FOUNDATIONS OF FITNESS PROGRAMMING

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FOUNDATIONS OF FITNESS PROGRAMMING

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FOUNDATIONS OF FITNESS PROGRAMMING OVERVIEW

ABOUT

The Foundations of Fitness Programming (FFP) was written to highlight the essential, research-based components of designing fitness programs, and to "bridge the gap" by providing recommendations to apply research to practice. It is not meant to replace individualized training, nor is it a "cookie-cutter," one-size-fits-all program. It is meant to serve as a resource and educational tool for personal trainers to design training programs quickly and effectively, which are progressive in nature and specific to the needs and goals of their clients.

The FFP provides supporting rationale and scientific references for the recommendations made, and these references can be found in the appendix. Practical training tips and links to relevant journal articles and exercise technique videos have also been added.

There are corresponding spreadsheet "templates" formatted to provide periodized training programs that include drop-down menus for exercise selection, pre-programmed exercise variables that correspond to the phases of training, and recommendations for aspects of a personal training session including dynamic warm-up, resistance, cardiovascular, and flexibility training.

WHY WAS THE FFP DEVELOPED?

As the worldwide authority on strength and conditioning, the National Strength and Conditioning Association (NSCA) supports and disseminates research-based knowledge and its practical application to improve performance and fitness. Since the practical application often provides the greatest challenge to novice personal trainers, the FFP was developed to bridge that gap, helping personal trainers

efficiently and effectively design training programs based on scientific principles, specific to the individual needs of their clients.

Personal training is often referred to as an art form (i.e., the art of applying research-based knowledge to individual situations including, but not limited to, a client's goals, current/previous injuries, health and fitness status, level of physical competency, self-efficacy, self-confidence, etc.). While there are general training principles that apply to everyone, there are a number of factors that affect program design and client motivation. Regardless, programs should adhere to the principles put forth by the NSCA. These principles (Haff G. H., 2012) are:

1. **Specificity (individuality)**
   Designing training programs/workouts with a specific goal in mind based on each client's individual needs. Specificity in training can be accomplished by targeting muscle groups, energy systems, speed of movement, movement patterns, and/or muscle action types (Haff G. H., 2012).

2. **Overload**
   The training stress (based on frequency, intensity, and type of exercise as well as recovery processes) placed on a client should exceed the training stress experienced during the previous workout. This is accomplished by increasing the load, sets, reps, or by decreasing the rest periods.

3. **Progression**
   Similar to overload, progression (or progressive overload) refers to the systematic modification of a training program over time. In addition to exercise intensity, progression also refers to frequency and increasing the difficulty of exercise selection (advancement from low-skill to high-skill exercises). Exercises are progressed on an individual basis rather than a pre-determined schedule, based on a client's ability and speed of adaptation.

4. **Variation**
   Variation is considered planned variety in exercise selection and training variables.

Keeping in line with these principles, the FFP provides a recommended (linear periodization) training sequence that consists of muscular endurance, hypertrophy, strength, and power phases for relatively untrained through advanced clients. While other periodization models exist, a linear model is suggested for beginners.

DESIGNING INDIVIDUALIZED FITNESS PROGRAMS

A training program should be based on the individual needs and abilities of a client in order to maximize the effectiveness and efficacy of the training program as well as decrease the risk of injury or overtraining. These needs and abilities should be determined during the initial consultation and fitness assessment, and then updated every 4 – 6 weeks of training. The following steps identify a systematic process used to develop the training program:

1. **Consultation and Discussion of Goals**
   The initial consultation is an opportunity for the personal trainer to establish professional credibility, determine client-trainer compatibility, and develop rapport and trust with the client. A personal trainer establishes credibility by "debunking" fitness myths and explaining the scientific rationale and programming necessary to reach their goals. Rapport and trust are developed when the personal trainer asks the "right" questions and demonstrates active listening to the client's responses; thereby, increasing the likelihood that a client will discuss the underlying motivational factors driving them to achieve their goals. These factors lay the foundation for open communication between the personal trainer and client, and increase the likelihood that their goals will be attained.

   During the initial consultation, personal trainers should ask questions pertaining to training history, resources, and other obstacles (e.g., time constraints, equipment access, family commitments etc.), as well as begin the initial discussion of training goals. This information provides the "road map" to designing effective programs; it tells the trainer where the client wants to go and identifies where they are starting from. It is important to note that goals should be discussed in general terms during this initial consultation. S.M.A.R.T. goals (see below) can only be accurately set following the evaluation of health history and fitness assessment.

   Refer to *Appendix A* for sample questions to ask during the initial consultation.

2. **Evaluate Health History Forms and Perform a Fitness Assessment**
   The results of the health history forms and fitness assessments are used to design a client's individual training program. This data includes a baseline for future comparison, identification of current fitness level, clarification of goal setting, and assistance in prescribing initial exercise frequency, volume, and intensity.

3. **Establish S.M.A.R.T. Goals**
   Successful programs train clients at a level that matches their needs and abilities to meet their specific goals. Following the initial consultation, health history evaluation, and fitness assessment, the personal trainer and the client should work together to develop specific, measurable, action-oriented, realistic, and timely (S.M.A.R.T.) goals. Tips for effectively establishing goals include:

a. **Agree Upon the Goals**
The personal trainer and client should develop and agree upon the goals together. The client provides the "why" (i.e., their motivation for achieving these goals), while the personal trainer determines whether the goals are realistic, including time frame to achieve goals, and develops and explains the overall plan for achieving those goals.

b. **Define Roles and Responsibilities**
The personal trainer should explain his/her role in helping the client achieve the goals as well as the client's role and responsibility in achieving the goals, and address the clients expectations of the personal trainer.

c. **Identify and Address Roadblocks**
The personal trainer and client should identify any potential issues that may impede progress and develop alternative options if, or when, these issues arise.

4. **Develop the Training Program**
At this point, the personal trainer has all the necessary information to develop a specific training plan that matches the needs and abilities of a client to reach the agreed upon goals. This plan should include frequency of training, exercise selection, and training variables.

IMPLEMENTING THE FOUNDATIONS OF FITNESS PROGRAMMING

FOUNDATIONS OF FITNESS PROGRAMMING: INSTRUCTIONS AND APPLICATION

While there are many ways to organize an individual training session, the FFP provides recommendations that cover the following training components:

1. Mobility, movement preparation, and flexibility training
2. Resistance training
3. Basic nutrition
4. Cardiovascular training
5. Core/stability training

It is assumed that at this point, the personal trainer has taken the client through and completed the initial consultation, health history evaluation, fitness assessment, and goal setting process. The following sections identify key points related to the application of key training components.

There are program design templates available for download. These templates are formatted for the personal trainer to design periodized training programs with his/her clients.

In addition, a list of other example exercises can be found in the appendix. These exercises are linked to short exercise technique videos with key points and coaching cues.

The templates and videos can be found on the **Program Design Essentials** page.

