Jenny Lausti and Ville Lehtinen

A Free Weight Video Guide for Balance Fitness Center Customers

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KAJAANIN AMMATTIKORKEAKOULU
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THESIS
ABSTRACT

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The purpose of this thesis was to develop a free weight video guide for gym training beginners which would provide guidelines to perform safe and effective lifting techniques. The video guide is targeted for customers in working age. The thesis was commissioned by Balance Fitness Center in Kajaani.

The aim was to create a valuable product for Balance Fitness Center which could use the product as a marketing tool. A product that introduces exercise techniques can lower the threshold for starting strength training. A guide about basic strength training machinery has been made for Balance Fitness Center earlier. Now there was a need for a guide which would provide guidelines to perform free weights movements. From the authors' point of view, the aim was to develop professional competence as sport instructors by increasing their knowledge of human anatomy, exercise physiology and principles of strength training.

The theoretical framework discusses the general principles of strength training and introduces basic information about muscle function, strength training terminology, strength training guidelines and structuring a strength training session. Theoretical part demonstrates that the key to successful strength training is an appropriate program design.

This thesis was carried out as a product development process. The process started in December 2014 and was finished in the end of May 2015. The development of the product is based on the authors' personal experience of strength training and especially free weights. The video guide includes 23 movements which are performed with free weights. The authors had to contemplate what kind of movements would be appropriate for gym beginners and to provide clear guidelines which would be easy for Balance Fitness Center customers to follow and understand. After watching the video, customers should be able to train independently and safely at the gym using a proper lifting technique. The product was published on Facebook.

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PREFACE

"Those who become enamoured of practices without science are like a pilot who goes into a ship without rudder or compass and never has any certainty of where he is going."

- Leonardo da Vinci

CONTENTS

1 INTRODUCTION

It is coming increasingly apparent that strength training has a good impact on person's physical, social and physiological health (Kauranen 2014, 428). Studies have proven that consistent strength training reduces the risk factors associated with coronary heart disease, non-insulin-dependent diabetes and colon cancer. In addition it prevents osteoporosis and promotes weight loss and maintenance (Suni & Vasankari 2011, 41 - 42.) Regular strength training can also increase overall quality of life (Kell, Bell & Quinney 2001, 864).

The popularity of strength training has increased over the last decade in Finland. Strength training is the third most popular form of exercise with 713 000 trainers and the percentage of gym trainers is above the EU average (Kansallinen liikuntatutkimus 2009 - 2010.) Nevertheless, only one out of ten of the Finnish working age population undertakes exercise to improve muscular strength according to the minimum level (Husu, Paronen, Suni & Vasankari 2010, 32-33).

Magazines, television and Internet are filled with information about strength training. Google search for the word physical activity (=liikunta) produces nearly ten million hits (Kokkonen 2013, 235.) For a beginner strength trainer, the information available from different sources may feel overwhelming, and guidelines on the Internet may not provide safe and effective strength training on the appropriate level.

The purpose of this thesis was to develop a free weight video guide for gym training beginners in working age. The purpose was to provide guidelines to perform safe and effective lifting techniques. The organization that commissioned the thesis was Balance Fitness Center that is located in the centre of Kajaani. The aim was to provide a valuable product for Balance Fitness Center, which acts as a marketing tool for the company. The aim was to offer knowledge for the customers of Balance Fitness Center how to use the free weight equipment with a proper technique. A product that provides exercise techniques can lower the beginning threshold. A guide about basic strength training machinery has been made for Balance Fitness Center earlier (Vatanen & Alakärppä 2013).

The most general types of strength training exercises can be performed with free weights or strength training machines (Kreamer, Fleck & Deschenes 2012, 367). Many strength training researchers believe that free weights have certain advantages over exercise machines for ex-

ample, movements require more functionality such as dynamic proprioception, stabilization, balance and control. According to Kauranen (2014, 451) disadvantage of free weights is a greater potential to cause injury, if the participant has a poor technique. Proper exercise techniques should be learned from the beginning in order to minimize the likelihood of injury (Baechle & Earle 2008, 84) and increase training effectiveness (Westcott & Baechle 2007, 21). Balance Fitness Center has a versatile gym that provides different free weight equipment, for example, dumbbells, barbells, weight plates, long bars, kettlebells and power balls.

The aim of the thesis from authors' point of view was to develop professional competence as sport instructors by increasing the knowledge of human anatomy, exercise physiology and principles of strength training. The authors' also learned about a product development process. The authors are willing to work in the gym business in the future.

2 STRUCTURE AND FUNCTION OF SKELETAL MUSCLE

All human activity requires bodily movements which are accomplished through the action of skeletal muscles (Stone, Stone & Sands 2007, 15). Skeletal muscle tissue moves the body by pulling on bones, making it possible, for example, to run, lift a weight, or play the guitar. According to Kauranen (2014, 8) the understanding of muscle structure and function, leads to understanding of the movements of the body. This section will allow a better understanding on why the skeletal muscle is highly adaptable to strength training exercise stimulus.

2.1 Muscle Physiology

Muscle tissue builds up a large part of the human body, and about 40 % of human body weight is muscle tissue (Niemi 2008, 18). The human body contains three types of muscle tissue: skeletal muscle, cardiac muscle, and smooth muscle tissue (Kauranen 2014, 8). According to Nienstedt, Hänninen, Arstila & Björkypeqvist (1989, 143) skeletal muscle is called as voluntary muscle because is the only muscle type under conscious control. Skeletal muscles are organs composed mainly of skeletal muscle tissue, but they also contain connective tissue, nerves, and blood vessels (Kauranen 2014, 8).

Skeletal muscle tissue is composed of thousands of muscle cells called fibers. These long, slender fibers are surrounded by a thin, elastic cell membrane called sarcolemma. The cells consist of smaller units called myofibrils which are the frameworks directly involved in contraction. Myofibrils can be divided further into thin and thick filaments which are proteins called actin and myosin. McArdle, Katch & Katch (1996, 315-316) conclude that the arrangement of these filaments gives skeletal muscle tissue a striped, or striated, appearance.

Muscle cells are able to produce a great amount of energy that the muscles require for contraction. Myofibrils can actively shorten, and are responsible for the contraction. At each end of the skeletal muscle fiber, the myofibrils fasten to the inner surface of the sarcolemma. The outer surface of the sarcolemma is attached to collagen fibers. This helps to connect the cells to the tendon or aponeurosis of the skeletal muscle. When myofibrils contract, the entire muscle cell shortens and pulls on the tendon (Bartholomew 2014, 330).

The ends of skeletal muscles are always attached to other structures that limit their movement. Both ends of the muscle are connected with tendons to the outermost covering of the skeleton (Kraemer et al. 2012, 70.) McArdle et al. (1996, 315) particularize that origin is the place where the fixed end attaches to a bone, cartilage, or connective tissue and insertion is the site where the movable end attaches to another structure. This forms a powerful link between muscle and bone which is difficult to separate except during severe stress when it can be severed or literally pulled away from the bone.

Skeletal muscles have an ability to adapt to a variety of environmental stimuli, involving regular strength training. Muscles can adapt in different ways. For instance, increasing size, improving neuromuscular performance or enhancing endurance capabilities (Ranke 2008, 2).

2.2 Muscle Fiber Types

Skeletal muscle is composed of different muscle fiber types, (Kraemer et al. 2012, 98) which have been classified by their contractile and metabolic characteristics (McArdle et al. 1996, 330). Muscles fibers from the same muscle may differ in the force they produce, the time they take to reach peak force and fatigability. Most familiar approach is to classify fibers in slow-twitch and fast-twitch fiber (Coburn & Malek 2012, 9 - 10.) Baechile and Earle explain that fast-twitch motor units are associated with fast contraction and relaxation times, and alternately slow-twitch motor units with slow contraction and relaxation times (Baechile & Earle 2008, 9).

Commonly identified fibers are Type I (slow-twitch), Type IIa (fast-twitch) and Type IIb (fast-twitch). The difference between Type I and Type II fibers is a distinct difference in the ability to demand and supply energy for contraction and tolerate fatigue (Viitasalo, Raninen & Liitsola 1987, 37-38.) Type I fibers have a high capacity for aerobic energy supply and are generally efficient and fatigue resistant, but they have a limited potential for rapid muscle force development (Coburn & Malek 2012 9-10). Type II fibers are the fundamentally opposite, and are characterized as inefficient and fatigable. The motor units have rapid force development, high anaerobic power together with high actomyosin myofibrillar (Häkkinen 1990.) Type IIa and Type IIb have a different capacity for aerobic-oxidative energy supply. Type IIa fibers show greater resistance in fatigue. They have greater capacity for aerobic metabolism and more capillaries surrounding (Baechile & Earle 2008, 9.)

The percentage distribution of Type I and Type II fiber types differs significantly among people, and is largely determined by genetic code. However, both muscle fibers can evidently improve their metabolic capacity with appropriate training. McArdle, Katch & Katch (2006, 498) resemble that age is no barrier to the training adaptations of muscle fibers.

2.3 Muscle Groups

The human body contains over 600 skeletal muscles varying in size and use (Kauranen 2014, 8). Although many of the skeletal muscles are grouped together, they can function either separately or in cooperation with each other. Most of the complex strength training movements are only prospective because the muscles work in concert, helping each other to perform the exercise (Baechle & Earle 2012, 11.)

Skeletal muscles can be divided into six main muscle groups, which are arms, chest, abdomen, shoulders, back and legs (Fourny, Fradette, Gounelle, Magnenot, Villeneuve, Daigle, Lacoste & Ahern 2000, 360). When building a strength training program, main muscle groups can be divided to 9 smaller muscle groups. These are chest, upper back, shoulders, arms, abdomen, lower back, gluteal, legs and calves (Aalto 2005b, 66.)

According to several of strength training researchers' strength training exercises can be divided into single joint and multiple joint types (Baechile & Earle 2008, 52 - 53; Dillman 2006, 52 - 53; Kreamer & Ratamess 2004, 675 - 676). Multi-joint exercises involve more than one joint or major muscle group. Multi-joint exercises, such as squats and bench press, are favoured as being more effective than single-joint exercises in improving strength and power. Exercises that recruit multiple joints generally involve more muscle mass and include integrated movements with more balance and coordination than single-joint exercises. Single-joint exercises, such as bicep curls, are usually used to target specific muscle groups. For beginners, single joint exercises might be more advantageous, because they require less skill than multi-joint exercises (Kreamer & Ratamess 2004, 675 - 676.)

