



AQUATIC PERSONAL TRAINING

CERTIFICATION MANUAL



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SCW CERTIFICATIONS

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SCW Fitness Education is a nationally recognized certification organization that has trained over 100,000 Fitness Professionals. Our certifications are recognized by fitness facilities across the USA and Internationally. The SCW Fitness Education Certifications are both general and specialty in orientation and span from Group Ex, PT, Aqua, Yoga, Barre, Pilates, Sports Nutrition, Weight Management, Kettle Weights and more. Each certification is developed and lead by qualified, veteran trainers that have 20+ years of fitness experience. Theory, practice, and application combine to credential our SCW professionals and prepare them for quality instruction at large, small and specialty facilities.

Most SCW Online Certifications are presented live at each of our SCW MANIA® conventions. When offered, our live certifications are free (within one year) for those who have completed the courses.

SCW Fitness Education

SCW is an internationally recognized education body that provides hands-on certifications and continuing education courses and conventions to fitness professionals in multiple disciplines nationwide. For the past 36 years, since 1987, Personal Trainers, Group Exercise Instructors, Small Group Training Leaders, Aquatic Exercise Professionals, Cycling Teachers, Mind-Body Experts, Sport Specific Training Educators and many more get certified through SCW. This outstanding Family of Leaders also supports Managers, Directors and Owners of clubs and facilities nationwide. As the largest Conference Leader and Continuing Education Provider in the world, MANIA® offers seven Professional Training Conventions in California, Florida, Atlanta, Dallas, DC, Midwest (Chicago), and Boston serving over 10,000 health and wellness professionals and reaching over 90,000 virtually.

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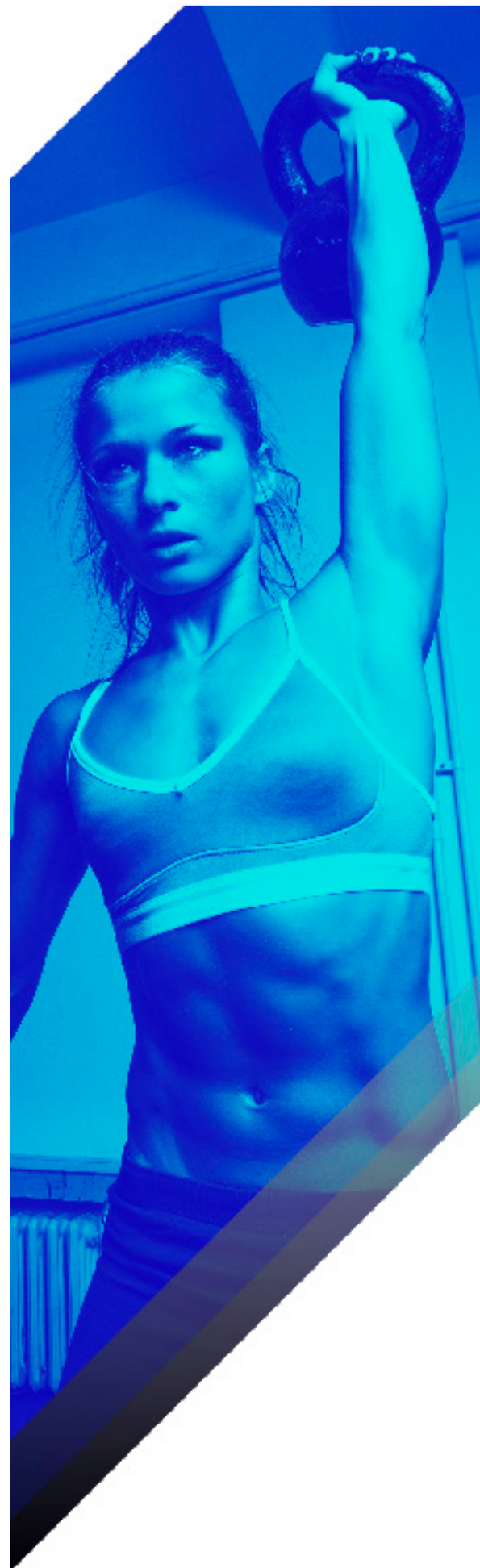
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SECTION 1

Introduction

COURSE INTRODUCTION

Welcome to SCW's Aqua Personal Training Certification. Course! Whether you are currently teaching aqua classes, facilitating personal training in a land-based environment, or simply want to have the option to move some of your clients to the aquatic environment, this course will provide you with several ways to creatively program for your clients and deliver through one on one and small group instruction.

Certification is important because it provides trainers with a recognized standard of competency for instructing personal training sessions. While challenging, this course is basic enough for beginning candidates. We will provide you with the knowledge, tools, and foundation to program safe, effective, and results-driven personal training sessions in the water. You will receive a deep understanding of how water influences how we move and breathe, in comparison to land-based training. Please read it thoroughly and participate in the practical activities where indicated.

