward from the hips with knees bent slightly
- lower back is arched and upper back is flat
- eyes are forward, shoulders are back and chest is extended

- upper back is brought to a parallel position with the ground knees are bent while pushing the gluteus maximus back slightly
- position should be held momentarily
- body should be returned slowly to starting position

Equipment: PVC Pipe or ball implement

Safety Concerns: knees must remain slightly bent throughout the movement

- eyes must be focused straight ahead as injury could result from lack of balance

ABDOMINALS:

Abdominal Crunches: (Beginners)

Muscles Used: Abdominals

Technique: students are supine with feet elevated

- hands are positioned across the chest
- movement is done slowly with control
- head, neck, and upper torso are kept in line
- shoulder blades are lifted off the ground (2-4 inches)
- up position is paused for 4-6 seconds

Equipment: none

Safety Concerns: hands must be placed across the chest as to alleviate neck or back injuries by pulling on the back of the head

- movement must be slow and controlled pausing at the top
- student need to be aware this is not a speed activity

Oblique Crunches: (Beginner)

Muscles Used: abdominals, obliques

Technique: students are supine with right foot flat on the floor and the left foot across the right knee

- hands are position on the sides of the head
- movement is done slow and controlled
- right elbow is brought to the left knee causing a slight body twist raising the right shoulder blade 2-4 inches off the ground
- position is held for four to six seconds
- process is repeated for the opposite side of the body

Equipment: none

Safety Concerns: hands must be placed on the sides of the head as to eliminate neck or back injuries by pulling on the back of the head

- movement must be slow and controlled pausing at the top
- student need to be aware that this is not a speed activity

Toe Touches: (Beginner)

Muscles Used: Abdominals

Technique: student lays on their back with feet and legs extended straight upward perpendicular

- shoulder blades are lifted two to four inches off the ground
- position is held for four to six seconds
- shoulders and head return to the ground in a slow and controlled manner

Equipment: none

Safety Concerns: movement needs to be slow and controlled during all phases

Bicycle (Beginner)

Muscles Used: Abdominals

Technique: student is supine with both legs off the ground with the left knee and hip flexed to 90 degrees

- shoulders are two to four inches off the ground
- hands are placed on the sides of the head
- left knee is extended while the right knee is simultaneously moving with a bent knee in the opposite direction toward the shoulder
- the same sequence is repeated beginning with the left knee

Equipment: none

Safety Concerns: hands must remain on the sides of the head to alleviate pressure on the neck

- movement must be done slow and controlled manner

TRICEP:

Tricep Press: (Beginner to Advanced)

Muscles Used: Tricep

Technique: in an upright position students grip a weighted implement with a two hand grip

- implement is brought behind the head with the elbows bent by the ears
- elbows are then extended in a slow and controlled manner
- upper arm is locked into place with the only movement at the joint of the elbow

Equipment: Beginner: gym balls, pvc pipe

Intermediate: 2,4, or 6 lb. Bag of sand, light pressure to PVC pipe or a gym ball

Advanced: pvc pipe or gym ball with partner supplying pressure

Safety Concerns: students must be careful that implement does not come in contact with the head

- partner must supply even pressure to the implement without interfering with correct form

BICEP:

Bicep Curl (Beginner to Advanced)

Muscles Used: Biceps

Technique: Hands are placed shoulder width apart on pvc pipe

- palms are facing out
- knees are slightly bent
- arms are straight at quadricep level
- with body erect the implement is raised to the shoulders and held for two to four seconds
- implement is then lowered in a slow and controlled manner with the elbows remaining at the side of the body

Equipment: pvc pipe or similar implement

Safety Concerns: movement is done slowly and controlled

SHOULDERS:

Partner Assisted PVC Shoulder Press: (Beginner to Advanced)

Muscles Used: Deltoids

Technique: in an upright position pvc pipe is held at chin level

- arms are then extended raising the pvc over the head
- implement is then lowered in a slow and controlled manner slightly below the chin
- pressure can be applied to the pvc pipe in both directions for students who are advanced

Equipment: pvc pipe

Safety Concerns: movement should be done in front of the head and lowered to just below the chin as to not cause shoulder impingement

- partner should not assist unless student has mastered the movement
- partner should apply pressure without prohibiting a full extension of the bar

PVC Upright Row (Beginner to Advanced)