2.4 Muscle Actions

Strength training exercises can be categorized based on the type of skeletal muscle action. If there is no change in muscle length during muscle activation, the action is said to be static or isometric (Kauranen 2014, 219.) When movement of the skeleton takes place, the action is considered dynamic. Dynamic action can be divided further to concentric and eccentric muscle actions, on the basis of the shortening and lengthening of the muscle tendon. In many activities, such as running, all three types of contraction may occur in execution of a smooth and coordinated movement (Viitasalo et al. 1987, 46 - 47.) According to Komi (2003, 6) muscles usually act at first eccentrically with a concentric action following immediately.

The most common type of muscle action is referred as concentric action (Kreamer & Vingren 2007, 24). In concentric muscle action the muscle is able to produce enough force that the tension in the muscle to overcome the resistance and the muscle shortens (Stone et al. 2007, 4). Concentric muscle action occurs, for example, when raising a dumbbell from the extended to the flexed elbow position (Viitasalo et al. 1987, 47).

Skeletal muscles can also exert force while lengthening. Eccentric muscle action occurs when external resistance exceeds muscle force and the muscle lengthens while developing tension. In strength training, muscles frequently act eccentrically as the weight is returned slowly to the starting position (Viitasalo et al. 1987, 47.)

When muscles act without moving, the action is called isometric. When this happens, the muscle generated force, but its length remains the same (Stone et al. 2007, 4.) While sitting or standing without moving, the person feels the muscles tense, but there is no joint movement. The natural human tendency to avoid long isometric muscle contraction is observed for example in a sitting position; the position is naturally changed at certain time frames and thereby increasing the blood flow to working muscles (Viitasalo et al. 1987, 47 - 48.)

Both static and dynamic training methods produce significant increases in muscle strength. The resistance training method selected is determined by the individual's specific needs and can be regulated by the specificity of the training response (Viitasalo et al. 1987, 47- 48.)

3 STRENGTH TRAINING IN WORKING AGE

Nowadays there is a better understanding of the health-related benefits of strength training and national health organizations such as the UKK institute strongly recommend it (UKK-institute 2009). Guidelines are made to provide guidance to help people improve their health. The goal for a guideline is to, for example, help people to be more physically active and give ideas about the types and amounts of physical activity they need for good health. The guidelines recommended by several health organizations are very similar. This section will focus on the reasons why strength training should be a vital part of physical activity routines and what is the recommended frequency.

3.1 Recommendations

UKK-institute has created a physical activity pie for 18 - 64 year old adults which recommends how much and what kind of physical activity enhances health. The physical activity pie recommends practicing physical activity that increases muscular strength and improves balance at least twice a week. Muscle strength can be improved by strength training and sequence training. In addition to strength training, a person needs moderate-intensity aerobic physical activity many times per week, totalling at least two hours and 30 minutes per week. Alternatively a person can achieve the recommendations by exercising more-demanding, vigorous-intensity aerobic physical activity with an accumulation of at least one hour 15 minutes per week. UKK physical activity pie was updated in 2009 (UKK-institute 2009.)

World Health Organization (WHO) has also made recommendations for physical activity for adults aged 18 - 64. The difference between WHO and UKK recommendations is minor; WHO recommends that adults aged 18 - 64 should practice muscle-strengthening activities two or more times a week. Addition to strength training, adults need at least two hours and 30 minutes of moderate-intensity aerobic physical activity or vigorous-intensity aerobic physical activity for one hour and 15 minutes throughout the week. WHO recommendations was updated in 2011 (WHO 2011.) US. Department of Health and Human Services (2008) has also created own recommendations which recommend exercising strength training at least two times a week.

Numerous strength training studies recommend that beginner individuals in working age should practice physical activity that increases muscular strength two - three times a week. This has been shown to be an effective frequency. For those people who are already engaged in a strength training program, an effective maintenance frequency appears to be practicing 1-2 times a week (Ratamess et al. 2009, 369.)

3.2 Effects

According to Sinha, Saini & Vaz (2013, 10) there are numerous reasons for incorporating strength training into a general workout program. Studies have proven that consistent strength training can increase bone density and prevent osteoporosis (Ratamess et al. 2009, 687) and inactivity can lead to a decrease in bone density especially for women (Sinha, Saini & Vaz 2013, 10). Strength training may assist the prevention and management of type 2 diabetes, colon cancer, enhance cardiovascular health, and coronary heart disease (Westcott 2012, 209 - 216).

According to UKK institute (2009) consistent strength training may decrease overweight. It also encourages weight maintenance (Hoeger & Hoeger 2015, 260). A person who is engaged in strength training usually has more muscle mass, which increases the body's metabolic rate and causes the body to burn more calories throughout the day (Sinha, Saini & Vaz 2013, 10).

A variety of sport-related or life-related injuries can be prevented by strengthening muscles and joints. Stronger and more resilient muscles improve balance, which means more comfortable living and fewer falls and accidents. Consistent strength training can prevent musculoskeletal disorders and may be effective to reduce lower back pain (Suni & Vasankari 2011, 35 - 42.) Musculoskeletal disorders are a major cause of sick leaves and use of health services. Together with mental disorders, they account for the majority of early retirement (Bäcnman & Vuori 2010, 8 - 9.)

According to Kauranen (2014, 428 - 430) regular strength training is also good for physiological health. Strength training increases the feeling of control, ability to cope with heavy physical tasks and improves self-esteem in working age people. Studies prove that strength training is associated with improved life satisfaction and decreased symptoms of anxiety, de-

pression and hostility. Hoeger & Hoeger (2015, 260) believe that improved posture generally has a connection to improved personal appearance and self-image. Many strength training researchers believe that regular strength training can increase overall quality of life (Kell et al. 2001, 864).

Strength training is the most effective method for improving muscle strength and lean body mass (Sinha, Saini & Vaz 2013, 10). Muscles adapt to strength training by growing and developing. Muscle hypertrophy refers to muscular enlargement resulting from training. The process of hypertrophy involves an increase in the cross-sectional area of muscle fibres (Baechle & Earle 2008, 100). According to McArdle, Katch & Katch (2001, 532) the effects of strength training already occur after two weeks in neural adaptations, but at that time there is not any increase in muscle fibre size. After around four weeks of regular strength training, significant strength gains can be already demonstrated.

4 STRENGHT TRAINING TERMINOLOGY

Before starting to exercise at the gym, it is necessary to learn the basic terminology of strength training. Learning the terminology helps to communicate clearly and at the same time increases self-confident to start exercising at the gym (Fleck & Kreamer 2004, 2). This section will provide definitions for basic strength training terminology, such repetition, set, rest period and load. Also different training methods, such as circuit training and station training, are defined.

Repetition

Repetition is referred as one complete movement of a strength training exercise (Fleck & Kreamer 2004, 8). According to Niemi (2008, 61) one repetition normally consists of two phases, which are lifting of the resistance and lowering of the resistance. In free weight training, a complete repetition of an exercise may involve several movements. For instance, the complete repetition of power clean, involve several muscle actions and movements (Fleck & Kreamer 2004, 8.)

The number of repetitions is directly related to the training goals (Niemi 2008, 61). Fleck, Kreamer & Deschenes (2012, 367) fill in that it also varies depending on the adaption being emphasized and training experience. A general rule is that the higher the load intensity, the lower the number of repetitions. Major impact for either strength or muscular endurance appears to be related to the number of repetitions performed; typically, higher number of repetitions is used to emphasize local muscular endurance and lower number of repetition is used to emphasize maximal power and strength (Fleck & Kreamer 2004, 8.)

Set

According to Fleck & Kreamer (2004, 8) a set is a group of repetitions performed continuously without stopping or resting. The number of sets in a strength training program generally ranges from 1 to 10, depending on the target load level. For beginners the number of sets is usually 1-3 (Kauranen 2014, 466). The analyses of single-set versus multiple-set studies, have suggested that single sets are appropriate for beginners for the first 6 to 12 months. However, multiple sets are important for further gains in strength, endurance, power, and hypertrophy (Capinelli & Otto 1998, 82.)

Rest Period

Rest period is referred as the time dedicated to recovery between sets and exercises. The rest period allowed between sets is in large part determined by the goals of the training program, the relative load lifted, and the training status (Fleck & Kreamer 2004, 18.) The longer the rest period allowed, the greater the opportunity for the recovery of the anaerobic energy stores, and the more time available to decrease blood and muscle acidity. Short rest periods results in greater fatigue levels as the training session progresses (Kraemer et al. 2012, 367-368.) A general rule is the heavier loads are lifted, the longer rest periods a person will need between sets (Kauranen K, 2014, 469). The American College of Sport and Medicine (2009, 687) recommend 2-3 minutes rest period for big muscle groups and 1-2 minutes for small muscle groups. Willardson (2006, 976) recommend having 2-5 minutes rest when programs are designed for strength or power and 30-90 seconds rest when programs are designed for hypertrophy or endurance.

Load

Load is defined as the amount of weight lifted or the resistance one exercises with (Baechile & Earle 2008, 392). The first concern for anyone participating in strength training is selecting an appropriate exercise resistance (Westcott & Baechle 2007, 145). A 1 RM load is the highest resistance that can be moved only ones. The amount of weight lifted is dependent on variables such as exercise order, volume, frequency, muscle action, repetition speed, rest period time and training goals. For example, light loads of approximately 45-50% of 1 RM or less may increase dynamic muscular strength in previously un-trained individuals, as this initial phase of lifting is characterized by improved motor learning and coordination (Kreamer & Ratamess 2004, 677.)

Load may be the most important variable in strength training, (Baechile & Earle 2008, 392) because altering the training load affects the acute metabolic, hormonal, neural, and cardiovascular responses to the strength training (Ratamess et al. 2012, 367). For strength training beginners, it has been recommended to train with loads corresponding to 60-70 % 1 RM for 8-12 repetitions. Moderate loading is recommended to be used initially, as learning proper form and technique is getting better. A variety of loads appears to be most effective for long-term improvements in muscular strength (Ratamess et al. 2012, 367.)