As you jump into this manual note that teaching aqua exercise differs at every pool. Be aware of the lifeguard on duty and learn your responsibilities as an Aquatic Personal Trainer. Find out where the first aid kit and AED machines are located, as well as rules regarding inclement weather. As a certified instructor, you are required to hold a current CPR/AED certification. It is recommended to learn basic lifeguarding skills to assist if needed. Plan to review pool regulations and facility protocol with your manager to be prepared in case of an emergency

Training Expectations

- Come prepared with water, training manual, pen & paper, healthy snacks, bathing suit, water shoes & towel, an open mind, energy, and a growth mindset.
- Be an active participant
- Be attentive student
- Be a supportive colleague
- Exercise non-judgement
- Communicate openly
- Experience the water
- Be open & receptive to feedback

Welcome aboard!

Getting Started:

Before we dive in, please take a moment to complete these four questions. Free-write.



01

Why are you attending this training?

02

What are three to five things you hope to achieve during this training?

03

What is your philosophy on personal training?

04

What do you think will be the most challenging aspect of bringing personal training into the aquatic environment?



SECTION 2

Communication & Relationships

The Role of the Fitness Professional

Please note: Much of the following information in this section, regarding anatomy, physiology and kinesiology, has been taken directly from the SCW Personal Training Certification, written by Keli Roberts, and the SCW Aquatic Exercise Training Certification, written by Ann Gilbert. If you already possess one or both certifications, you have seen this information before, BUT it is highly recommended you review, as connections to the water are made throughout the content.

Most Healthcare professionals have little experience in designing exercise programs or providing expertise on how to exercise. Personal Trainers play a vital role helping clients participate in quality exercise programs that result in positive health improvements. With the increase in issues such as obesity and diabetes, personal trainers should be prepared to work with clients that range widely in health and fitness levels in addition to age and background.

Role of a personal trainer

- Perform a variety of assessments to gather relevant information and track progress.
- Build and administer effective and safe exercise programming.
- Motivate clients by setting goals, providing feedback, and being a source of accountability.
- Provide other general health and nutrition guidelines.
- Properly refer clients for issues that fall outside of your scope of practice.

Qualities of a personal trainer

- Excellent communication skills
- Good at motivating and connecting with others.
- In excellent physical shape due to the nature of the job
- Good at sales techniques and follow through (gaining clientele is all about selling yourself!)
- Personable and outgoing

Scope of Practice

A scope of practice defines the legal range of services a professional can provide in each field, and the setting where those services can be provided. The regulations and laws may vary from state to state but scope of practice is generally determined by education, training, and certifications of the professional. The following information will help educate a personal trainer's scope of practice.

Professional Responsibility

Personal Trainers DO NOT:	Personal Trainers DO:
Diagnose	<ul style="list-style-type: none">• Screen for exercise limitations and potential risk factors• Apply guidelines received from physician/therapist/dietician diagnosis
Prescribe	<ul style="list-style-type: none">• Design exercise programs and give general nutrition advice• Refer clients to appropriate health professional for specific diet plan and supplements
Treat Injury / Disease	<ul style="list-style-type: none">• Use exercise to improve health based off physician advice• Refer clients to appropriate health professional for injury treatment
Rehabilitate	<ul style="list-style-type: none">• Improve physical fitness and provide guidance after rehabilitation has been completed
Counsel	<ul style="list-style-type: none">• Coach physical fitness• Provide appropriate education• Refer clients to appropriate health professional for counseling

Client Privacy While trainer-client relationships do not have the same legal requirements of confidentiality as a physician or psychologist, personal trainers should maintain the client's health history and private information with the same level of security.

Safety Personal trainers should do everything possible to minimize risk for clients. This includes cleanliness, properly maintained equipment, and client specific risk management according to health history, physician guidance, and appropriate training level. *More information re: safety training in the water can be found in Section Six. *

Networks and Referrals:

It is important for personal trainers to know their professional boundaries and to refer to the appropriate healthcare professionals when it falls outside their scope of practice.

i.e., a client complains of back pain and after performing strengthening and mobility work for the affected area there is no improvement. You may want to refer them to a chiropractor.

When building a referral network, you should identify other professionals who are properly licensed and can uphold the same reputation of your own services to a client. If you network properly, you may also be able to gain referrals from other health professionals.

Potential referral source examples:

- Massage Therapist
- Licensed Physician
- Licensed Therapist
- Chiropractor
- Nutritionist and/or Dietician

Certification and Renewal

To become an SCW personal trainer you must show that you will be a safe and effective trainer by studying the material and passing your exam.