Muscles Used: Deltoids

Technique: subject grips the pvc pipe with the palms facing in and hands about 18 inches apart

- pvc pipe is resting near the quadriceps with arms fully extended
- pvc is pulled upward along abdomen and chest toward the chin
- pvc is kept close to the body
- at top position the elbows are above the wrists
- bar is then lowered in a slow and controlled manner
- more advanced students can have partners apply pressure evenly to both sides of the pipe

Equipment: pvc pipe

Safety Concerns: student should apply even and equal pressure for the advanced student without compromising form

- movement must be done in a slow and controlled manner to avoid shoulder impingement

Front Raise: (Beginner to Advanced)

Muscles Used: Anterior Deltoid

Technique: weighted implement is lifted in a standing position

- arms are fully extended near the quadricep with student gripping implement with the palms down
- arms are extended and lifted to shoulder height
- position is held for three to five seconds and then lowered to the starting position

- advanced students can have their partners exert even force to both sides of the pvc pipe, or heavier implements can be utilized

Equipment: Beginner: gym balls, pvc pipe,

Intermediate: 2 & 4 lb. Plyo balls, 2 & 4 lb. sand bags or gym balls with partner applying light resistance

Advanced: 6 & 8 lb. Plyo balls or sand bags, pvc with partner resistance, or gym balls with partner resistance

Safety Concerns: for the advanced Students the partner must apply even force to both sides of the implement and not apply so much pressure as to cause technique breakdowns in the subject

Sandbag Lateral Raise: (Beginner to Advanced)

Muscles Used: Deltoid

Technique: student is in an upright position

- arms are positioned by the sides of the legs with an implement in each hand
- each arm is raised to the side of the body in a slow and controlled manner until arms are parallel to the ground
- arms are then returned to starting position in a slow and controlled manner

Equipment: Beginner: weightless

Intermediate: 2 or 4 lb. Implements or sand bags

Advanced: 6 or 8 lb. Implements or sand bags

Safety Concerns: students should not raise arms above parallel to avoid shoulder impingement

- movement must be slow and controlled

LOWER BODY

UPPER LEG:

Squats: (Beginner to Advanced)

Muscles Used: quadriceps, gluteus maximus, lower back)

Technique: bar or implement should be balanced across the back of shoulders

- feet should be positioned shoulder width apart
- in a slow and controlled manner the bar should be lowered by flexing the knees
- back should be arched and the knees aligned over the toes
- at the bottom position upper leg should be parallel to the floor
- students should imagine they are sitting down on a small chair
- bottom position should be held for three to five seconds
- bar should then be raised by straightening the hips and knees

Equipment: Beginner: no weight

Intermediate: pvc pipe or similar implement, or partner supplying even pressure to the pvc pipe

Advanced: partner on the advanced students back as resistance

Safety Concerns: this movement should be done slow and controlled

- students should not advance to a higher degree of difficulty until they have mastered a lesser degree of difficult
- if a partner supplies added resistance it should be done evenly without compromising form

Reverse Lunges (All levels)

Muscles Used: gluteus maximus, quadriceps, hamstrings

Technique: students are standing in an upright position

- hands are placed on the hips
- students should step backwards 30-36 inches directly behind the body with one leg
- during backward step shoulders should come forward slightly

Forward Lunges

Muscles Used: gluteus maximus, quadriceps, hamstrings

Technique: subjects are standing in an upright position

- hands placed on the hips
- subjects should step forwards 30-36 inches directly in front of their body with one of their legs
- during forward step shoulders should come forward slightly as subjects step forward front knee should be bent in a slow and controlled fashion
- front knee should stay lined up above the foot
- quadricep should be perpendicular to the floor
- hold position for three to five seconds
- pull self upright with forward leg allowing front leg to perform entire movement
- switch legs

Equipment: none

Safety Concerns: movement should be done slowly and controlled to enhance balance

- forward knee should not pass toes to prevent undue stress on the knees

Ankle Jumps: (All levels)

Muscles Used: Entire leg musculature

Technique: students stands upright with arms extended over the head

- with knees slightly bent the arms are raised overhead
- student bounces up and down off their toes
- student concentrates on quick and precise jumps

Equipment: none

Safety Concerns: teach students to absorb the shock by landing on their toes first to avoid potential injury to the lower back

Tuck Jumps (All levels)

Muscles Used: Entire leg musculature

Technique: students stand in a semi-squat position with their hips, back, knees over toes, and shoulders over the knees