TABLE 1 Percent of the 1RM and repetitions allowed

NUMBER OF REPETITIONS ALLOWED	% 1 RM
1 RM	100 %
2 RM	95 % (+/- 2 %)
3 RM	90 % (+/- 3 %)
4 RM	86 % (+/- 4 %)
5 RM	82 % (+/- 5 %)
6 RM	78 % (+/- 6 %)
7 RM	74 % (+/- 7 %)
8 RM	70 % (+/- 8 %)
9 RM	65 % (+/- 9 %)
10 RM	61 % (+/- 10 %)
11 RM	57 % (+/- 11 %)
12 RM	53 % (+/- 12 %)

(Adapted Coburn & Malek 2008, 358)

Training Volume

Fleck & Kreamer (2014, 7) define training volume as a measure of the total amount of work performed in single training session, a week of training, or some other period of time. It is generally determined by the exercises performed, the total number of exercise sets and repetitions performed during a training session (Kraemer et al. 2012, 367). Altering training volume can be executed by changing the number of exercises performed per session, the number of repetitions performed per set, or the number of sets performed per exercise. Changes in training volume can be used to accentuate maximal strength, local muscular endurance, power or hypertrophy. Low volume program is usually considered as the use of heavy loads with low repetitions using moderate-to-high number of sets due to the low number of repetitions performed per set (Fleck & Kramer 2014, 7.)

Movement Speed

Movement speed is considered as the time required performing each exercise repetition. It is important to perform all strength training exercise repetitions under control. Slow move-

ment speed involves more muscle tension and less momentum, which should decrease injury risk and increase training stimulus. It is difficult to determine an ideal movement speed for performing strength training exercises, but the general guideline is that repetitions should take at least 4 seconds. Westcott and Baechle (2007, 149-150) explain that if the repetition can be stopped at any point of exercise, the repetition is performed at the proper speed. The American College of Sports Medicine (2009, 687) recommended a repetition speed of about 6 seconds, using 2-second lifting phase and 4-second lowering phase. Anyhow, Baechle and Westcott Baechle (2010, 35-36) encapsulated that any repetition speed is equally effective if the movements are performed under control.

Free Weights

Free weights are one of the most generally used tools in gym training (Kauranen 2014, 451). The term "free weight" means the equipment will not restrict the movement. Dumbbells, barbells, weight plates, long bars, kettlebells and power balls are considered to be free weights (Niemi 2005, 133.)

McArdle et al. (2006, 195) believe that exercising with free weights provides various benefits. One reason is that movement patterns performed with free weights allow joints to move through their full range, and these movements increase flexibility and improve overall muscle coordination (Kauranen 2014, 451). In many of the free weight movements, it is necessary to recruit more motor units, not only the one being trained, but also supporting muscles are acting as fixators and stabilizers. This allows to gain a control of the bar, stabilize the weight lifted, and to maintain the body balance. By using free weights the person has to control not only the speed of the movement but also the direction, which makes the exercise more difficult (Viitasalo et al. 1987, 204.) According to Maud and Foster (2006, 124) total-body strength and power is easier to asses with free weights. Several free weight movements require large muscle mass recruitment.

Although free weights have certain advantages over exercise machines, they have also a bigger potential to cause an injury. Reasons for an injury can be poor techniques, fatigue or dropping weights through carelessness. Therefore right techniques should be learned from the beginning (Kauranen 2014, 451.)

Training Methods

Station training is the most used exercise method in strength training. In this exercise method, you focus on one movement at a time and complete all the given sets for each exercise before moving on to the next one. Station training is used to enhance muscular strength and power. (Niemi 2008, 97) *Circuit training* is an exercise method where the movement or machine is changed after each set. The sets are performed with minimal rest periods, for example 20-30 seconds. The rest periods between the rounds are usually about 3 to 5 minutes. Circuit training is used to improve cardiorespiratory and muscular endurance (Baechile & Earle 2008, 391) and to increase the caloric cost of an exercise (McArdle et al. 2006, 447) *Superset method* involves two sequentially performed movements that stress opposing muscles or muscle areas. For example, performing 10 repetitions of bicep curl exercise and immediately thereafter performing 10 repetitions of one- arm dumbbell triceps extensions. According to Baechile & Earle (2008, 392) this method is time efficient and purposely more demanding, therefore it is suitable for a person with a busy schedule.

5 STRUCTURE OF A TRAINING SESSION

This section will provide a better understanding of how to build a strength training session. The session generally consists of a warm-up, a body of the session, and a cool-down. Strength training warm-up period usually comprise a general and specific phase. Both warm-up and cool-down usually include flexibility training or stretching (Kraemer et al. 2012, 375).

5.1 Warm-up

Strength training places significant demands on the musculoskeletal system. It is recommended to prepare the body for this high-effort physical activity with a warm-up. According to Westcott and Earle (2008, 37 - 38) the warm-up should be designed to gradually shift the muscular and cardiovascular systems from a resting to a working state. A warm-up should provide sufficient intensity to increase muscle and core temperature. It should also be light enough to prevent causing fatigue or reducing energy stores (Baechile & Earle 2008, 297).

Generally the main objective of a warm-up is to reduce the risk of an injury. The benefits are enhanced blood flow to active muscles, physiological preparation by increasing the ability to focus on exercise, and enhanced metabolic reactions (Viitasalo et al. 1987, 357 – 358.) Warm-up increases the body temperature, which can have a positive effect on performance (Baechile & Earle 2008, 297). Kraemer et al. (2012, 375) believe that the positive impact of higher body temperature are decreased muscle and tendon stiffness, altered force-velocity relationship of muscle, and increased anaerobic energy available.

An active aerobic warm-up is commonly used method as it has been shown to have positive impacts on performance, for example, improvements in muscle strength and power (O'Sullivan, Murray & Sainsbury 2009, 8). A general aerobic warm-up may consist of 5-10 minutes of slow activity such as jogging or skipping (Baechile & Earle 2008, 297). Stretching is often recommended to include to a warm-up as it has been noticed to improve muscle flexibility, prevent muscle injury and enhance physical performance (O'Sullivan et al. 2009, 8). It should be performed at the end of the warm-up, because at that time body temperature has been increased slightly (Kraemer, Fleck & Deschenes 2012, 373). O'Sullivan et al. (2009, 8) found that dynamic stretching techniques are generally more appropriate than static stretching

methods during warm-up. Aalto (2005b, 31) recommends that the stretches before a strength training sessions should last about five to ten seconds.

The warm-up before a strength training session should consist of a specific phase, which refers to sets being done before the weight training exercises themselves. For example, in bench press you perform couple of warm up sets using progressively heavier weights. The heavier the movement and used weights are the greater amount of warm up sets must be performed (Erämetsä & Laakko 2001, 106).

5.2 Body of a Session

The body of a strength training session refers to the training performed in one session (Kreamer et al. 2012, 373) and has an aim to develop desired strength properties (Niemi 2008, 76). The duration of training session is recommended to be short enough to allow effective training. Long training sessions have been associated with decreased intensity effort and motivation level, and changes in hormonal response. Erämetsä & Laakko (1998, 106-107) recommend a maximum length of a training session to be 75 to 90 minutes. The appropriate strength training session is 45-60 minutes. Graves and Franklin (2001, 24 - 25) found out that strength training sessions lasting more than 60 minutes are correlated with higher dropout rates. Stretching between exercises may relieve muscle tension and thereby postpone fatigue (Burke 1999, 173-175).

Proper technique for strength training movements is partially determined by anatomy and specific muscle groups being trained. Proper techniques are important mainly for preventing an injury, especially in movements where improper technique exposes low back to additional stress, such as squat, or in movements where the resistance can be "bounced" off a body part, such as bench press. In these movements proper technique is particularly important Altering the form of an exercise, other muscle groups have to assist in the movement, which reduces training stimulus on the muscles normally associated with a particular movement. Beginners should first learn the basic movements, before altering advanced strength training techniques (Fleck & Kreamer 2004, 28).

Strength training movements should be performed in a controlled manner using proper breathing techniques (Baechle & Earle 2008, 328). Holding the breath may cause excessive

internal pressure that restricts blood flow, which results in high blood pressure responses (Westcott & Baechle 2007, 151). According to Baechle & Earle (2008, 328) sticking point is the most strenuous movement of a repetition, which is typically soon after the transition from the eccentric phase to the concentric phase. Generally the exhale occurs through the sticking point and the inhale during the less stressful phase of the repetition. For instance, in bicep curl the sticking point occurs about midway through the upward movement phase. The exhale should occur during sticking point and inhalation as the bar is lowered back to the starting position. Westcott & Baechle (2007, 151) advise more simply to exhale when lifting a weight load and to inhale when lowering a weight load.

5.3 Cool-down

Cold-down should be an integral part of the each strength training session (Baechle & Earle 2008, 299). After a strenuous activity, blood tends to accumulate in the lower legs, which can cause undesirable changes in blood pressure and stress cardiovascular system, (Westcott & Baechle 2007, 152 - 153) which can result in light-headedness, dizziness, or even fainting (Kreamer et al. 2012, 375). The purpose of a cool-down is to facilitate blood flow to heart and provide a smooth return to resting (Westcott & Baechle 2007, 152 - 153).

Recommended cool-down consist of light aerobic activity such as cycling, or walking, followed by a gentle stretch. Sufficient length for a cool-down is 10 to 15 minutes (Kreamer, Fleck & Deschenes 2012, 375).

Post-practice stretching is recommended, and it may decrease the risk of a muscle injury. Increased muscle temperature helps to circulate nutrients to muscle tissues, and carry waste products away from the muscles. Stretching after a strength training session may also decrease muscle soreness (Burke 1999, 173 - 174.) According to Baechle & Earle (2008, 299) post-practice stretching should be performed within five to ten minutes after practice and strong muscle stretching should be avoided immediately after a hard strength training session. (Aalto 2005b, 30) recommends as the appropriate duration for a stretch to last 20-40 seconds.

6 GENERAL GUIDELINES OF STRENGHT TRAINING

How to vary strength training components over the time, to keep the training stimulus optimal? How should I determine training frequency? Designing a strength training program is not an easy task. This section discusses different guidelines for a strength training program, to get a better understanding and recognition of program design variables. A well-designed program is based on these variables.

6.1 Exercise Selection

The choice of exercise is one of the most critical factors, which has an impact on person's progress. Exercises should be selected on the basis of persons exercise technique experience, the amount of time available and wanted goals (Baechile & Earle 2008, 387.) It is important to choose exercises that provide the best balance of exercise effectiveness, training efficiency, and workout safety (Westcott & Baechle 2007, 141 - 142).