MOBILITY, MOVEMENT PREPARATION, AND FLEXIBILITY TRAINING

WARM-UP BENEFITS

The term "warm-up" refers to preparatory exercises performed prior to engaging in activities that are more vigorous and includes three types: passive, general, and specific. Regardless of the type selected, the overall purpose remains the same: to prepare the body for the demands of the upcoming workout, in particular to increase temperature-dependent physiological responses. These responses:

1. increase muscle temperature causing more forceful contractions and quicker relaxations,
2. increase blood temperature to working muscles, unloading more oxygen to working muscles, and
3. increase range of motion around joints (Hedrick, 2012).

It is important to note that dynamic warm-up/stretching is not the same as flexibility (e.g., static stretching) training. Flexibility refers to the range of motion at a specific joint or series of joints, and is typically assessed in non-weight bearing situations. Conversely, dynamic stretching refers to performing movements specific to a sport or movement pattern (Hedrick, 2012). Within the context of dynamic stretching are the terms mobility and movement preparation (prep). Mobility refers to a client's ability to achieve a posture or position, is more global in nature, and emphasizes multi-joint movements and stabilization (Brooks & Cressey, 2013). Movement prep is an even broader term used to describe all of the various methods used to improve mobility during a warm-up. Performing a dynamic-based warm-up prior to physical activity appears to improve performance and may provide increased resistance to muscle injury (Hedrick, 2012).

DYNAMIC WARM-UP RECOMMENDATIONS

A dynamic warm-up routine starts with about 5 min of cardiovascular activity, starting at a low intensity and progressing to a moderate intensity (i.e., to the point of developing a light sweat). This cardiovascular warm-up is followed by 5 – 15 min of movement prep that progresses from general exercises to ones that are more specific. Each movement prep exercise is performed for approximately 20 – 25 yards, or 5 – 10 reps. A list of dynamic warm-up exercises can be found in Appendix B; the exercises listed are linked to videos that provide exercise technique tips and coaching cues.

In addition to the dynamic warm-up exercises included in the appendix, some clients may benefit from additional movement preparation techniques, such as self-myofascial release. This technique may improve range of motion without subsequent performance detriments (MacDonald, et al., 2013).

DYNAMIC WARM-UP PROGRAMMING CONSIDERATIONS AND RECOMMENDATIONS

Personal trainers should have a conscious reason for prescribing exercises for their clients and can support their recommendations with scientifically sound research. This statement applies to all phases of a workout, including the dynamic warm-up routine. When designing a warm-up routine, personal trainers should ask themselves:

1. What cardiovascular activity is most appropriate for the client and involves the most amount of muscle mass?
2. What exercises are planned in the upcoming workout?
    a. What joints and muscles will be involved?
    b. What is the overall level of mobility required to perform the exercise?
    c. What planes of motion will be involved?
    d. What speed of movement will be involved?
3. Does the client have any specific mobility restrictions or exercise contraindications?

Recommendations:

1. Start with general movements that mobilize joints that will be used in the upcoming workout or need consistent work, such as the ankle, hip, and thoracic spine (Myer, et al., 2014).
2. Select additional mobility drills based on the individual needs of the client.
3. Progress to specific warm-up movements/exercises that meet the physical and physiological demands of the upcoming workout.

Consider the following warm-up example for a client with limited mobility who will be performing the barbell back squat in the upcoming workout. After a 5-min warm-up (walk to jog to run), a sample mobility routine may include the following:

BODY AREA/JOINT	MOBILITY DRILL	WARM-UP MOVEMENT
Ankle	Ankle Wall Mobility	Single-Leg Quarter Squats
Hip	3-Way Lunge	Hip Bridge/ Thrusters
Thoracic Spine	T-Spine Rotations	Suspension Trainer Rows
Total Body	Bodyweight Squat/Goblet Squats	
Neurological	Back Squat Warm-Up Sets	

FLEXIBILITY TRAINING

Research suggests that although static stretching and proprioceptive neuromuscular facilitation (PNF) are viable options for increasing range of motion, they may decrease force production and subsequent performance (Mojock, Kim, Eccles, & Panton, 2011). This decrease in performance is attributed to musculotendinous unit (MTU) stiffness and decreased neural activation of the skeletal muscles (Mojock, Kim, Eccles, & Panton, 2011). For this reason, flexibility training via static stretching and PNF are recommended when the muscles are already warmed up, either at the end of a workout session or during a separate flexibility focused session.

PROGRAM DESIGN: BASICS

CLASSIFYING TRAINING STATUS AND TRAINING FREQUENCY RECOMMENDATIONS

In order to progress a client through a training program safely and effectively, the personal trainer must first know where to start when assigning training variables, such as frequency of training. The following table provides a means of classifying clients based on the duration and frequency of their current training program and their overall training experience.

EXAMPLE OF CLASSIFYING TRAINING STATUS*

CLASSIFICATION	DURATION OF CURRENT TRAINING PROGRAM	CURRENT FREQUENCY	TRAINING INTENSITY	RECOMMENDED FREQUENCY
Beginner	0 – 6 months	0 – 3	Low-medium	2 – 3
Intermediate	8 – 12 months	3 – 4	Medium-high	3 (total body) 4 (split routine)
Advanced	≥ 1 year	≥ 4	High-very high	4 – 6

Adapted, with permission, from tables 15.1 and 15.2 on pages 350 and 352 of J.W. Coburn and M.H. Malek (eds.), 2012, NSCA's essentials of personal training, 2nd ed. (Champaign, IL: Human Kinetics).

**The classifications in this table provide an example; exact client classification cannot be definitively described.*

SEQUENCING OF TRAINING

Periodization is the systematic process of planned variation in a training program and is commonly used in athletic populations, where peaking for an event is critical. Consider a football team who just ended their fall season. After a short time off, their periodized training program will begin with a general preparation phase in the off-season and progress toward a peaking/competitive phase. This general preparation phase will begin shifting from high volume/low intensity to low volume/high intensity as the football season nears. How does a personal trainer apply this concept to a client who wants to lose weight, build muscle, or "get in shape?"

Before answering that question, it is important to understand that the purpose of periodization is to improve physical performance progressively towards a training goal through the manipulation of training variables. This purpose adheres to the general training principles of overload, progression, and variation previously discussed. The personal trainer should understand that different training goals have complementary effects, and that by sequencing different phases of training those same principles are adhered to. For example, a client whose primary training goal is strength would benefit from completing a hypertrophy phase prior to completing a strength phase. The hypertrophy phase will result in an increased cross-sectional area (e.g., more muscle mass) which can increase total force production potential (Haff G. H., 2012).

It is generally accepted that all clients should begin a resistance training plan based on either muscular endurance or hypertrophy to establish a training base for the development of other specific goals. Intermediate and advanced clients who have already developed this training base may perform a shorter muscular endurance or hypertrophy phase or move directly into training for their specific goals.