- hands are out in front for balance
- students jump as high as they can bringing the knees to the chest at the top of the jump
- students should land on their toes with hips back and shoulders over the knees

Equipment: none

Safety Concerns: students should land on their toes to absorb the shock to avoid injury to the lower back

- potentially injury to the lower back could be caused by repeated jumps on the heels

Jump and Reach Jumps (All Levels)

Muscles Used: Entire Leg Musculature

Technique: students stand in a semi-squat position with their hips, back, knees over toes, and shoulders over the knees

- students jump as high as they can and reach

Equipment: none

Safety Concerns: students must not land on the heels but instead their toes to absorb shock

- potentially injury to the lower back could be caused by repeated jumps on the heels

LOWER LEG:

Calf Raises (Beginning to Advanced)

Muscles Used: Gastrocnemius and soleus

Technique: students stand with the balls of their feet on a ledge or elevated object

- if none is available the floor can be used
- feet should be shoulder width apart
- students should elevate on the balls of their feet lifting their heels as high as allowable
- students should then drop down just below the starting position if on a ledge

Equipment: Beginner: floor or ledge to step on

Intermediate: use one leg at a time off the floor or ledge

Advanced: perform movement with a partner on your back

Safety Concerns: students must make sure at least one-half the foot is on the ledge to prevent slippage

- subjects should not lower heel as far as possible toward the floor as this puts undue stress on the calf musculature

APPENDIX N:

SAMPLE INTRODUCTORY CIRCUITS TO FAMILIARIZE STUDENTS WITH RESISTANCE MOVEMENTS

Introductory Circuit #1

Directions: Each movement should be performed for 10-15 repetitions with the partner critiquing the form of the exerciser.

Beginning Program #1:

- ✓ Four students at a station will accommodate 32 students.
- ✓ Six students at a station will accommodate 48 students.
- ✓ Eight students at a station will accommodate 64 students.

Station #1: knee Push-ups or push ups

Station #2: low pull with a towel with resistance from a partner

Station #3: partner assisted pull-ups or pull ups

Station #4: hyperextensions

Station #5: abdominal crunches

Station #6: squats (weightless or with PVC if available)

Station #7: toe touches

Station #8: Front raise (weightless or with PVC if available)

Introductory Circuit #2

Directions: Each movement should be performed for 10-15 repetitions with the partner critiquing the form of the exerciser.

- ✓ Four students at a station will accommodate 32 students.
- ✓ Six students at a station will accommodate 48 students.
- ✓ Eight students at a station will accommodate 64 students.

Station #1: knee push-ups, push ups or incline push-ups

Station #2: hyperextensions or good mornings

Station #3: tricep press with gym ball (or PVC if available)

Station #4: lateral raise (with sand bag or similar implement)

Station #5: oblique crunches

Station #6: front lunges

Station #7: bicycle

Station #8: front raise with a gym ball (or PVC if available)

Introductory Circuit #3

Directions: Each movement should be performed for 10-15 repetitions with the partner critiquing the form of the exerciser.

- ✓ Four students at a station will accommodate 32 students.
- ✓ Six students at a station will accommodate 48 students.
- ✓ Eight students at a station will accommodate 64 students.

Station #1: reverse lunges

Station #2: squats or squats applied with pressure to the shoulders

Station #3: tricep press with gym ball (or PVC if available) with a partner exerted light pressure to the implement

Station #4: ankle jumps

Station #5: pvc upright row or toe touches (if PVC is not available)

Station #6: front raise with a gym ball (or PVC if available) with light pressure on the ball by a partner

Station #7: calf raises from the floor

Station #8: bicycles

Introductory Circuit #4

Directions: Each movement should be performed for 10-15 repetitions with the partner critiquing the form of the exerciser.

- ✓ Four students at a station will accommodate 32 students.
- ✓ Six students at a station will accommodate 48 students.
- ✓ Eight students at a station will accommodate 64 students.