Selected exercises should maintain a balance of muscular strength between opposing muscle groups and across joints, for example in biceps and triceps (Baechile & Earle 2008, 387). This is ensured by performing at least one exercise for the major muscle groups and by giving equal attention to the opposing muscles (Westcott & Baechle 2007, 141 - 142). Muscle balance does not always mean proper ratio in strength, but a proper ratio of strength, power, or muscular endurance of one muscle or muscle group (Baechile & Earle 2008, 387).

Both single-joint and multiple-joint have proven to be effective for increasing muscular strength. Single-joint exercises are generally used to isolate specific muscle groups. According to Schwellnus (2009, 11) single-joint exercises, such as bicep curls, may be more advantageous for beginners because of the reduced level of technique involved. Multi-joint exercises, such as squats, place more neural demand and are generally regarded as most effective for increasing overall muscular strength (Baechile & Earle 2008, 386). When learning multi-joint techniques, the movements should be done with very light resistance and not add weights until the technique is adequate (Schwellnus 2009, 11).

6.2 Exercise Order

The order of strength exercises in a training session can have a vital impact on the quality of the constituent exercises performed (Spreuwenberg et al. 2006, 141 - 144). There are many ways to arrange exercises; anyhow the order is invariably based on how one exercise affects the quality or the technique of another exercise (Kauranen 2014, 461). Larger muscles and multiple-joint exercises spend more energy, produce more fatigue by-products, and generate higher blood pressure responses than smaller muscle groups (Westcott & Baechle 2012, 142). Typically the recommendation of strength training authorities is to progress from larger to smaller muscle groups (Kauranen 2014, 461) and from multiple-joint exercises to single-joint exercises (Kreamer & Ratamess 2014, 676). Kreamer and Ratamess (2014, 676) also recommend rotating upper and lower body exercises or opposing exercises when training all major muscle groups in a session.

6.3 Training Frequency

The rest period between sessions has to be sufficient for muscular recuperation and development. Training frequency is the number of strength training sessions completed in a given time period, for example one week. According to Hoeger & Hoeher (2015, 250) appropriate frequency varies with different people, but general recommendations can be done.

Numerous resistance training studies have suggested using frequencies 2-3 days a week in previously untrained individuals. If a person performs a total body strength training program 2 times a week, the sessions should be spaced out evenly. For example, a total body program is trained on Monday, Wednesday and Saturday (Westcott & Baechle 2012, 143 - 144; Ratamess et al. 2009, 369).

A way to increase strength training frequency in a week is by using a split routine. In split-routine programs different muscle groups are trained on different days. For example, a lower body-upper body program includes 4 training sessions per week: lower body on Tuesday and Friday and upper body on Monday and Thursday. This allows the body to properly recover between similar training sessions (Westcott & Baechle 2012, 143 - 144).

6.4 Recovery

Strength training stresses muscles, and after every session produces some degree of tissue microtrauma (Westcott & Baechle 2007). Person's ability to continue exercising is limited by how quickly the muscles recover after a session (Burke 1999, 43 - 44). Recovery secures that body returns to a normal, and a balanced state. It restores body fluids, replenishes energy stores, and repairs damaged muscle tissues (Sandström & Ahonen 2011, 127.) The immune system is also enhanced with adequate rest (Burke 1999, 43 - 44).

Recovery is essential in strength training, because muscles develop during rest. Although the appropriate recovery length varies with different individuals, typical recommendation is to have a 48 hour break between the sessions (Erämetsä & Laakko 2001, 111.) Hoeger and Hoeger (2015, 250) believe that two to three days should be appropriate recovery between sessions, and the person is likely overtraining if the body is not complete recovered at that time.

Every strength training program should incorporate muscle care to allow an adequate recovery. Appropriate relation between exercise and rest, versatile training program, periodization, nutrition, and various active steps, such as warm-up, stretching and massage form the basis for muscle care (Viitasalo et al. 1987, 357 - 358.) Regular massage is recommended, because it improves circulation of body fluids and helps to decrease swelling in muscle tissues. Stretching decreases muscle soreness, helps to maintain flexibility, and thereby increases physical efficiency and performance (Burke 1999, 167.)

Lack of sufficient rest, recovery and nutrient intake can lead to overtraining. Overtraining has been a topic that has received a great interest, and is not only a problem among athletes. A beginner strength trainer can also attempt to perform too much too early before the body is physiological adaptations can cope with the stress. Overtraining can be defined as excessive frequency, volume, or intensity in training that may result in extreme fatigue, illness, or in the worst case injury. Recovery from excessive, but short-term training is easily achieved within a few days of rest. Overtraining syndrome in turn can last six months, and recovery may even be delayed. This syndrome can include dramatic performance decrements, and is sometimes referred as stainless. Overtraining state is even associated with negative physiological alterations in the neuromuscular system (Baechle & Earle 2008, 14.) Signs of overtraining are, for example, sleep problems, anaemia, increased resting heart rate, persistent

muscle soreness and depression (McArdle et al. 2006, 208). Consequently recovery is an important part of a strength training program (Baechle & Earle 2008, 14.)

6.5 Progression

When performing regular strength training program over a period of weeks, the muscle strength increases. Once the body has adapted to a program, some variations has to be made for further development. According to Westcott and Baechle (2007, 147) progression is the key component to continued strength development. The approach must be done gradually and systematically for best results. Strength training progression can include gradual increments of increasing training intensity, increasing training volume, or shortening and lengthening rest periods. As strength, local muscular endurance, or power capabilities increases, a common rule is to increase the resistance used for a specified number of repetitions (Kraemer et al. 2012, 370).

The principles of strength training progressions are progressive overload, specificity, and variation. Successful training programs have been built on the overload principle. It is referred as a gradual increase of stress placed upon the body during a strength training program. General ways to apply overload principles is by altering exercise intensity, total repetitions performed, repetition speed or rest periods (Ratamess et al. 2012, 367). Strength training program should be varied in one or more components over the time, to keep the training stimulus optimal. A well-designed program takes specificity into account; it has to correspond with wanted goals (Fleck & Kreamer 2007, 34).

7 RESEARCH TASKS

The purpose of this thesis was to develop a free weight video guide for gym training beginners which would provide guidelines to perform safe and effective lifting techniques. The video guide is targeted for customers in working age. The aim for the working life was to create a valuable product which acts as a marketing tool for Balance Fitness Center. The aim from the authors' point of view was to develop professional competence as sport instructors by increasing the knowledge of human anatomy, exercise physiology and principles of strength training. From the KUAS point of view, the aim was to compile a thesis, which can be exploited when teaching, for example, gym training.

The research questions of the thesis were the following:

Which free weight movements should be included to the video guide so that the video guide would be suitable for beginners?

What benefits would the customers get from the free weight video guide?

What kind of elements needed to be included in the free weight videos to make the beginners learn the movements correctly?

8 PRODUCT DEVELOPMENT PROCESS

A product development process contains a list of activities that the organization follows in order to plan, develop and commercialize a product. The common product development process includes six phases. They are planning, concept development, system-level design, detail design, testing and refinement, and production ramp-up (Ulrich & Eppinger 2003, 12).

The first phase is planning which precedes the project acceptance and it is the beginning of the actual product development process. The second phase is concept development. There the needs of the target group are recognized, different options for product develop concepts are created and evaluated, and concepts are chosen for further development and testing. The third phase is system-level design, and it consists of the description of the structural design of the product and the decomposition of the product into subsystems and components. The fourth phase is called detail design. It includes the total design of the geometry, materials, and tolerance of all of the parts in the product. Robust performance and production costs are the most important factors in detail design phase. The fifth phase, testing and refinement, includes the construction and evaluation of several preproduction versions of the product. The first versions need to be tested to see how the designed product will work and whether it satisfies the customers' needs. The purpose of the sixth phase, production ramp-up, is educating the work force and solving remaining problem in the production process (Ulrich & Eppinger 2003, 12 - 15.)

The product development process was divided on three main phases. The first phase was the product manuscript and filming plan. The second phase was the actual filming part and editing of the video. After finishing the videos, the exercising programs and the list of movements with instructions were planned. (Appendix 1) The last phase was publishing the finished product in Balance Fitness Center Laiteopastus Facebook pages with the aftermath and evaluating.

The target group was free weight training beginners. They were able to watch the videos and learn the right techniques from the videos. The staff of Balance Fitness Center would be able to make programs about those movements to the customers. The movements can be learned by self, but the organization benefits with a change to create a program if the customers' interest arouses.

8.1 Planning the Product

The product development process was divided on three main phases. The first phase was the product manuscript and filming plan. The second phase was the actual filming part and editing of the video. After finishing the videos, exercising programs and the list of movements with instructions were planned. (Appendix 1) The last phase was publishing the finished product in Balance Fitness Center Laiteopastus Facebook pages with the aftermath and evaluating.

In the beginning, a schedule for the whole product development process was planned. It included all the important dates and deadlines for the structure of the process. A filming plan was done before the filming sessions. The plan included the complete list of movements, correct techniques, used equipment, shooting angles and the turn of models. The authors worked as the models and filmmakers at the same time. The movements were divided in a way that both authors would be equally shown in videos. The authors' expertise about the correct techniques helped during the filming. The authors wanted to be the models and not hire them, to benefit from the product in future. After that it was time for editing and publishing on Facebook.

8.1.1 Planning the Videos

In the planning phase, there was a lot of time used to build the filming plan. The authors watched numerous videos about free weight exercising and tried to choose the best parts for their videos. The most suitable videos were found from Youtube and Bodybuilding.com channels. There the videos had often educational purpose so they were beneficial for the authors. The authors had to figure out the best angles for the videos.

Choosing the movements was not simple. As mentioned in the theory part, exercises should be selected on the basis of persons exercise technique experience (Baechile & Earle 2008, 387.) However, in free weight movements it is hard to drawn a line for which movement is suitable for beginners or which one is characterized as frequent free weight movement. Also the mix of chosen movements covers the whole body, so it is possible to make a complete

training program for beginners with the videos if needed. We chose 23 movements and the commissioner requested some of them.

There were not trustworthy researches done about which free weight movement is suitable for a beginner and which is not. Because of that, the movements were chosen by using the consideration and expertise of the organization and the authors. The amount of the movements was limited in a way that it covered all the body parts, but still the number was small enough to produce a respectable product in given time. The authors ended up to 23 different free weight movements.