The following provides an example linear periodization sequence, each lasting 2 – 4 weeks (Haff G. H., 2012):

1. Muscular endurance phase
2. Hypertrophy phase
3. Strength phase
4. Power phase (intermediate and advanced clients only)

It is important to note that many different methods of periodization/sequencing can produce significant results; however, there is no "one best way" (Cissik, Hedrick, & Barnes, 2008). After completing the initial training sequence of 3 – 4 months, the personal trainer should sequence the training phases to meet the specific needs/goals of the client, and then manipulate training variables every 2 – 4 weeks to prevent stagnation and encourage continuous adaptation.

EXERCISE SELECTION, REGRESSION, AND PROGRESSION

Becoming proficient at an exercise requires coaching (from the personal trainer) and practice (from the client). Clients must be able to perform movements that challenge their ability without putting them at risk of injury and still provide them with an appropriate training stimulus in order to adapt.

As an example, consider Mari, a 45-year-old female who just signed up for an eight-week personal training program. She will be getting married in eight weeks and her goal is to look great in her wedding dress. In training terms, she wants to decrease her percentage of body fat. Mari's training age is 0, meaning she has never stepped foot in a weight room and describes herself as "clumsy." Her personal trainer thinks that one of the best overall exercises is the barbell back squat, which requires a moderate level of technical skill to be performed safely with an adequate load to elicit a training effect. The personal trainer also knows that most lumbar disk injuries occur when the spine is flexed (Durall & Manske, 2005), especially when loaded. If the personal trainer were to spend 15 minutes a session, twice a week working on barbell back squat technique, it would be using about 25% of her training time on learning exercise technique.

Instead of getting stuck on the process, the personal trainer should focus on the product (or outcome of performing the exercise). If the personal trainer thinks about the product of the exercise (incorporating a multi-joint movement involving the majority of muscles in the body) he/she may choose to "regress" the exercise. Regression refers to selecting a less complicated exercise using the same movement pattern. In this case, the trainer may choose to select a goblet squat, assisted squat, or even a wall sit. Progression is the opposite; it involves selecting an exercise of a similar movement pattern with a higher technical degree. For example, a progression from the back squat may include the front squat or overhead squat. Going back to Mari, performing a less technical exercise, like the goblet squat, would be a more effective exercise (given her eight-week time frame) in building muscle and/or burning calories.

The following table provides recommended training regressions and progressions that can be used for primary movement patterns. Note that these are recommendations; the best regressions and progressions are the ones that best reflect the individual client's strengths and weaknesses.

EXAMPLE EXERCISE REGRESSIONS AND PROGRESSIONS

MOVEMENT	REGRESSION #1	REGRESSION #2	STANDARD	PROGRESSION #1	PROGRESSION #2
Squat	Wall Sit	Goblet Squat	Back Squat	Front Squat	Overhead Squat
Hinge	Hip Bridge or 45° Hip Extension	Cable Romanian Deadlift (RDL)	RDL	Single-Leg RDL	Kettlebell Swings
Lunge	Split Squat	Assisted Reverse Lunge	Walking Lunge	Multiplanar Lunge	Split-Squat Jumps
Push (bodyweight)	Modified or Wall Push-Up	Stability Ball Push-Up	Push-Up	Archer Push-Up	Plyometric Push-Up
Push (external load)	Machine Chest Press	Barbell Bench Press	Dumbbell Bench Press	Single-Arm Dumbbell Press	Split-Stance Single-Arm Cable Press
Horizontal Pull	Seated Row	Dumbbell Row	Bent-Over Row	Split-Stance Cable Row	Split-Stance Cable Row with Rotation
Vertical Pull	Lat Pulldown	Assisted Chin-Up	Chin-Up	Pull-Up	Weighted Pull-Up
Press	Machine Shoulder Press	Kneeling Military Press	Military Press	Single-Arm Military Press	Push Press

TRAINING VARIABLES

The next sections provide descriptions of each training phase. These training phases include muscular endurance, hypertrophy, muscular strength, and muscular power. Training variables are included within each phase. These training variables include:

1. Sets per exercise
2. Reps per exercise
3. Rest between sets
4. Load, which is expressed as a percentage of one-repetition maximum (1RM)

Note that these exercise variables apply to the primary exercises (multi-joint/compound). Assistance exercises (single-joint/isolated) are typically performed with lower intensity and higher repetition ranges (primarily in the strength and power phases). For example, during the strength phase, the primary lifts (e.g., squats, bench press, etc.) utilize high intensity/low reps, but the assistance exercises (e.g., leg extension, biceps curl, etc.) utilize low intensity/high reps.

ASSIGNING LOAD

Load is commonly expressed as a percentage of 1RM (one-repetition maximum), which is the heaviest load that can be lifted once while maintaining correct form/technique during a given exercise. Load and the number of reps performed have been shown to be highly associated to specific training goals. For example, heavier loads (> 80% of 1RM) with lower reps are associated with gains in strength, while lighter loads (< 70% of 1RM) with higher reps are associated with gains in muscular endurance (Haff G. H., 2012).

Before assigning load, the personal trainer must determine the 1RM of the desired lift. This can be attained by performing a true 1RM test or by using a multiple repetition maximum (RM) test to estimate the 1RM.

The advantage of performing a 1RM test is that a true 1RM test will provide the most accurate result; however, this method does have some disadvantages. Novice clients may lack the technique necessary to allow a safe 1RM test. Some clients may have the necessary technical competence to complete a lift safely, but lack confidence to complete the test safely. It is essential that the personal trainer take the client's training age, technical competency, and confidence into consideration when deciding which method they will use to determine a 1RM. It is also important to note that 1RM tests should be reserved for compound/multi-joint lifts because these lifts are typically better suited for use with large loads. Testing assistance exercises (e.g., single-joint exercises such as the biceps curl) for a 1RM should be avoided. (Haff G. H., 2012)

An alternative to 1RM testing is multiple RM testing, which can be used to estimate a client's 1RM. While a 1RM test directly measures the maximal amount of weight a client can lift, multiple RM testing determines a 6RM – 10RM load that can be used to indirectly estimate a client's 1RM using the Training Load Chart found on the **Program Design Essentials** page.

PROGRAM DESIGN METHODS AND DESCRIPTIONS

The following are program design terms used in subsequent sections with brief explanations:

- **Single-set system:** performing one set of a given exercise (as opposed to performing multiple sets of an exercise)
- **Multiple-set systems (standard exercise order):** performing multiple sets of an exercise before moving on to subsequent exercises
- **Complex set:** combining a strength exercise followed by a power exercise (e.g., squats followed by depth jumps)
- **Compound set:** performing 2 – 3 exercises for similar muscle groups
- **Circuit training:** performing one set of multiple exercises before repeating
- **Supersets:** performing alternating exercises for opposing muscle groups
- **Pyramid loading:** increasing training load progressively and then decreasing
- **Drop sets:** performing a set to muscular failure with a given load and continuing immediately with additional sets at a lighter load
- **Heavy negatives:** performing eccentric-only work with a load greater than concentric 1RM
- **Forced reps:** performing additional reps past volitional fatigue with the help of a spotter
- **Cluster sets:** also known as rest-pause sets, utilize inter-repetition rest intervals of 10 – 30 s
- **Accommodating resistance:** incorporating bands and chains to free weight exercises to exert isokinetic resistance throughout the full range of motion
- **Partial range of motion:** performing an exercise in partial ranges of motion to increase strength at a particular joint angle

PROGRAM DESIGN: PHASES OF TRAINING

The FFP and the corresponding training templates follow the linear periodization method. It should be noted, however, that there are numerous valid and effective periodization methods that can be implemented when working with clients.