SCW certifications are valid for two years. Please note the following steps that are required to renew your certification:

- Complete 20 hours of continuing education credits from courses you attend after your certification's renewal date. Continuing education is a standard to ensure professionals are up to date w your certification: within their respective fields. Given the dynamic nature of the fitness industry it is critical to complete continuing education on a consistent basis.
- SCW has a wide range of continuing education courses to help maintain certification and advance your career and they can be applied to multiple SCW certifications.
- You can also obtain CECs from a SCW Approved Provider. Please visit: <http://www.scwfit.com/scwproviders> to view the list of approved providers.
- SCW recognizes other courses taken through all accredited colleges and universities. Academic courses relating to the field of fitness such as leadership, teaching skills, fitness management, nutrition, research, anatomy, physiology, exercise programming, and others can be applied towards your SCW Certification renewal.
- Due to state and facility CPR requirements, SCW no longer requires a copy of your CPR card.

Career Development

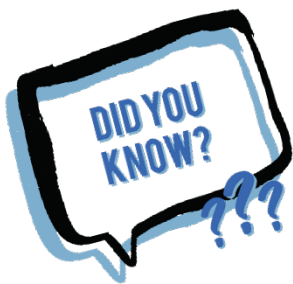
It is important for fitness professionals to have an idea of the career path they are looking to follow. Whether it is becoming a club manager, having your own training studio, online personal training, or even just a personal trainer at a box gym. Having a career path in mind can help guide your selection of continuing education and what events or opportunities will help guide your progress. In addition, additional certifications and advanced training may change your scope of practice. *It is important to understand how your career development will influence how you train safely, lawfully, and effectively.*

Continuing Education SCW Aquatic Personal Trainers should select their continuing education based on interest, the clientele they want to train, and alignment with the desired career path.

- Specialization can help a trainer become recognized as an expert for a particular clientele or type of training. For example, if you are interested in working with an older demographic you may want to focus on Advanced Aging education opportunities.

Additional Fitness Certifications SCW Aquatic Personal Trainers can also earn continuing education credits and experience through additional certifications. For example, if an aquatic personal trainer wanted to be able to provide advanced nutritional advice, they may take our Nutrition Coaching certification.

Advanced Degrees Having a degree in a health-related field is not a requirement for SCW Aquatic Personal Trainers but it can help with advancing your career, especially for advanced positions such as management or teaching

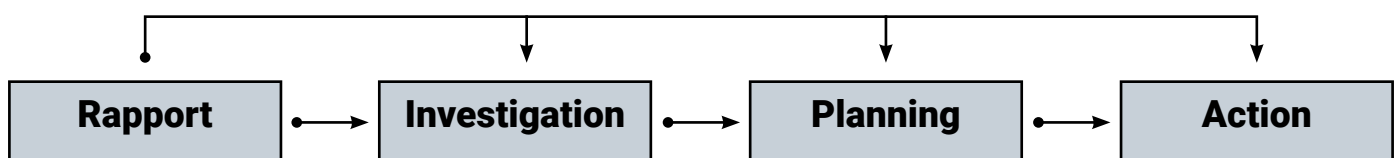


According to the Department of Labor, Occupational Outlook Handbook, the projection of fitness trainers and instructors is projected to grow by 19% between 2021 and 2031 (Occupational Outlook Handbook, 2022).

Relationship Building

Whether you are training your Clients on land or in the water, developing a professional relationship with your Client involved four stages that occur sequentially, although rapport is continuous.

Figure 1: Stages to Successful Personal Training Client On-Boarding



These four stages are:

Rapport: Personal interaction you establish and maintain with your Clients and your ability to effectively communicate with them.

- This stage includes making impressions of professionalism, developing trust, demonstrating warmth and genuineness, and exhibiting empathy.
- While you will initiate the relationship, your Client will also contribute, and you will gain a greater understanding of your Client and what they hope to achieve.

Investigation: Collection of all relevant information to identify the comprehensive needs of your Clients.

- This stage includes identifying readiness to change behavior, stage of behavioral change and personality style, collecting health and safety information, learning about lifestyle preferences, interests, and attitudes, understanding previous experiences, and conducting assessments.

Planning: Collaborative goal setting with your Client after the investigation is complete in order to design an effective and comprehensive program.

- This stage includes goal setting, programming considerations, and designing motivational and adherence strategies. (see pg. —)

Action: Successful implementation of all programming components and providing the appropriate instruction, feedback, progressions, and regressions as needed.

- This stage includes instruction, demonstration and execution of programs, implementing strategies to improve motivation and promote long-term adherence, providing feedback and evaluation, making necessary adjustments to programs and monitoring the overall exercise experience with progression towards goals.

The New Client On-boarding Phase involves:

1. The initial meeting of a potential Client where first impressions are made and an early working relationship is explored, the trainer begins Building Rapport.
2. When the potential customer becomes an actual new Client, information gathering, and health screening begins. This is the Investigation Phase.