As a beginner it may be better to have the basic movements and the most important guidelines for the movements, because of the risk of getting overwhelmed. Even if the movements are familiar to the authors, it is still important to learn the movements and the main points from a beginner's point of view. The authors also had to decide which main points to focus on while performing the movements. For example, the weightlifting movements were left out, when they were characterized as not suitable and easy to learn for everyone in some videos.

Three different factors make video downloading attractive for the viewers: (1) videos can be created easily and at low cost, (2) distribution is almost cost-free, and (3) hosting is free, as the most popular Web hosting sites are supported by banner advertising and allow cost-free contributor uploads (Massachusetts Institute of Technology 2005). Our product development process met these factors and it can be kept attractive for the potential customers.

The filming was done by a systems camera. The goal was to make the videos as convenient as possible. Clients should find them easy to follow and understand. The video was shot without any voice, because the authors wanted to make sure that there is not any distraction while performing the movements. Movements are performed from eight to ten times in a normal pace. The authors agreed with the organization to leave the incorrect videos out from their pages. The authors had to be very critical, when the performance is part of teaching videos.

Titles, the logo of Balance Fitness Center, main points and music are edited into the video clips later. The most important thing is to focus on the essential things and ensure that the content of the video is understandable. Videos are edited with iMovie program, which is a video editing software application sold by Apple.

The plan was to divide the filming for three different days. The authors filmed the videos on first day and watched them later. The mistakes were checked on second day and the authors filmed them again. On third day the photos for Thesis were taken. The authors did this on purpose, since it was very likely that some videos had to be filmed again. The authors ended up leaving incorrect movements out and using only proper ones. The focus was on correct forms and angles, which helps to see the correct trajectories. The names of movements in videos are only in Finnish, since it is the main target group for the product and the organization. Also the instructions are only given in Finnish.

The instructions were recorded later using Vocaroo- program. In this way the authors were able to concentrate on movements during the filming and on speaking while recording later. The sound effects were important part of the videos. The authors felt that the customers want to hear the instructions and music also. Instructions can also help the learning process while the auditory sensory is used (Van Blerkom 2009, 12).

The lightning was very good at the gym, which helped the filming process. Also the equipment was easily accessible when we mainly needed bars and dumbbells. That saved time when the authors were able to stay on a same place and only change the size of dumbbells between the movements.

The product had marketing purposes also. The video product was designed to attract more customers for the organization and promote them by showing their facilities, for example. Of course it was important to introduce the free weights for beginners in safe and efficient way besides of the marketing purposes.

The video medium has significant advantages over print media. These advantages include rapid, worldwide proliferation. They include also enhanced credibility, as "images tend to be perceived as more believable than simple texts" because videos are a superior storytelling media, connecting emotionally with viewers more quickly and immediately than different text descriptions (Kaldor-Robinson 2002, 185.) This research reveals that videos have great advantages as a product over printed guidebooks. The superior storytelling media helps the product to spread easier in social media.

8.1.2 Resources and Materials

All the equipment and facilities were rented or used for free, for the authors. For the filming, the authors needed a system camera and a tripod. The system camera was rented from Kajaani University and the tripod was rented from Balance Fitness Center. The authors performed the video shooting. The authors acted as the models and they performed the movements, so there were not any extra resources needed for the filming. Videos were edited with iMovie program, which is a free video editing software application sold by Apple. Vocaroo-program was used for voice recording. Balance fitness center gave access to their facilities.

8.2 Finishing the Product

The chosen filming date was 21.03.2015 on Saturday morning at seven o´clock. This particular time was chosen, because of the low rate of customers that use the organization's gym early on weekends. There was not much distraction in this way. The plan helped a lot during the filming. However, the filming took five to six hours each time the authors had to do it. The camera adjusting and moving from point A to point B at the gym took most of the time. The authors expertise of movements helped a lot during the filming so they were able to concentrate on other essential things, like correct breathing. Some videos had to be filmed again but that did not take too much time. During the filming the authors inspected the content, to be sure about the quality of videos. Moreover, the authors stayed on schedule during the filming days.

8.3 Editing

The editing started straight away after the filming sessions and continued till the end of May. It took much more time and energy than planned to. Luckily, the authors managed to finish other parts early enough, so there was enough room for the editing. The authors used the IMovie- program. The editing itself was easy. However, there were so many different parts, which needed to be attached that the editing was very time consuming. The videos needed to be cut and merged with voices, instructions and logos, for example.

The model of each video was following: in the beginning there appears the organization's logo (Balance) with a soundtrack on the video. This is followed by the name of the movement and the movement itself with recorded instructions. In the end the logo shows up again with the soundtrack. The logo of Balance Fitness Center needed to be attached for marketing purposes. If the videos are re-used or shared somewhere, the origin is easy to track. This can benefit Balance in marketing and to reach new customers.

8.4 Distribution

The idea for distribution was to attach the videos on Balance homepages but that was not possible for technical reasons. Instead of that, the distribution takes place is Balance fitness center Laiteopastus Facebook page. The page has 170 "likes" (checked 24.01.2015) and the goal is to get more "likes" during the process. The Facebook page has been created earlier with different videos but same purposes. The creation of page itself would have been simple and fast to create but now we already have certain community as audience base, which can see the videos and share them forward. This benefits the organization in marketing purposes. The only problem with the Facebook page was that the customers needed to know that it exist in order to find the videos. The commissioners' web pages would have been worked better in that sense. The product needs certainly effective marketing in order to reach the customers and to get more visibility.

In the last 20 years, the Internet has evolved from simply conveying text and then still photographs and music to the present- day medium. There individuals are contributors and consumers of a nearly infinite number of professional and do-it-yourself videos. In this dynamic environment, new generations of Internet users are streaming video and downloading gigabytes of video every day. The estimations reveal that 65,000 videos are added each day to YouTube alone (Arrington 2006). This evidence reveals that Internet as a distribution channel for do-it-yourself videos is able to attract potential customers of the new generation.

The customers can visit on Facebook pages for free. Balance fitness center can create a training program based on that and sell it for the customer. This system benefits the both parties.

8.5 Evaluation Plan for the Product

The filming was performed on 21.03.2015, and the editing was performed during spring 2015. The material was estimated to be published on Facebook May 2015. The most important goal was to make a product that satisfies Balance fitness center which is the reason why feedback from the commissioner was an important part of the evaluation. The product was also evaluated by academic sources regarding product development. With the academic sources, it was possible to critically evaluate the product according to earlier researches about successful products.

That is the reason why the feedback from the commissioner was important part of the evaluation. The product was also evaluated by academic sources regarding product development. With the academic sources, it was possible to critically evaluate the product according to earlier done researches about successful products. The authors used critical arguments about their own work while evaluating the finished product.

Product evaluation is a dynamic process and generally can be conducted at five major stages. They include concept testing, prototype testing, pretest market, test market, and launch. The concept testing stage is concerned with assessing consumers' reactions to a product concept, identifying important attributes, and determining potential market size. Individuals evaluate a prototype of a new product in the prototype testing stage (Mahajan, V & Wind, J. 1988.) The research proves that testing acts important role in product development. There was no possibility for customer evaluation, once the product was not published during the thesis process. It is possible to make a research about customer satisfaction and learning process in future if wanted. It would add more reliability for the product. The commissioner has copyrights for the videos with the authors. The videos are marked with Balance fitness center logo so they are easy to track if needed.

9 DISCUSSION

The purpose of the thesis was to create free weight video guide for beginners. The guide had to be easy to approach for beginners and motive them to start exercising at Balance fitness center. The authors divided the process on parts.

The filming plan could have been even more accurate. Even when the authors had the basic information, like filming angles, they needed three days for the filming. The order of the movements could have been considered more carefully on the filming days and the photos for thesis could have been taken at the same time. Now the authors decided to take them on a separate day, which was time consuming. Also the pictures of movements could have been drawn on paper to make the plan more perceiving.

The authors could have also used professional help with the system camera. Now some videos were blurry and the authors had to re-film them. A professional photographer would have fastened the process and been able to give hints for the filming angles.

The editing was also a surprising process since it was very time consuming. There was enough time for it but the authors could have arranged more time for it in the original plan. Subcontracting the whole editing was one option but resources were not sufficient for it. The organization emphasized that the point is to have clearly instructed videos with a good technique. For this reason the main emphasis was on filming and overall product development. The authors had never used the Vocaroo recording program before but that was easier than expected for a beginner to use. The files were able to save on mp3 form and paste on IMovie program after.

The authors paid a lot of attention to different kind exercise videos that have been done on Internet. There are thousands of them available and with Balance Fitness center help the authors were able to find the best parts that needed to be included in the product. For example, sounds are important to make the videos entertaining besides being instructive. The authors managed to fill all these factors in and were satisfied.

The authors could have added the instructions to the videos also by using texts. This could have helped the beginner to follow the key points, even without the sounds. But the authors felt that there were already much content on videos and it could have distracted the viewer

from the movement itself, so they were left out out. Another option was to make the videos better for phone and Ipad use during the workout, but there was an agreement with Balance Fitness Center that the videos are mainly meant to be watched at home.

The whole process started early enough and the schedule with deadlines helped a lot with the product and the thesis part. . In order to ensure visibility the publishing could have taken place in Balance Internet pages. This was not possible, so the authors used the Facebook pages instead. A good side with Facebook pages is that it can may be easy for Balance Fitness Center to handle and easy to share with other people. The difficult part is that customers might visit on commissioner's web pages but the videos are on a separate place. Another idea was also to get the videos on the gym screens and the customers could see them while exercising. It was not confirmed during the thesis process but it is still possible in the future.

There were two persons doing this thesis, and the authors had to pay attention to pair work. The authors had similar interests towards exercising, and wanted to do the thesis together. April 2015 Ville moved to Espoo and Jenny stayed in Kajaani. The authors decided that it would not be a problem and still the rest of thesis could have been done together.

The authors did the filming and all the necessary tasks before moving to different cities. In this way the authors were able to finish the thesis. At this time the authors had to communicate a lot by calling. The authors also used phone messaging for sharing opinions during the process.

The connection with Balance Fitness Center was continuous during the process. The authors exercised in commissioners' facilities a lot in their free time and they were able to discuss with the staff all the time, when they got some ideas or questions about the product. The authors also processed the videos while they were exercising, desired or not.

The communication with the teacher supervisor was also helpful and helped in the beginning of the project, especially when the structure for our thesis was formed. This reflected also to the product development when the authors had a clear vision about the content. The authors had a clear idea about the process from the beginning. In this way the authors were able to focus the energy on producing, when there were not many floating factors that needed reconsideration and time.