MUSCULAR ENDURANCE

Muscular endurance is defined as the ability to maintain submaximal muscle actions (Willardson, 2008). Training for muscular endurance combines high repetition ranges with short rest periods, bringing about high levels of metabolic stress thereby requiring lighter loads to complete the prescribed number of repetitions. These lighter loads are not as effective in stimulating muscle hypertrophy as moderate loads with slightly longer rest periods (as recommended in the hypertrophy phase) (Schoenfeld, 2010).

Muscular endurance training is most commonly performed with either standard exercise order (completing all sets of an exercise before moving on to another exercise) or through circuit training.

Resistance exercise performed through circuit training has been shown to improve VO_2max, lactate threshold, body composition, and strength endurance in untrained populations (Waller, Miller, & Hannon, 2011). An essential component to successful implementation of circuit training is the rest period. While there are no specific rules for assigning the work-to-rest period, the FFP recommends that the personal trainer start novice clients with a 1:1 ratio then progress to a 2:1 ratio as the client's fitness level improves.

MUSCULAR ENDURANCE VARIABLES	BEGINNER	INTERMEDIATE	ADVANCED
Duration	2 – 4 weeks	2 – 4 weeks	2 – 4 weeks
Sets per exercise	1 – 3	≥ 3	≥ 3
Reps per set	10 – 15	10 – 15	10 – 25
Rest between sets	≤ 30 s	≤ 30 s	≤ 30 s
Load/intensity (% of 1RM)	65%	70%	75%
Volume/intensity relationship	Moderate/low	Moderate/low	Moderate/low

Adapted, with permission, J.W. Coburn and M.H. Malek (eds.), 2012, NSCA's essentials of personal training, 2nd ed. (Champaign, IL: Human Kinetics).

SEQUENCING EXAMPLE FOR MUSCULAR ENDURANCE GOAL

INTERMEDIATE:
Muscular endurance (standard) → Hypertrophy → Muscular endurance (circuit training) → Hypertrophy (supersets)

ADVANCED:
Muscular endurance (circuit training) → Hypertrophy (supersets) → Muscular endurance (high-intensity interval training [HITT]) → Hypertrophy (compound sets)

HYPERTROPHY

Muscle hypertrophy refers to an increase in cross-sectional area (CSA) brought about from a net increase or growth of the contractile proteins actin and myosin (myofibrillar hypertrophy), as well as glycogen and intracellular fluids (sarcoplasmic hypertrophy). To accomplish this increase in CSA, the hypertrophy phase combines moderate loads, repetitions, and rest intervals to elicit muscular tension, metabolic stress, and muscle damage, all of which act as stimuli for adaptations. This combination of moderate loads, higher relative volume, and rest intervals can also cause an increase in circulating testosterone and growth hormones, which lead to increased protein synthesis and decreased protein degradation (Schoenfeld, 2010).

When training for hypertrophy, the personal trainer should pay particular attention to rest intervals, as too much rest (over about 2.5 min) may decrease the magnitude of the endocrine response (i.e., the amount of testosterone and growth hormones released). Subsequent sets of a given exercise must begin before complete recovery has been reached, which causes increased metabolic stress (Buresh, Berg, & French, 2009). It is important to adjust the load and/or rest periods to assure that exercise technique is not compromised.

Hypertrophy training is often performed in body part "splits" or upper/lower body alternating routines, whereby exercises that focus on the upper body are performed on one day and exercises for the lower body the next day. Typical splits include chest, shoulders, and triceps; back and biceps; and legs. Other programming techniques used for hypertrophy may include forced reps, drop sets, supersets, compound sets, and heavy negatives.

Regardless of the method employed, the goal of hypertrophy workouts is to induce metabolic stress, muscle tension, and appropriate levels of muscle damage.

HYPERTROPHY VARIABLES	BEGINNER	INTERMEDIATE	ADVANCED
Duration	2 – 4 weeks	2 – 4 weeks	2 – 4 weeks
Sets per exercise	1 – 3	≥ 3	≥ 3
Reps per set	8 – 12	6 – 12	6 – 12
Rest between sets	30 s – 1.5 min	30 s – 1.5 min	30 s – 1.5 min
Load/intensity (% of 1RM)	67 – 80%	67 – 85%	67 – 85%
Volume/ intensity relationship	Moderate/ moderate	Moderate/ moderate	Moderate/ moderate

Adapted, with permission, J.W. Coburn and M.H. Malek (eds.), 2012, NSCA's essentials of personal training, 2nd ed. (Champaign, IL: Human Kinetics).

SEQUENCING EXAMPLE FOR HYPERTROPHY GOAL

INTERMEDIATE:
Muscular endurance (circuit training) → Hypertrophy (supersets) → Muscular strength (single set) → Hypertrophy (drop sets)

ADVANCED:
Hypertrophy (drop sets) → Muscular strength (cluster sets) → Hypertrophy (compound sets) → Muscular strength (complex sets)

MUSCULAR STRENGTH

Maximum strength represents the maximal amount of force that can be generated by a muscle or group of muscles, regardless of the amount of time it takes (Tan, 1999). The muscular strength phase employs heavy loads (e.g., 1 – 6RM) and longer rest periods to increase the maximal level of force a muscle (or group of muscles) can generate, regardless of time.

Training with heavier loads and longer rest periods can result in positive neural and physiological adaptations. The neural improvements have been shown to occur earlier in the training phase, typically the first two months for novice clients. The physiological adaptations (primarily increased CSA) occur later in the training. Training for maximum strength improves the ability to recruit fast-twitch muscle fibers, which typically are not recruited when training with lighter loads, especially among novice clients (Weir & Brown, 2012).

From a physiological standpoint, the heavy loads and longer rest periods can result in a greater increase in circulating testosterone, while the use of moderate loads and intensity combined with short rest periods employed during hypertrophy training can lead to greater increases in growth hormones (comparatively) (Willardson, 2008).

As mentioned earlier, sequencing of training has a complementary effect. This means that initially increasing the CSA of muscle fibers may promote greater increases in strength with subsequent training. Similarly, the neural improvements that result from increasing maximum strength may improve the hypertrophic effect (Haff G. H., 2012).

Existing strength training guidelines suggest that primary exercises (complex multi-joint movements) be performed first, followed by assistance exercises (smaller muscles/muscle groups and single-joint movements). Standard exercise order seems to be the most effective for optimal strength gains because it allows greater recovery between sets compared to muscular endurance or hypertrophy training. Max strength training is typically performed by movement groups (as opposed to training individual body parts), such as push (e.g., squat, lunge, bench press, etc.), pull (e.g., deadlift, bent-over row, etc.), and press (e.g., military press, etc.). Clients with more experience who are more advanced may further break down the movements into lower-body push, lower-body pull, upper-body push, upper-body pull, and press (Haff G. H., 2012).