Station #1: squats or squats with a partner on your back

Station #2: Hyperextensions or good mornings

Station #3: tricep press with gym ball (or PVC if available) or tricep press with a gym ball (or PVC) with partner applied pressure

Station #4: tuck jumps

Station #5: oblique crunches

Station #6: jump and reach jumps

Station #7: calf raises from the floor or an elevated position

Station #8: bicep curl with pvc pipe or front lunges if pvc is not available

APPENDIX O:

FORMAT FOR TEACHING AND PRACTICING

THE RESISTANCE MOVEMENTS

Class Objective
Day #1: Teach proper form for the chest movements and upper back Student practice
Day #2: Teach proper form for the lower back and abdominals Student practice
Day #3: Teach proper form for the tricep and bicep Student practice
Day #4: Teach proper form for the shoulders and lower body Review lower back and abdominals Student practice
Day #5: Review Key Points/ Introductory Circuit #1 (Appendix N)
Day #6: Review Key Points/ Introductory Circuit #2 (Appendix N)
Day #7: Review Key Points/ Introductory Circuit #3 (Appendix N)
Day #8: Review Key Points/ Introductory Circuit #4 (Appendix N)

APPENDIX P:

RESISTANCE PLAN (16 WORKOUTS)

#1. Upper Body Focus

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 30 seconds
Rotate Interval Between Stations: 15 seconds
Rotate Interval Between Partners: 15 seconds
Total Time: 22 minutes

STATION #1: knee push-ups or pushups

STATION #2: low pull with towel (pull-ups if towels are unavailable)

STATION #3: hyperextensions

STATION #4: abdominal crunches

STATION #5: tricep press with pvc or gym ball(partner resistance)

STATION #6: pvc shoulder press or if pvc is not available front raise with gym ball with partner added resistance

STATION #7: oblique crunches

STATION #8: bikes

#2. Lower Body Focus

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 30 seconds
Rotate Interval Between Stations: 15 seconds
Rotate Interval Between Stations: 15 seconds
Total Time: 22 minutes

STATION #1: squats (advanced: partner added resistance)

STATION #2: reverse lunges

STATION #3: forward lunges

STATION #4: ankle jumps

STATION #5: calf raise (off floor or ledge)

STATION #6: tuck jumps

STATION #7: good mornings

STATION #8: jump and reach jumps

#3. Entire Body Focus

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 30 seconds
Rotate Interval Between Stations: 15 seconds
Rotate Interval Between Partners: 15 seconds
Total Time: 22 minutes

STATION #1: squats or partner-assisted squats

STATION #2: knee push-ups, push-ups or incline push-ups

STATION #3: hyperextensions

STATION #4: toe touches

STATION #5: tricep press with pvc or gym ball

STATION #6: front raise with pvc or gym ball (partner resistance)

STATION #7: forward lunge

STATION #8: tuck jumps

#4. Resistance Movements with Cardio Added Cardiovascular Component

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station. Partners will do a cardiovascular exercise during the resting phase.

Exercise Interval: 30 seconds
Rotate Interval Between Stations: 15 seconds
Rotate Interval Between Partners: 15 seconds
Total Time: 22 minutes

STATION #1: abdominal crunches alternated with oblique crunches

STATION #2: good mornings alternated with jumping jacks

STATION #3: knee push-ups or push-ups alternated with jumping rope

STATION #4: squats alternated with tuck jumps

STATION #5: forward lunges alternated with rear lunges

STATION #6: ankle jumps alternated with calf raises

STATION #7: bikes alternated with jump and reach jumps

STATION #8: toe touches alternated with upright rows (pvc or gym ball)

#5. Upper Body Circuit

This circuit consists of seven stations. Students are paired up and rotate to each station on the teachers command. Each student will perform three sets per station.

Exercise Interval: 30 seconds
Rotate Interval Between Stations: 15 seconds
Rotate Interval Between Partners: 10 seconds
Total Time: 26:15 minutes

STATION #1: knee push-ups, push-ups or incline push-ups

STATION #2: tricep press with pvc or gym ball (partner resisted)

STATION #3: hyperextensions or good mornings

STATION #4: bicep curl (if PVC is available) or front raise with gym ball(partner assisted resistance)

STATION #5: abdominal crunches

STATION #6: side lateral raise (if implement is available) or oblique crunches

STATION #7: pvc shoulder press (if pvc is available) or upright row with gym ball (partner adding resistance)

#6. Lower Body Circuit

This circuit consists of seven stations. Students are paired up and rotate to each station on the teachers command. Each student will perform three sets per station.