An important part of the thesis process was effective and appropriate information retrieval. The authors learned a lot about searching knowledge from different sources. By searching knowledge about different free weight researches the authors improved their sports specific skills and extended their professionalism. Therefore, in the future the authors have an opportunity to give their clients more informative, professional and specific answers and advice than before.

9.1 Product Evaluation

The purpose of the video product was to benefit the commissioner. Their feedback was an important part of the evaluation. The commissioner gave oral feedback concerning the product and was satisfied with the overall production. The strenghts were the low-speed of the movement and the duration of the movements performed. According to the commissioner, the videos were a compact packet and were short enough, so they would not get bored and still they would be able to learn the movements. Balance Fitness Center was satisfied with the appearance of the logo, music and overall expression.

The commissioner watched the videos carefully and found some minor mistakes about the techniques. The commissioner thought that all the movements were good enough to publish in their Facebook pages, but some movements could have been performed with slightly different techniques. They emphasized that there is not one correct technique for many movements. For example, squat is a very controversial movement, when it comes to the correct technique. Powerlifters can prefer over a 90-degree angle, because then it is acknowledged as an approved movement in competitions (IPF International Powerlifting Federation, 2015, 8). Someone can define squats with a different depth and possession of legs as correct. One-arm dumbbell triceps extensions could have been performed with the assisting arm supported on the waist. The squats could have been deeper and the working arm in one- arm bent row could have been positioned lower to get a better contraction for latissimus dorsi. All these minor technique variations were mentioned by the commissioner.

The videos were not published on Facebook pages before finishing the thesis. The commissioner promised to attach the videos to Facebook pages on weeks 20-21. There was not possibility to see how many views the videos received after publishing.

One idea what the authors had with the commissioner was that they could have used one random customer who is totally beginner with gym exercising. The customer would have watched the videos and performed the movements after. A qualitative research could have been done by using multiple customers for performing the movements and evaluating them after. There would not have been acquaintance between the authors and the customers so the results would have been reliable. Now there was not possibility for this once the videos were not published on Facebook before finishing the thesis. The research could have been proved that the product is itself capable or not to teach the techniques for beginners.

The authors were mainly satisfied with the finished product. Some techniques could have been performed differently, especially squats and one- arm dumbbell triceps extension. The authors were satisfied with the outlook and how all the different parts worked on a finished video, like appearance of logos to name one. The recorded instructions could have been synchronized exactly at the same time with the movements. Now there was a minor time lapse with them. The reason for this was the difficulty of editing. The authors were also satisfied about their appearance as the models. The breathing and performing of the movements were successful. The commissioner was satisfied, which was very important for the authors and made the whole process successful.

According to Aaltonen (2002, 178) a good commercial video is simple and humane. The viewer expects the video to be reliable and factual. This has been proven by the commissioner and the authors.

Identifying customer needs is an integral part of the concept development phase of the product development process. The resulting customer needs are used to guide the team in establishing product specifications, generating product concepts and selecting a product concept for further development" (Ulrich & Eppinger 2003, 68). An important fact in the beginning was to know what gym beginners need to know about performing the movements. The authors had a clear vision about the needs with the working life organization. For example, movements with low speed and clear instructions had to be included. The experience of the authors and the commissioner helped to determine customer needs.

The successfulness of the product is hard to evaluate when many factors affect on it. It is possible to make a research in the future to get more evidence about how successful the product is. In this particular case the authors used feedback from the commissioner and

their own critical arguments about the product. All parts were satisfied with the product. Some minor improvement suggestions were given, but the product was successful.

9.2 Ethicality and Reliability

The thesis is made by two people. All the stages of the process have been examined from two different perspectives, which add reliability. There are male and female perspectives used in thesis. The authors have critically examined each other's production. The authors have only used references that are from reliably sources. The authors used reliable references to support their own arguments. Kajaani University of Applied sciences supported the production and published the thesis.

To ensure product reliability, an organization needs to follow certain practices during the product development process. These practices impact reliability through the selection of parts, product design, manufacturing, shipping and handling, assembly, operation, maintenance, and repair (Pehct, M. 2009). The product was developed obeying these factors by having a good cooperation with the Balance fitness center. Each phase supported the reliability of the product.

There were not trustworthy researches done about the reliability and successfulness of the product during the process. Instead of, the product is evaluated by the commissioner and the authors. The product will be published on Facebook and the organization stands behind of the instructing videos. There were not any trustworthy researches done about which free weight movement is suitable for a beginner. The commissioner and authors expertise is used to define which 23 movements were. Also the techniques were accepted to be suitable for beginners by the organization. Reliable sources about product development are used to have a critical analysis about the finished product. Daily cooperation with the commissioner supported the ethicality and reliability of the product.

9.3 Development of Professional Competences

The objective of the Degree Programme in Sports and Leisure Management is to provide students with a high quality, academic yet practical education in the field of sports. The stu-

dents' professional competence will be built upon a multidisciplinary knowledge base, as well as interpersonal and practical skills. The authors developed knowledge in physical activity, human anatomy, exercise physiology, well-being and management skills. The thesis deepened the authors earlier learned competences and gave valuable experience of working process. The authors learned to search and utilize adequate information from different sources.

The Degree Programme in Sports and Leisure Management is divided to four different competence, which are health promoting physical activity and coaching, pedagogy and didactics, physical activity, and areas of physical exercise involving leadership and enterprise. Competence in physical activity means ability to manage the fundamental knowledge and skills required in the most common physical activities and applying them to different targets. The knowledge of physical activity was needed when the product was filmed. The product included many variations of free weights movements and they needed to be chosen carefully in order to be suitable for the target group, which were the beginners. The competence helped to understand what beginners are capable of and what kind of instructing they need, as explained instructions in videos while the model is performing the movement to improve the learning.

Competence in health promoting physical activity is a demonstration of a fundamental knowledge of anatomy and physiology and the ability to apply when teaching different types of target group. The knowledge about human anatomy was important part of free weight movements. For example, to understand where the chosen movement affects and which ligaments and joints are stimulated. The process widened the authors' expertise of this particular area of competence, especially when the list of movements was done. (Appendix 1)

Competence in pedagogy and didactics includes management of planning, execution, and evaluation of extensive modes of teaching and ability to utilize learning concepts based on personal values. The learned expertise of instructing was now transferred into the video, which was a new experience for the authors. The values of pedagogy and didactics remained the same but the authors had to adjust them by using the video and giving easy access for the target group to start free weight training.

The last competence in areas of physical exercise involving leadership and enterprise includes for example, proficiency in the different enterprise opportunities in physical education and ability to manage developmental visions in physical activity culture. This particular

competence was present during the whole thesis process. The product needed to be planned, executed and evaluated in order to benefit a local enterprise. Also the marketing was taken into account during the product development process.

The thesis was product development process that gave an experience of planning and executing product in working life for the authors. The product development plan taught managing schedules and adapting to new situations. The process also taught the authors to be critical with evaluating and working technics. These are good abilities in the field of sports where self-development is important part. The field of sports is fast phase changing area, so adapting to its needs and trends helps to be successful in the future. The authors writing was developing all the time during the process and the earlier learned competences were widened and tested in working life. The authors believe that all what they have learned during the thesis process will be beneficial when they move to the working life.

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Free weight movements

1) Bench press

Correct technique:

Starting position: Lie face up on a horizontal bench, with buttocks on the bench, back arched and feet flat on the ground.

- Grasp the barbell with an overhead grip wider than shoulder width.
- Lock onto the bar with a grip in which the thumb and fingers oppose each other.
- Inhale and lower the bar to the chest with a controlled movement.
- Extend the arms and exhale at the end of effort.

The movement can be executed with arched back variation, classic position and raised-leg variation. The chosen movement in picture and video is arched- back variation. It is chosen, because this power-lifter style allows lifting significantly heavier weights than other forms. It also gives more support for the lifter. The classic version is recommended for people with back problems.

Muscles involved in the movement:

- Pectoralis major
- Pectoralis minor
- Anterior deltoid
- Serratus anterior and
- Coracobrachialis.

- Three joints are active during the bench press exercise: the shoulder joint, the elbow joint and the scapulothoracic joint.

Synergists:

- Triceps brachii
- Anterior serratus muscle.

Stabilizers:

- Abdominal muscles

2) Incline press

Correct technique:

Starting position: Sit on an incline bench angled at 45 to 60 degrees, grasp the barbell with an overhand grip wider than shoulder width.

- Inhale and lower the barbell to the sternal notch.
- Extend the arms, until the elbows are straight.
- Keep the lower back in contact with the bench at all times
- Natural spine arch maintained throughout.
- Exhale at the end of the movement.

Muscles involved in the movement:

- Clavicular head of the pectoralis major
- Anterior deltoid
- Triceps brachii
- Serratus anterior and
- Pectoralis minor.

Main Agonist:

- Pectoralis major (Clavicular Head)

Synergists:

- Triceps Brachii
- Serratus Anterior (Scapula abduction)
- Deltoid (Anterior Head)
- Coracobrachialis

Stabilizers:

- Abdominal muscles

Movement analysis:

Shoulder joint: Horizontal adduction with a little flexion
Elbow joint: Extension
Scapula: Abduction and upward rotation

3) Decline press

Correct technique:

Starting position: Lie on a decline bench (between 20 and 40 degrees), with the head angled down and feet fixed to prevent sliding and grasp the barbell with an overhand grip shoulder width or more.

- Inhale and lower the barbell to the lower pectorals with a controlled movement.
- Extend the arms and exhale at the end of the movement.

Muscles involved in the movement:

- Pectoralis major
- Triceps brachii and
- Anterior deltoid.

Main Agonist:

- Pectoralis major (Abdominal Head)

Synergists:

- Triceps brachii
- Serratus anterior (Scapular abduction)
- Deltoid (Anterior Head)
- Coracobrachialis

Stabilizing muscles:

- Abdominal muscles

Movement analysis:

Shoulder joint: Horizontal adduction with a little extension
Elbow joint: Extension
Scapula: Abduction

4) Dumbbell flys

This exercise is hardly never performed with heavy weights. It serves as a basic exercise to increase thoracic expansion, which contributes to increased pulmonary capacity. It also develops muscle flexibility.

Correct technique:

Starting position: Lie on a narrow bench that will not interfere with the shoulder movement and hold a dumbbell in each hand with arms extended or slightly bent to relieve stress on the joint.