An example strength workout might include 1 – 3 strength exercises, such as the back squat and bench press (3 – 6 sets of 3 – 6 reps with 3 min of rest) followed by assistance/complementary movements using hypertrophy variables, such as walking lunges, leg extensions, dumbbell flies, and triceps extensions (3 sets of 8 – 12 reps with 1 min of rest).

Other program design techniques commonly used to increase maximum strength include cluster sets, the use of accommodating resistance, partial range of motion, and isometric work (Schoenfeld, 2011).

STRENGTH TRAINING VARIABLES	BEGINNER	INTERMEDIATE	ADVANCED
Duration	2 – 4 weeks	2 – 4 weeks	2 – 4 weeks
Sets per exercise	1 – 3	≥ 3	≥ 3
Reps per set	≤ 6	≤ 6	≤ 6
Rest between sets	2 – 5 min	2 – 5 min	2 – 5 min
Load/intensity (% of 1RM)	≥ 70%	≥ 80%	≥ 85%
Volume/intensity relationship	Low/high	Low/high	Low/high

Adapted, with permission, J.W. Coburn and M.H. Malek (eds.), 2012, NSCA's essentials of personal training, 2nd ed. (Champaign, IL: Human Kinetics).

SEQUENCING EXAMPLE FOR MUSCULAR STRENGTH GOAL

INTERMEDIATE:
Hypertrophy (supersets) → Muscular strength → Hypertrophy (drop sets) → Muscular strength (accommodating resistance)

ADVANCED:
Hypertrophy (drop sets) → Muscular strength (cluster sets) → Muscular strength + Muscular power (complex sets) → Hypertrophy (compound sets)

MUSCULAR POWER

While more often thought of for use with athletes, fitness clients can also benefit from power training. In fact, power training has been shown to increase older adults' ability to perform activities of daily living (ADL) more than standard strength training (Haff G. H., 2012).

The emphasis of this phase is on explosive movements, developing force as quickly as possible, and is accomplished by moving loads as quickly as possible. Exercises traditionally utilized in the power phase include traditional barbell Olympic-style lifts (the snatch and the clean and jerk) and plyometrics. However, the Olympic-style lifts require a high degree of technical experience along with a high degree of mobility and stability; it is not always realistic to expect the everyday client to be able to perform Olympic-style lifts. However, power training can still be performed safely and effectively using explosive exercises and various implements, such as medicine balls, dumbbells, kettlebells, and bodyweight (plyometrics).

Training for power is typically performed with standard exercise order described earlier. Two other methods that require more research, but appear to improve the development of power, are complex sets and cluster sets.

Complex sets can be used to improve both strength and power by performing biomechanically similar exercises in pairs (two similar exercises) or triads (three similar exercises). Complex sets typically begin with a strength exercise followed by a power exercise. In theory, training using cluster sets is thought to stimulate motor unit excitability, increase phosphorylation of the myosin light chain, and decrease presynaptic inhibition. This response is thought to augment power output and is collectively termed postactivation potentiation (PAP). Training with complex sets seems to be more beneficial in clients with higher levels of strength and is not typically recommended for novice clients. Prior to implementing complex sets into training, a client should have a solid strength base and be proficient in plyometric training (Carter & Greenwood, 2014).

Cluster sets manipulate the configuration of reps performed within a set and may also be referred to as a rest-pause set. This manipulation involves programming short rest periods between each rep and/or manipulating the load within each rep performed within a set. The short rest period (15 – 30 s between each rep) is thought to allow some phosphocreatine (PCr) replenishment and overall higher quality successive reps. Load manipulation within a set is typically performed in an undulating (using a pyramid loading scheme) fashion. Theoretically, the undulating cluster training elicits a potentiation effect allowing for greater overall power outputs and barbell velocities. Undulating cluster training should be reserved for highly experienced clients (Haff, et al., 2008).

POWER VARIABLES	BEGINNER	INTERMEDIATE	ADVANCED
Duration	–	2 – 4 weeks	2 – 4 weeks
Sets per exercise	–	1 – 3	3 – 6
Reps per set	–	3 – 6	1 – 6
Rest between sets	–	2 – 5 min	2 – 5 min
Load/intensity (% of 1RM)	–	30 – 60%	30 – 70%
Volume/ intensity relationship	–	Low/high	Low/high

Adapted, with permission, J.W. Coburn and M.H. Malek (eds.), 2012, NSCA's essentials of personal training, 2nd ed. (Champaign, IL: Human Kinetics).

SEQUENCING EXAMPLE FOR MUSCULAR POWER GOAL

INTERMEDIATE:
Hypertrophy (negatives) → Muscular strength → Muscular power → Muscular strength (accommodating resistance)

ADVANCED:
Hypertrophy (drop sets) → Muscular strength (cluster sets) → Muscular strength + Muscular power (complex sets) → Muscular power

NUTRITION AND PERSONAL TRAINING

SCOPE OF PRACTICE

Nutrition and exercise go hand-in-hand and poor nutritional habits "sabotage" physical fitness success. Within their scope of practice (i.e., what is versus what is not legally defensible in a given profession), personal trainers can share general nutrition information from sources that are public domain, such as textbooks, research articles, and trustworthy websites. However, regulations for scope of practice vary from state to state. Personal trainers should review their individual state regulations, which are provided by the Center for Nutrition Advocacy (http://nutritionadvocacy.org/laws-state).

It is well within a personal trainer's scope of practice to address misinformation and to give general advice related to nutrition for physical performance, disease prevention, weight loss, and weight gain (Spano, 2012). Personal trainers can also provide clients with research-based recommendations, such as estimated daily protein, fat, carbohydrate, and caloric intake. These recommendations are based on equations and are very general in nature; it is difficult, if not impossible, to obtain an accurate estimate of a client's energy expenditure.

Take-home message: Personal trainers can educate a client based on generally accepted, research-based principles but should *never* prescribe specific diets or supplements.

PRACTICAL RECOMMENDATIONS FOR WEIGHT LOSS

Training for weight loss (i.e., increased lean body mass/decreased fat mass) is one of the most common reasons a client hires a personal trainer. Sometimes, when a personal trainer hears "weight loss" they mistakenly assume the client needs to perform high-repetition circuits or cardiovascular training, as the common misconception is that heavy weights lead to hypertrophy and "bulking." However, a decrease in fat mass can be attained through any number of nutritional and training variations, but one constant remains: the client needs to create a caloric deficit (ideally through a combination of nutrition, cardiovascular exercise, and resistance training exercise) (Spano, 2012).

1. The ability to gain muscle and lose body fat simultaneously depends on a client's training status, training program, and nutrition. However, it is more difficult for trained individuals who have a low percentage of body fat to achieve this.