Exercise Interval: 30 seconds
Rotate Interval Between Stations: 15 seconds
Rotate Interval Between Partners: 10 seconds
Total Time: 26 minutes 15 seconds

STATION #1: reverse lunges

STATION #2: squats or partner assisted squats

STATION #3: forward lunges

STATION #4: tuck jumps

STATION #5: calf raise (floor or ledge if available)

STATION #6: ankle hops

STATION #7: good mornings

#7. Entire Body Circuit

This circuit consists of seven stations. Students are paired up and rotate to each station on the teachers command. Each student will perform three sets per station.

Exercise Interval: 30 seconds
Rotate Interval Between Stations: 15 seconds
Rotate Interval Between Partners: 10 seconds
Total Time: 26 minutes 15 seconds

STATION #1: squats or partner-assisted squats

STATION #2: knee push-ups, push-ups or incline push-ups

STATION #3: hyperextensions

STATION #4: abdominal crunches

STATION #5: toe touches

STATION #6: tuck jumps

STATION #7: oblique crunches

#8. Resistance Movements with Added Cardiovascular Component

This circuit consists of seven stations. Students are paired up and rotate to each station on the teachers command. Each student will perform three sets per station. Partners exercise during the rest phase.

Exercise Interval: 30 seconds
Rotate Interval Between Stations: 15 seconds
Rotate Interval Between Partners: 10 seconds
Total Time: 26 minutes

STATION #1: good mornings alternated with abdominal crunches

STATION #2: squats alternated with tuck jumps

STATION #3: calf raise alternated ankle hops

STATION #4: oblique crunches alternated with jumping rope

STATION #5: forward lunges alternated jump and reach jumps

STATION #6: reverse lunges alternated with jumping jacks

STATION #7: knee push-ups, push-ups, or incline push-ups alternated with in-place running

#9. Upper Body Circuit

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 45 seconds
Rotate Interval between stations: 10 seconds
Rotate Interval Between partners: 5 seconds
Total Time: 26 minutes 40 seconds

STATION #1: low pull w/ towel (pull-ups if towels are unavailable)

STATION #2: hyperextensions

STATION #3: good mornings

STATION #4: abdominal crunches

STATION #5: pvc shoulder press or if pvc is not available front raise with partner with gym ball with partner added resistance

STATION #6: tricep press with pvc or gym ball (partner resistance)

STATION #7: oblique crunches

STATION #8: bicep curl with partner resistance or bikes

#10. Lower Body Circuit

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 45 seconds
Rotate Interval between stations: 10 seconds
Rotate Interval between partners: 5 minutes
Total Time: 26 minutes 40 seconds

STATION #1: reverse lunges

STATION #2: ankle jumps

STATION #3: forward lunges

STATION #4: tuck jumps

STATION #5: squats or partner resistance squats

STATION #6: hyperextensions

STATION #7: jump and reach jumps

STATION #8: calf raise of floor or ledge

#11. Entire Body Circuit

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 45 seconds
Rotate Interval between stations: 10 seconds
Rotate Interval between partners: 5 seconds
Total Time: 26 minutes 40 seconds

STATION #1: knee push-ups, push-ups or incline push-ups

STATION #2: squats or partner assisted squats

STATION #3: tuck jumps

STATION #4: forward lunge

STATION #5: abdominal crunch

STATION #6: tricep press with pvc or gym ball

STATION #7: hyperextensions

STATION #8: bicep curl (if PVC is available) or front raise (gym ball)

#12. Resistance Movements with Added Cardiovascular Component

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 45 seconds
Rotate Interval between stations: 10 seconds
Rotate Interval between partners: 5 seconds
Total Time: 26 minutes 40 seconds

STATION #1: jump and reach jumps alternated good mornings

STATION #2: toe touches alternated with ankle jumps

STATION #3: squats alternated front lunges

STATION #4: knee push or push ups alternated with oblique crunches

STATION #5: reverse lunges alternated with tuck jumps

STATION #6: jumping rope alternated with calf raise (floor or ledge)

STATION #7: front raise (with pvc or gym ball) alternated with bikes

STATION #8: upright rows (pvc or gym balls) alternated with calf raise

#13. Upper Body Circuit

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 45 seconds
Rotate Interval between stations: 10 seconds
Rotate Interval between partners: 5 seconds
Total Time: 26 minutes 40 seconds

STATION #1: low pull w/ towel (pull-ups if towels are not available)