- Inhale and open the arms to horizontal at forearm width with bended elbows.
- Raise the arms to vertical while exhaling.
- Perform a small isometric contraction at the end of the movement to emphasize the work on a sternal head of the pectoralis major.

Muscles involved in the movement:

- Pectoralis major.

Main Agonist:

- Pectoralis major

Synergists:

- Serratus anterior (Scapula abduction)
- Deltoid (Anterior Head)
- Biceps Brachii (short head-horizontal adduction)
- Coracobrachialis

Stabilizers:

- Abdominal muscles
- Elbow flexors

Movement analysis:

Shoulder joint: Horizontal adduction.
Scapula: Abduction

5) Deadlift

Correct technique:

Starting position: Stand facing the barbell, legs slightly with the abdominal muscles contracted and the back slightly arched. Bend the knees until thighs are horizontal with the floor. This possession will vary depending on the flexibility at the ankles and your physical structure. (The thighs will be horizontal for someone with short femurs and arms. The thighs will be above than horizontal for someone with long femurs and arms.) Grasp the barbell with extended arms in an overhand grip a little wider than shoulder-width apart (reversing the grip of one hand—one overhand and one underhand—keeps the bar from rolling, which allows you to use much heavier weights)

- Inhale, hold the breath, and contract the abdominal muscles and low back and raise the bar by straightening the legs and allowing the bar to slide up the shins. When the bar reaches the knees, straighten the torso while straightening the legs.
- Exhale at the end of the effort.
- Throughout the exercise, never straighten your back.

Muscles involved in the movement:

Main Agonist:

- Gluteus maximus

Synergists:

- Quadriceps femoris

Hip extensors:

- Hamstrings
- Adductor magnus

Ankle plantar flexors:

- Gastrocnemius
- Soleus

Stabilizers:

- Trapezius
- Rhomboids
- Erector spinae
- Quadratus Lumborum
- Abdominal muscles

Movement analysis:

Hip joint: Extension.
Knee joint: Extension.
Trunk movement at the hip joint: Extension.
Ankle joint: Plantar flexion (small range of movement).

6) One arm dumbbell row

Correct technique:

Starting position: Grasp a barbell with the palm facing in; use the opposite hand and knee on the bench to support the back.

- Inhale and lift the upper arm and elbow as high as possible next to the body with the elbow bent.
- Exhale at the end of the movement
- To maximize the contraction, rotate the torso slightly toward the working side at the end of the row.

Muscles involved in the movement:

- Latissimus dorsi
- Teres major
- Posterior deltoid
- Trapezius
- Rhomboids and
- The forearm flexors (biceps brachii, brachialis, and brachioradialis) are also used.

Main Agonist:

- Latissimus dorsi

Synergists:

Scapular adductors:
- Trapezius
- Rhomboids

Elbow flexors:

- Brachialis
- Brachio-radialis
- Biceps brachii

Shoulder extensors:

- Pectoralis major
- Posterior deltoid
- Teres major
- Triceps brachii (long head)

Stabilizers:

- Rotator cuff
- Abdominal muscles

- Pectoralis major
- Triceps brachii

Movement analysis:

Shoulder joint: Extension.
Elbow joint: Flexion.
Scapula: Adduction with downward rotation.

7) Dumbbell shrugs

Correct technique:

Starting position: Stand with the legs slightly apart, head upright or slightly flexed forward, and arms relaxed at the sides gripping a dumbbell in each hand:

- Shrug the shoulders with an anterior to posterior rotation.
- Return to the initial position.

Muscles involved in the movement:

- Superior, or clavicular, portion of the trapezius
- Levator scapula
- Middle portion of the trapezius and
- Rhomboids

Main Agonist:

- Trapezius

Synergists:

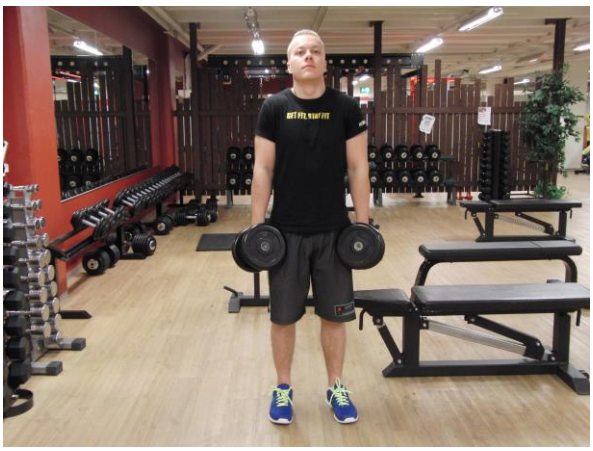
- Levator scapulae

Stabilizing muscles:

- Spinal erectors
- Abdominal muscles

Movement analysis:

Scapula: Elevation with upward rotation



8) Back squat

Correct technique:

Starting position: With the barbell resting on a stand, slide under the bar and place it on the trapezius a bit higher than the posterior deltoid. Grasp the bar firmly with the hands at a comfortable width and the elbows back.

- Inhale deeply (to maintain the intrathoracic pressure, which will prevent the torso from collapsing forward), slightly arch the back by rotating the pelvis forward, contract the abdominal core, look straight ahead, and remove the barbell from the stand.
- Step back one or two steps and stop with both feet parallel to each other (or toes pointing slightly forward) and about shoulder-width apart. Bend forward from the hips (the axis of flexion should pass through the coxofemoral joints) and avoid rounding the back in order to prevent injury.
- When the tights are horizontal to the floor, straighten the legs and lift the torso to return to the initial position.
- Exhale at the end of the movement.

Muscles involved in the movement:

- Quadriceps
- Gluteal muscles
- Adductor group
- Erector spinae
- Abdominal muscles and
- Hamstrings

Main Agonist:

- Quadriceps femoris

Hip extensors:

- Gluteus maximus
- Hamstrings
- Adductor magnus
- (posterior fibers)

Ankle plantar flexors:

- Gastrocnemius
- Soleus

Stabilizers:

- Erector spinae
- Abdominal muscles (antagonist stabilizers

Movement analysis:

Hip joint: Extension.
Knee joint: Extension.
Ankle joint: Plantar flexion (small range of movement)

9) Front squat

Correct technique:

Starting position: Stand with the legs about shoulder- width apart, holding the bar with an overhand grip as it rests on the upper pectoral muscles and the anterior deltoid.

- Inhale deeply to maintain intrathoracic pressure, which prevents the torso from collapsing forward, slightly arch the lower back, contract the abdominal core, and bend the knees to lower the thighs horizontal to the floor.
- Return to the initial position and breathe out at the end of the movement.
- Stick out the chest and raise the elbows as high as possible to prevent the barbell from sliding forward.
- Even though the barbell is in front, keep the back upright and do not lean the torso forward. To make the exercise easier, place block under the heels.

Muscles involved in the movement:

- Quadriceps
- Qluteal
- Hamstring
- Abdominal core and
- Erector spinae

Main Agonist:

- Quadriceps femoris

Synergists:

- Gluteus maximus
- Hamstrings
- Adductor magnus
- (posterior fibers)

Ankle plantar flexors:

- Gastrocnemius
- Soleus

Stabilizers:

- Erector spinae
- Abdominal muscles (antagonist stabilizers)

Movement analysis:

Hip joint: Extension.
Knee joint: Extension.
Ankle joint: Plantar flexion (small range of movement)

10) Dumbbel lunges

Correct technique:

Starting position: Stand with the legs slightly apart and hold a dumbbell in each hand.

- Inhale and take a big step forward, keeping the torso as straight as possible.
- When the forward thigh reaches horizontal or slightly below, use tonic extension to return to the initial position.
- Exhale at the end of the movement.

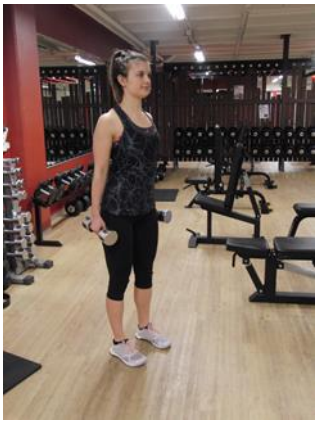
Muscles involved in the movement:

- Gluteus maximus and
- Quadriceps.

Main Agonist:

- Quadriceps femoris

Synergists:



- Gluteus maximus
- Hamstrings
- Adductor magnus
- (posterior fibers)

Knee extensors:

- Quadriceps femoris

Ankle plantar flexors:

- Gastrocnemius
- Soleus

Stabilizers:

- Erector spinae
- Abdominal muscles (antagonist stabilizers)

Movement analysis:

Hip joint: Extension.
Knee joint: Extension.
Ankle joint: Plantar flexion (small range of movement).

11) Standing calf raise

Correct technique:

Starting position: Stand with the toes pointing straight forward and hold dumbbels in both hands.

- Rise up on the toes (plantar flexion), keeping the knee joint straight or slightly flexed.
- Return to the initial position.

Muscles involved in the movement:

- Triceps surae

Main Agonist:

- Gastrocnemius

Synergists:

- Soleus
- Peroneus Brevis
- Peroneus Longus
- Flexor Hallucis Longus
- Flexor Digitorum Longus

Stabilizers:

- Knee extensors
- Hip extensors
- Spinal erecrots
- Trapezius

Movement analysis:

Ankle joint: plantar flexion

12) Bicep curls with EZ-bar (wide grip)

Correct technique:

Starting position: Stand with the back straight, grasping the barbell with an underhand grip and hands slightly wider than shoulder- width apart.

- Inhale and raise the barbell by bending the elbows, taking care to stabilize the torso and spine by isometrically contracting the gluteal muscles, abdominal muscles, and spinal muscles.
- Exhale at the end of the movement.
- This exercise mainly contracts the biceps brachii, brachialis, and, to a lesser degree, the brachioradialis, pronator teres, and the wrist flexor group.