2. Weight loss of 1 – 2 lb (about 1% of total bodyweight) per week is a common guideline (Spano, 2012). This represents a daily caloric deficit of 500 – 1,000 calories per day achieved through a combination of diet and exercise.

    a. During caloric restriction, it is recommended to maintain or increase daily protein intake (1.5 – 2.0 g/kg of bodyweight) and emphasize resistance training as this combination may attenuate or prevent the loss of fat-free mass and resting metabolic rate (Antonio & La Bounty, 2011).

3. Encourage clients to maintain a diet log for the primary purpose of helping self-identify areas for improvement. For example, a client may not realize that they snack on a soft drink and cookie every afternoon until they write it down in a log repeatedly.

PRACTICAL TIPS FOR WEIGHT GAIN

The ability to gain muscle mass is influenced by a number of factors, including genetic predisposition, body type, and compliance. Therefore, the following practical tips are generic, but could be applied to clients looking to gain weight:

1. Gaining a pound of muscle requires about 2,500 calories, which can generally be achieved by increasing daily caloric intake by 350 – 700 calories. Additional calories should be consumed to account for the energy expended during resistance training sessions (Spano, 2012).

2. Clients should increase protein intake to 1.5 – 2.0 g/kg of bodyweight (Antonio & La Bounty, 2011).

3. Clients should consume protein frequently throughout the day to meet their overall daily requirements (Antonio & La Bounty, 2011).

4. Clients should consume protein prior to and immediately after a workout (Lowery, Edel, & McBride, 2012), along with carbohydrates.

5. Clients should time meals and snacks with whole foods around training to meet these recommendations.

COMMON MYTH: "BULKING" AND THE "PUMP"

If a client (especially female) walks into a training session wanting to lose weight they may be skeptical of a personal trainer that recommends strength training, especially if they believe the "pump" experienced during workout will make them appear "bigger." The "pump," is cellular swelling caused by a temporary shift in blood caused by increased blood flow into the muscle and compression against the veins (Schoenfeld & Contreras, 2013). Oftentimes, this fear is reduced when personal trainers inform their clients that the "pump" is short lived (i.e., minutes to hours) and causes beneficial adaptations.

CONSTANT STATE OF FLUX

Sport and exercise nutrition are ever-evolving fields. Personal trainers can stay engaged and informed with changes by visiting trusted websites (e.g., www.choosemyplate.gov, www.heart.org, or www.eatright.org) and reading research-based journals.

More information:

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3. Santana, JC, Dawes, J, Antonio, J, Kalman, D. The Role of the Fitness Professional in Providing Sports/Exercise Nutrition Advice. *Strength and Conditioning Journal* 29(3); 69-71, 2007.

4. Hot Topic: Schoenfeld, B. Omega-3 Fatty Acids: A Novel Fat Burner. http://www.nsca.com/education/articles/omega-3-fatty-acids-a-novel-fat-burner/

5. Hot Topic: Draper, T. Three Tips for Earning the Trust of the Weight-Loss Client. http://www.nsca.com/Education/Articles/Three-Tips-for-Earning-the-Trust-of-the-Weight-Loss-Client/

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CARDIOVASCULAR TRAINING

Engaging in regular cardiovascular activity provides many benefits, both acute and chronic. The benefits can range from improved fitness and decreased body fat to reduced risk of disease and improved mental health. For these reasons, cardiovascular training should be included, to some degree, as part of every client's training program (Hagerman, 2012). However, a client's goals and training status greatly influence the mode, frequency, duration, and intensity of the cardiovascular training recommendations.

SPECIFICITY OF AEROBIC ENDURANCE TRAINING

The principle of specificity states that the results of a training program will be directly related to the type of training performed. When designing the cardiovascular portion of a training program, the personal trainer must first determine if the client is training for performance or general health. Performance training requires selecting a mode of training that is most specific to the performance measure/event (i.e., triathlon, swim meet, treadmill test, etc.). When training for general health, the mode is less important.

TRAINING FREQUENCY AND DURATION

The recommendation for improving general fitness is 30 – 60 min (at least) of moderate intensity cardio performed 2 – 5 days per week (Hagerman, 2012). Practically speaking, the personal trainer should base the initial recommendation on the client's current fitness level, access to equipment, work/life balance, as well as consider if the client is engaged in another training regimen concurrently.

FREQUENCY AND DURATION RECOMMENDATIONS*

CLIENT CLASSIFICATION	FREQUENCY (DAYS PER WEEK)	DURATION (MIN)
Beginner	2 – 3	About 20 – 40
Intermediate	4 – 5	About 30 – 60
Advanced	5+	Varies

(Hagerman, Aerobic Endurance Training Program Design, 2012)

**These recommendations must consider the relationship between frequency, duration, and exercise intensity. Longer duration and/or higher intensity training requires greater recovery. Only increase one training variable at a time.*

PROGRESSION

Similar to resistance training program design, cardio training must be progressive in nature in order to see continuous benefits. Additionally, a cardio training program should be progressed in a planned and gradual fashion to reduce the risk of overtraining. As a general rule, increases in frequency, intensity, or duration should be limited to 10%, and increases should only be made after the body has adjusted to the new program (Hagerman, 2012). The personal trainer should also take into consideration the volume and intensity of resistance training being performed by a client. For example, it may not be prudent to recommend a heavy leg day followed by an intense running day.

Referring again to a client's goals, if the primary goal is to increase muscle hypertrophy, strength, or power, cardio training should emphasize maintenance of their current fitness level. Increasing the duration, frequency, or intensity means additional overall recovery time as well as calorie consumption.

CARDIOVASCULAR TRAINING TYPES AND EXERCISE INTENSITY

Cardio training intensity is typically expressed as a percentage of VO_2max or heart rate reserve (HRR); these two measures are comparable. It can be difficult to obtain an accurate VO_2max without access to special equipment or an exercise physiology laboratory. For that reason, many personal trainers use the HRR method, which is the difference between maximal heart rate and resting heart rate.

HRR = Max Heart Rate (MHR) - resting heart rate

- MHR can be found directly using max testing or estimated using 220 - age (less accurate process)

TYPES OF AEROBIC TRAINING

TRAINING TYPE	DURATION	WORK:REST	INTENSITY
Long slow distance (LSD)	Race pace or longer	n/a	About 50 – 85% HRR
Pace/tempo	About 20 – 30 min	n/a	At, or slightly above, lactate threshold*
Interval	3 – 5 min	1:1	90 – 100% HRR
Repetition	30 – 90 s	1:5	≥ 100% HRR

(Reuter & Hagerman, 2008)

**Lactate threshold occurs at 50 – 60% of VO_2max in untrained subjects and 70 – 80% of VO_2max in trained subjects (Triplett, 2012).*

RESISTANCE TRAINING'S EFFECT ON ENDURANCE PERFORMANCE

Performance in an endurance event is dictated by a number of factors including VO_2max, lactate threshold, and movement efficiency. Of these factors, resistance training has been shown to improve neuromuscular efficiency (e.g., motor control, muscular strength, muscle elasticity, and rate of force development) (Haff & Burgess, 2012).