STATION #2: abdominal crunches or bikes

STATION #3: knee push-ups, push-ups or incline push-ups

STATION #4: hyperextensions

STATION #5: pvc shoulder press or if pvc is not available toe touches

STATION #6: tricep press with gym ball or pvc (partner resistance)

STATION #7: upright row with pvc or a gym ball (partner assisted)

STATION #8: good mornings

#14. Lower Body Circuit

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 45 seconds
Rotate Interval between stations: 10 seconds
Rotate Interval between partners: 5 seconds
Total Time: 26 minutes 40 seconds

STATION #1: calf raise (floor or ledge)

STATION #2: reverse lunges

STATION #3: squats or partner assisted squats

STATION #4: forward lunges

STATION #5: jump and reach jumps

STATION #6: tuck jumps

STATION #7: ankle hops

STATION #8: good mornings

#15. Entire Body Circuit

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 45 seconds
Rotate Interval between stations: 10 seconds
Rotate Interval between partners: 5 seconds
Total Time: 26 minutes 40 seconds

STATION #1: knee push-ups, push-ups or incline push-ups

STATION #2: hyperextensions

STATION #3: tricep press with pvc or gym ball

STATION #4: tuck jumps

STATION #5: forward lunges

STATION #6: toe touches

STATION #7: front raise with pvc or gym ball (partner resistance)

STATION #8: oblique crunches

#16. Resistance Movements with Cardio Respiratory Component

This circuit consists of eight stations. Students are paired up and rotate to each station on the teachers command. Each student will perform two sets per station.

Exercise Interval: 45 seconds
Rotate Interval between stations: 10 seconds
Rotate Interval between exercises: 5 seconds
Total Time: 26 minutes 40 seconds

STATION #1: good mornings alternated jumping jacks

STATION #2: forward lunges alternated with rear lunges

STATION #3: bikes alternated with toe touches

STATION #4: calf raise alternated with ankle hops

STATION #5: squats alternated tuck jump and reach jumps

STATION #6: knee push-ups, push-ups alternated with jumping rope

STATION #7: abdominal crunches alternated with oblique crunches

STATION #8: tuck jumps alternated with upright rows (gym ball or PVC)

APPENDIX Q:

COOL DOWN ALTERNATIVES

Alternatives: (2-3 minutes)

- jogging
- walking
- stationary cycling (if available)
- light activity on a rowing machine (if available)
- stretching
- treadmill (if available)

APPENDIX R:

SAMPLE STUDENT ASSESSMENT FOR THE BENEFITS OF RESISTANCE TRAINING

Directions: Read the question(s) and then circle the best answer.

True or False (circle one)

1. T F Resistance training can increase muscle, bone, tendon and ligament strength.

2. T F By participating in resistance training a person has a higher chance of getting injured in sports.

3. T F An increase in the size of the muscles from resistance training causes your body to burn fat more efficiently.

4. T F Resistance training can cause the rate of height to be reduced in a child.

Circle the correct answer

5. Bones become stronger from resistance training because:

   a. Compression forces put on the bone through resistance training make the bone stronger
   b. Bones actually become weaker from resistance training
   c. Scar tissue builds up inside the bone
   d. Fat builds up around the bones making them stronger

6. Resistance training can increase self-confidence levels in some people because:

   a. They look better
   b. They feel better
   c. They have more energy
   d. All the above

7. What are the benefits in gaining muscle and muscular strength?

   a. A higher metabolism, which means you burn body fat more efficiently
   b. Stronger bones, ligaments and tendons
   c. Less chance of getting injured
   d. Higher self-confidence levels
   e. All the above

APPENDIX S:

LICKERT SCALE TO DETERMINE IF A CHANGE IN ATTITUDE OCCURRED AS A RESULT OF RESISTANCE TRAINING

Directions: To be administered to the students before participation in the program and at the conclusion of the program.

1. I believe I am able to set fitness goals and work towards improvements.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

2. I believe I am capable of improving my fitness levels through hard work.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

3. I believe I can effectively develop my own personal fitness program.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

4. I believe I will participate in fitness activities for a lifetime.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

5. I enjoy the feeling I get as a result of regular participation in physical activity.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

6. I appreciate the relationships with others that result from participation in physical activity.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

7. I respect the role that regular physical activity plays in my personal goal of lifelong health and well-being.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

8. I understand that physical activity provides the opportunity for self-expression, communication and enjoyment.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

9. Physical activity and physical fitness are important to me.

Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	2	3	4	5

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