Muscles involved in the movement:

Main Agonist:

- Biceps brachii

Synergists:

- Brachialis
- Brachioradialis

Stabilizers:

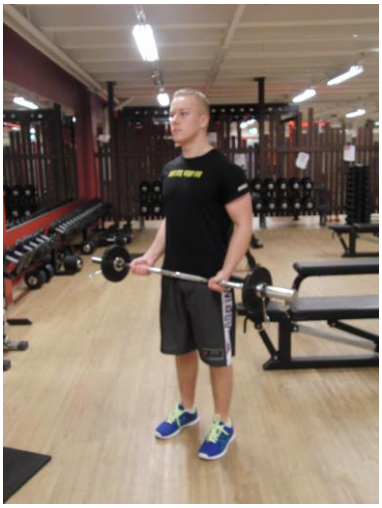
- Spinal erectors

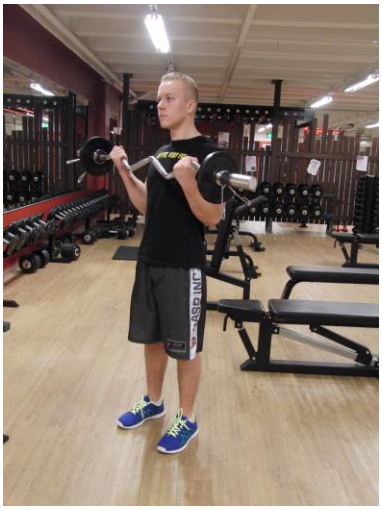
Scapular stabilizers:

- Trapezius
- Rhomboids
- Wrist Flexors

Movement analysis:

Elbow: Flexion





13) Hammer curls

Correct technique:

Starting position: Sit gripping a dumbbell in each hand with the palms facing each other.

- Inhale and raise the forearms together or alternately
- Exhale at the end of the movement

Muscles involved in the movement:

- Brachioradialis
- Briceps brachii
- Brachialis
- Extensor carpi radialis brevis and longus.

Main Agonist:

- Brachioradialis

Synergists:

- Brachialis
- Biceps brachii

Stabilizers:

- Spinal erectors

Scapular stabilizers:

- Trapezius

Wrist Adductors (Radial deviators):

- Flexor Carpi Radialis
- Extensor Carpi Radialis
- Adductor pollicis longus
- Extensor pollicis

Movement analysis:

Elbow: Flexion (Forearm midposition)

14) Barbell lying triceps extensions

Correct technique:

Starting position: Lie on a flat bench and grasp a dumbbell in each hand with the arms vertical.

- Inhale and lower the forearms by bending the elbow with a controlled movement.
- Return to the initial position.
- Exhale at the end of the effort.

Muscles involved in the movement:

- All three heads of the triceps brachii

Main Agonist:

- Triceps brachii

Synergists:

- Anconeus

Stabilizers (Shoulder extensors):

- Lattisimus dorsi
- Teres major
- Posterior deltoid
- Pectoralis major

Movement analysis:

Elbow joint: Extension

15) One- arm dumbbell triceps extensions

Correct technique:

Starting position: Stand and grip a dumbbell in one hand with the arm vertical.

- Inhale and bend the elbow to lower the dumbbell behind the head to the neck.
- Return to the initial position.
- Exhale at the end of the movement.

Muscles involved in the movement:

- Triceps brachii

Main Agonist:

- Triceps brachii

Synergists:

- Anconeus

Stabilizers (Shoulder extensor):

- Posterior deltoid
- Latissimus dorsi

Scapular adductors:

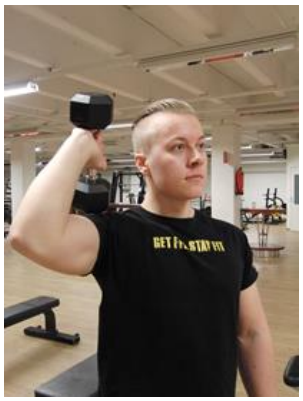
- Trapezius
- Rhomboids

Wrist adductors:

- Extensor Carpi Ulnaris
- Flexor Carpi Ulnaris
- Rotator cuff

Movement analysis:

Elbow joint: Extension



16) Seated dumbbell shoulder press

Correct technique:

Starting position: Sit on a bench, keeping the back straight, and hold dumbbells at shoulder level an overhand grip (thumbs pointing inward).

- Inhale and extend the forearms vertically.
- Exhale at the end of the movement.

- Deltoid
- Trapezius
- Serratus anterior and
- Triceps brachii.

Main Agonist:

- Deltoid

Synergists (Shoulder abductors):

- Supraspinatus

Elbow extensors:

- Triceps brachii
- Anconeus

Shoulder flexors:

- Pectoralis major (Clavicular head)

Stabilizers:

- Levator Scapulae
- Trapezius (superior)
- Abdominal muscles

Movement analysis:

Shoulder joint: Abduction
Elbow joint: Extension
Scapula: Upward rotation with elevation

17) Lateral dumbbell raise

Correct technique:

Starting position: Stand with a straight back, with legs slightly apart, arms hanging next to the body, holding a barbell in each hand.

- Raise the arms to horizontal with the elbows slightly bent.
- Return to the initial position.

Muscles involved in the movement:

- Mainly middle deltoid.

Main Agonist:

- Deltoid

Synergists:

- Shoulder abductors - Supraspinatus

Stabilizers:

- Levator Scapulae
- Trapezius (superior)
- Abdominal muscles
- Spinal erectors

Movement analysis:

Shoulder joint: Abduction
Scapula: Upward rotation with elevation

18) Bent- over lateral raises

Correct technique:

Starting position: Stand with legs slightly apart and knees slightly bent and lean forward at the waist while keeping back straight. With arms hanging down, grasp the dumbbells with the elbows slightly bent.

- Inhale and raise the arms to horizontal.
- Exhale at the end of the effort.

Muscles involved in the movement:

- Shoulder group, accenting the work of the posterior deltoid
- Middle and lower portions of the trapezius
- Rhomboids
- Teres minor and
- Infraspinatus.

Main Agonist:

- Deltoid (Posterior part)

Secondary Agonist:

- Trapezius (Middle Part)

Synergists:

- Rhomboids
- Infraspinatus
- Teres minor

Stabilizing muscles:

- Spinal erectors
- Triceps brachii

Movement analysis:

Shoulder joint: Horizontal abduction
Scapula: Adduction

19) Alternate front arm raises

Correct technique:

Starting position: Stand with the feet slightly apart, holding the barbells with an overhand grip as they rest against the front of the thighs or slightly to the side.

- Inhale and alternate raising arms to the front to eye level.
- Exhale at the end of the effort.

Muscles involved in the movement:

- Anterior deltoid
- Clavicular head of the pectoralis major and
- Deltoids.

Main Agonist:

- Deltoid (Anterior part)

Synergists:

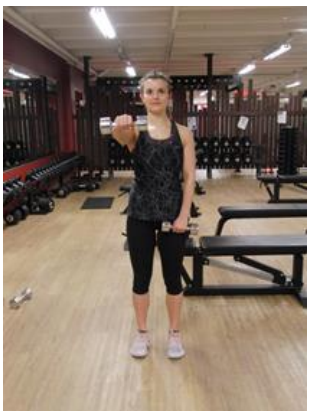
Shoulder flexors:
- Deltoid (middle)
- Pectoralis major (Clavicular head)
- Bicep Brachii (short head)
- Coracobrachialis

Stabilizers:

- Rotator cuff
- Erector spinae
- Levator Scapulae
- Rhomboids
- Trapezius

Movement analysis:

Shoulder joint: Flexion
Scapula: Upward rotation with abduction



20) Upright rows

Correct technique:

Starting position: Stand with the legs slightly apart and back straight. Grasp the barbell with an overhand grip slightly wider than shoulder width as it rests against the tights.

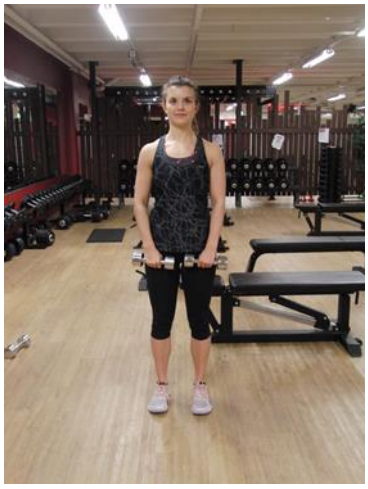
- Inhale and pull the barbell up along the body to the chin keeping elbows as high as possible.
- Lower the bar in a controlled manner without abrupt movements.
- Exhale at the end of the effort.

Muscles involved in the movement:

- Deltoid
- Trapezius,
- Biceps,
- In lesser degree, the muscles of the forearms, the gluteal muscles, the lumbosacralis group and the abdominal muscles.

Main Agonist:

- Deltoid



Synergists:

Shoulder abductors:
- Supraspinatus

Elbow flexors:

- Brachialis
- Brachioradialis
- Biceps brachii

Stabilizers:

- Levator Scapulae
- Trapezius
- Rhomboids
- Abdominal muscles
- Spinal erectors

Movement analysis:

Shoulder joint: Abduction
Elbow joint: Flexion
Scapula: Upward rotation with elevation

21) Dumbbel side bends

Correct technique:

Starting position: Stand with the legs slightly apart, one hand behind the head and holding a dumbbell in the other hand.

- Bend the torso to the side opposite to the dumbbell.
- Return to the initial position or beyond with passive flexion of the torso.
- Alternate sets changing the side of the dumbbell without resting.

Muscles involved in the movement:

- Obliques
- Rectus abdominis
- Quadratus lumborum

Main Agonist:

- External Abdominal Oblique
- Internal Abdominal Oblique

Synergists:

- Quadratus Lumborum
- Spinal Erectors
- Psoas major

Stabilizers:

- Upper Trapezius
- Rectus Abdominis

Movement analysis:

Spinal column: Lateral flexion

22) Russian twist

Correct technique:

Starting position: Start in a seated position with knees bent and feet on the ground. The upper body is slightly reclined.

- Inhale and rotate the torso by moving the weight to side
- Exhale at the end of the movement
- Rotate the body and return the weight to other side

Muscles involved in the movement:

Main Agonist:

- External Abdominal Oblique
- Internal Abdominal Oblique

Synergists:

- Rectus abdominis

Stabilizers:

- None

Movement analysis:

Spinal column: Spinal Flexion with rotation

23) Crunches

Correct technique:

Starting position: Lie on the back, with knees bent, feet flat on the ground, and arms extended in front.

- Raise the torso and keep the hands extended.
- Return to the initial position without touching the ground.
- Keep your abs contracted.

Muscles involved in the movement:

Main Agonist:

- Rectus abdominis

Synergists:

- External Abdominal Oblique
- Internal Abdominal Oblique

Stabilizers:

- None

Movement analysis:

Spinal column: Flexion