RESISTANCE TRAINING AND ENDURANCE PERFORMANCE KEY POINTS

1. When adding resistance training to an endurance program, endurance training volume should be reduced (about 17 – 30%) and not simply added to the current program (Haff & Burgess, 2012).

2. After building a resistance training base, emphasis should be placed on max strength and power development.

3. Strengthening a weak core may improve movement efficiency; however, increased core strength does not seem to elicit further improvement in movement efficiency or performance (Sato & Mokha, 2009) (Abt, et al., 2007).

4. Consider implementing eccentric training for advanced clients, particularly those who run. When fatigued, the stretch-shortening cycle (i.e., transition period from eccentric to concentric) phase increases, decreasing ground reaction forces and increasing energy cost (Hayes, French, & Thomas, 2011).

5. The bulk of resistance training should occur during the off-season for clients competing in endurance events, shifting towards maintenance during the season.

CORE TRAINING

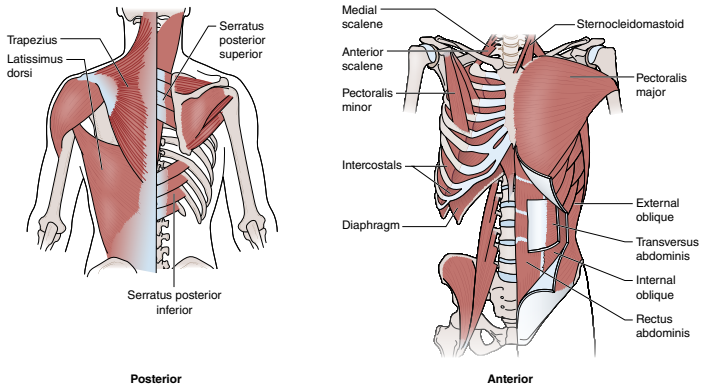
DEFINING THE CORE

The core plays an essential role in facilitating and supporting efficient and powerful movements of the body (Martuscello, et al., 2013). The muscles of the core can be divided into three categories: global core stabilizers, local core stabilizers, and upper and lower extremity core-limb transfer muscles (Willardson, 2014). To develop a comprehensive core training program, the program should utilize a variety of exercises that challenge different types of movements (e.g., concentric, eccentric, isometric, etc.), planes of motion, degree of stability, and speed of movement.

CORE MUSCLE CATEGORIES

GLOBAL	LOCAL	UPPER EXTREMITY	LOWER EXTREMITY
Erector group	Multifidus	Pectoralis major and minor	Iliopsoas group
Quadratus lumborum	Intertransversalis and interspinalis	Latissimus dorsi	Gluteus maximus
Rectus abdominus	Rotatores	Serratus anterior	Gluteus medius
Obliques (internal and external)	Diaphragm	Rhomboids	Hamstrings group
Transverse abdominus	Pelvic floor group	Trapezius	

(Willardson, 2014)



© Human Kinetics Figure 8.12 on page 141 of Clinical Mechanics and Kinesiology, by Janice K. Loudon, Robert S. Manske, and Michael P. Reiman

CORE CONNECTIONS

The core provides an essential link in connecting the lower body to the upper body. To illustrate this link, consider throwing a baseball. The force to throw a baseball is generated from the legs, travels up the body, and is ultimately released through the fingers. Now consider throwing a baseball from a seated position; this essentially negates the power generated from the legs. Using the legs to initiate the throwing action will result in a much faster/farther throw than a throw from a sitting position. The core provides the link, or sling, that transmits the energy from the legs through the fingers.

Integrated core exercises (i.e., exercises that engage the deltoids and gluteals) seem to elicit greater activation of the abdominal and lumbar muscles when compared to isolated core exercises (Martuscello, et al., 2013). For this reason, the majority of recommended core exercises in the FFP emphasize integration as opposed to isolation.

MULTI-JOINT EXERCISES AND CORE ACTIVATION

The term "posterior core" refers to muscles on the backside of the body spanning from the hamstrings to the shoulder joint. Research suggests that multi-joint exercises such as the squat, Romanian deadlift, and good morning stimulate greater muscle activation in the posterior core group compared to stability ball exercises training those same muscles (Gottschall, Mills, & Hastings, 2013). In addition, multi-joint, free weight exercises provide adequate stimulus to the lumbar multifidus, transverse abdominis, and quadratus lumborum (Nuzzo, McCaulley, Cormie, Cavill, & McBride, 2008).

CORE TRAINING AND PROGRESSION

A comprehensive core training program is an excellent supplement to an overall training program that incorporates multi-joint exercises and free weights. Given the integrative nature of the core, and for simplicity, the FFP identifies the core as anterior, lateral, and posterior core musculature, as well as anti-rotational and rotational when describing exercises. The recommended core exercises address a variety of contraction types (e.g., isometric, concentric, eccentric, etc.), planes of motion (e.g., sagittal, frontal, and transverse), bases of support (e.g., stable versus unstable), and speeds of movement.

The following table provides a sample of core training exercises along with progressions targeting the anterior, lateral, and posterior portions of the core. Recall that compound exercises such as the squat, Romanian deadlift, and good morning effectively train the posterior core; the exercises included in this table are supplemental to those primary lifts.

For more information

1. Hot Topic: Core Training for the Deep Abdominal Muscles. http://www.nsca.com/Education/Special-Interest-Groups/Core-Training-for-the-Deep-Abdominal-Muscles/

2. Hot Topic: (McGill) Why Everyone Needs Core Training. http://www.nsca.com/Education/Articles/Why-Everyone-Needs-Core-Training/

3. Willardson, J. *Developing the Core*. Champaign, IL: 2014.

SAMPLE CORE PROGRESSION FOR BEGINNER CLIENTS				
Difficulty	**Anterior**	**Lateral**	**Posterior**	**Anti/Rotation**
Low ↕ High	Kneeling Plank	Kneeling Side Plank	Hip Bridge	Kneeling Pallof Press
	Plank	Side Plank	Stability Ball Supine Bridge	Split-Stance Pallof Press
	3-Point Plank	Side Plank with Abduction	Single-Leg Bridge	Pallof Press with High-Low
	2-Point Plank	Side Plank with Adduction	Stability Ball Back Extension with Cobra	Pallof Lateral Walk-Out
SAMPLE CORE PROGRESSION FOR INTERMEDIATE CLIENTS				
Difficulty	**Anterior**	**Lateral**	**Posterior**	**Anti/Rotation**
Low ↕ High	Stability Ball Plank	Dumbbell Lateral Flexion	Reverse Hip + Back Extension	Kneeling Chop/Lift
	Stability Ball Stir the Pot	Stability Ball Lateral Flexion	Kneeling Back Extension	Split-Stance Chop/Lift
	Stability Ball Roll-Out	Overhead Lateral Flexion	Hip + Back Extension	Medicine Ball Diagonal Toss
SAMPLE CORE PROGRESSION FOR ADVANCED CLIENTS				
Difficulty	**Anterior**	**Lateral**	**Posterior**	**Anti/Rotation**
Low ↕ High	Stability Ball Jackknife	Farmer's Carry	Band Hip Thruster	Stability Ball Cable Twist
	Stability Ball Pike	Single-Arm Farmer's Carry	Single-Leg Hip Thruster	Cable Twist
	Stability Ball Pike Roll-Back	Waiter's Carry	Barbell Hip Thruster	Medicine Ball Side Toss

Refer to appendix C for links to videos providing core exercise technique tips.

APPENDIX

APPENDIX A. INITIAL CONSULTATION SAMPLE QUESTIONS/CONSIDERATIONS

During the initial consultation and throughout the health history evaluation, the personal trainer should consider the following questions. Answers to these questions should influence the program developed for each individual client.

1. Does the client have any of the following risk factors?
    a. Age
    b. Family history
    c. Cigarette smoking
    d. Sedentary lifestyle
    e. Obesity
    f. Hypertension
    g. Dyslipidemia
    h. Prediabetes
2. Based on an evaluation of the risk factors, what is the client's risk factor stratification (low, medium, or high)? Do they need medical clearance?
3. Aside from current complaints and documented orthopedic concerns, does the client have any previous injuries or orthopedic limitations that might affect program recommendations? How will these concerns affect exercise selection and exercise variables?
    a. For example, a client may have a history of "weak" ankles. Weak ankles may not mandate medical clearance but should be considered when selecting exercises that are most appropriate for this client.
    b. What are the client's goals and are they specific? Are these goals realistic based on the client's current fitness level, previous training experience/ability, and level of motivation? In order to understand the client's level of motivation, their "why" should be discussed. A client's "why" is the ultimate reason they want to achieve their specific goal. Understanding the "why" can be used by the personal trainer to influence effort and adherence to the training program; it should be tied to emotion and stoke up the clients intrinsic motivation.
        i. Consider a client who wants to lose 50 lb. An example of their "why" might be so that they live long enough to be around for their future grandchildren.
4. What resources are available to the client? Does the client's schedule allow them to exercise according to the desired training frequency? What equipment does the client have access to (keep in mind training in a gym during busy times may limit access to some pieces of equipment)? Does the client have a supportive social network?
5. Has the client attempted to achieve their goals on their own in the past? If so, what did they do? Were they successful (why or why not)? It is important to learn from past experiences by identifying roadblocks and creating a plan that addresses ways to avoid the same roadblocks in the future.

APPENDIX B. DYNAMIC WARM-UP EXERCISE LIST

Videos of the following exercises and their related variations, along with exercise technique tips, can be found on the webpage: **http://www.NSCA.com/program-design-essentials**

SELF-MYOFASCIAL RELEASE	
Gastrocnemius-Soleus Complex	Tibialis Anterior
Quadriceps	Hamstrings
Iliotibial Band	Gluteal Group
Latissimus Dorsi	Thoracic Spine
DYNAMIC WARM-UP EXERCISES (GENERAL)	
Inchworm	Downward Dog Series (flexion, extension, and rotation)
Bear Crawl	Spiderman Crawl
3-Way Lunge	Rolling (upper body and lower body)
Knee Tuck/High Knees	Walking Leg Cradle
Toy Soldier/Butt Kicks	Skips (A skips, B skips, and power skips)
Lateral Shuffle	
SAMPLE WARM-UP ROUTINES SPECIFIC TO BODY PART	
Ankle/Gastrocnemius-Soleus	
3-Way Ankle Wall Mobility	Inchworm to Sprint Position
Gluteal, Hip Flexor, and Adductor Groups	
Brettzel	Active Hip Flexor
Active Straight-Leg Raise	Windmill
Crossover Lunge	
Thoracic Spine and Upper Body	
Thoracic Spine Rotations	Warrior with Band
Pectoral Group	
Foam Roll Floor Angels	Stability Ball Active Pectoral
Push-Up Plus	Upper Back (Latissimus Dorsi) Group
Foam Roll Lats	Pigeon with Reach
Active Straight-Leg Raise with Band	

APPENDIX C. PRIMARY MOVEMENT PATTERNS AND EXERCISES

Videos of the following exercises and their related variations, along with exercise technique tips, can be found on the webpage: **http://www.NSCA.com/program-design-essentials**

SQUAT	
Assisted Squat	Back Squat
Bulgarian Squat	Front Squat
Goblet Squat	Hack Squat
Leg Press	Overhead Squat
Single-Leg Squat	Suitcase Squat
Wall Sit	
HINGE	
Deadlift	Good Morning
Hip Bridge	Hip Thruster
Kettlebell Swing	Pull Through
Romanian Deadlift (RDL)	Single-Leg Deadlift
Single-Leg Romanian Deadlift (RDL)	Sumo Deadlift
LUNGE	
Multiplanar Lunge	Reverse Lunge
Split-Squat Jump	Stationary Lunge
Step Down	Step-Up
Walking Lunge	
PUSH	
Archer Push-Up	Bench Press
Chest Press	Incline Bench Press
Plyometric Push-Up	Push-Up
Single-Arm Bench Press	
PRESS	
Arnold Press	Military Press
Push Press	Single-Arm Half-Kneeling Shoulder Press
Single-Arm Shoulder Press	Shoulder Press
VERTICAL PULL	
Chin-Up	Lat Pulldown
Pullover	Pull-Up
Single-Arm Lat Pulldown	Horizontal Pull
Bench Row	Bent-Over Row
High Row	Inverted Row
Low Row	Seated Row
Split-Stance Row	

APPENDIX D. CORE TRAINING EXERCISES

Videos of the following exercises and their related variations, along with exercise technique tips, can be found on the webpage: **http://www.NSCA.com/program-design-essentials**

The table also identifies the exercise movement type as it relates to the core. Note that while an exercise may emphasize a primary muscle group, most (if not all) core muscles play a role in performing the exercise.

ANTERIOR CORE	
2-Point Plank	3-Point Plank
Body Saw	Jackknife
Kneeling Plank	Pike
Pike + Roll-back	Plank
Roll-out	Stir the Pot
LATERAL CORE	
Farmer's Carry	Kneeling Side Plank
Lateral Flexion	Single-Arm Farmer's Carry
Single-Arm Waiter's Carry	Side Bend
Side Plank	Side Plank w/Hip Abduction
Side Plank w/Hip Adduction	
POSTERIOR CORE	
Back Extension	Hip Bridge
Hip Extension	Hip Thruster
Kneeling Back Extension	Reverse Hip Extension
Single-Leg Hip Bridge	Single-Leg Hip Thruster
Single-Leg Supine Bridge	Supine Bridge
ROTATIONAL CORE	
Cable Twist	Kneeling Chop
Kneeling Lift	Kneeling Pallof Press
Kneeling Side Toss	Lift
Side Toss	Split-Stance Chop
Split-Stance Lift	Split-Stance Pallof Press

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