Building Rapport

- Successful Personal Trainers consistently demonstrate excellent communication skills and teaching techniques while understanding the psychological, emotional, and physiological needs and concerns of their Clients.
- Building rapport is a critical component to effective communication that promotes open, effective communication and the development of trust. This translates into greater levels of participation with Clients.
- Three essential attributes are needed to develop rapport:
 - Empathy, the ability to experience another person's world as if it were one's own.
 - Warmth, an unconditional positive regard, or respect for another person regardless of their individuality and uniqueness. This quality conveys a climate that communicates acceptance to the Client.
 - Genuineness, authenticity, or ability to be honest and open without putting up a front or façade.
- The first impression you make upon a prospective Client is probably the most influential in their decision to hire you as a Personal Trainer.
 - This impression can be made in person, over the phone or even through an email.

- ALWAYS make a strong, convincing, and positive first impression, called the “Moment of Truth.”
- It is believed that within the first 11 seconds of meeting a person, they make seven decisions about you (7-11 rule).
- The better your rapport with your client, the more positive the word-of-mouth advertising will be. Clients who believe in your technique, motivation, and appreciate your professionalism, are great sources of referrals and testimonials.

Communication Strategies to Build Rapport

Your immediate objective upon meeting your prospective Client is NOT to start gathering information and establish goals, but to **build the foundation of a professional, personal relationship.**

- Take some time to acquaint yourself with your Client while being sensitive to their individual personality traits, which will help determine the appropriate level of rapport needed.
- All too frequently Personal Trainers adopt an approach of “getting down to business” immediately while failing to develop a personal relationship by building trust and a level of comfort with their Client.
 - This simply involves taking the time to talk to them and get to know who they are and not just what they seek to achieve through training.

Attend the environment where you meet your prospective / current Clients.

- Create a nurturing, yet professional environment by meeting in a quiet, comfortable area.
- Avoid high traffic areas, member distractions or attempting to establish rapport with a facility tour or orientation.
- Do not sit behind a desk, but rather sit facing each other to create a level of comfort.
- Be attentive to your own personal appearance (clothing, grooming, jewelry, scent, breath, etc.).

Communicate effectively.

- Verbal communication translates only part of the message people send. While we hear each other’s words, we often evaluate a speaker’s non-verbal message including posture, facial expressions, gestures, eye contact, etc. This is also known as body language.
- It is estimated that 55 – 90 % of communication is non-verbal.

1. Distance and orientation (body positioning):

- Face your Client squarely and maintain appropriate distance to demonstrate respect for personal space.
- 1½ - 4 feet is considered ideal while less than 1½ feet is considered intimate space.
- Now more than ever you must gauge the distance your client is comfortable with.

2. Posture and position:

- This demonstrates confidence and interest in the conversation.
- Adopt an open, erect but relaxed posture with a slight forward lean towards your Client.
- Leaning or stooping suggests boredom and fatigue.
- Rigid hands placed upon the hips can be interpreted as aggressive behavior.
- Avoid crossing your arms or legs as it conveys a defensive stance.

3. Mirroring and Gestures:

- Sensitively mimic your Client's posture, gestures, voice tone, and tempo to help place them at ease and facilitate communication that is more open. People generally feel more comfortable when individuals use relaxed, fluid gestures to convey messages.
- Reduce distracting movements that may disrupt your Client's communication, e.g. shifting in your seat, tapping your feet, looking at your phone, etc.

4. Eye Contact:

- Maintain a relaxed look at your Client to help instill comfort but avoid fixed stares.
- Looking away while a person speaks conveys disinterest, un-attentive behavior (not listening) or suggests diminished importance of the speaker.

5. Facial Expressions:

- Smile and be genuine and sincere.

6. Voice quality (tonality and articulation):

- A weak, hesitant voice does not inspire confidence, whereas a loud, overbearing voice can make individuals nervous.
- Speak warmly with compassion. Be clear with your questions, concerns, and statements.

7. Listen effectively:

- Listening is the primary non-verbal communication skill. Being an effective communicator involves listening more than speaking. While humans can speak at 125 – 250 words / minute, we can listen to up to 500 words / minute.
- Effective listening implies listening to both the content and emotions behind the speaker's words. Learn to paraphrase or repeat what the other person is saying so your Client knows he/she is being heard.
- Listening occurs at different levels:
 - Indifferent listening where one is not really listening and is "checked" out. °
 - Selective listening where one listens only to key words.
 - Passive listening where one gives the impression of listening by using minimal noncommittal agreements (e.g., head nods, "aha", etc.)
 - **Active listening**, where one is empathetic and listens as if in the speaker's shoes, is the key to effective listening. Do not listen to respond, listen to understand your Client.

Behavioral Change & Growth Mindset

When it comes to a lifestyle change, how your Client understands the information is imperative to their success in their training program. Every person has a mindset, their fixed mental attitude or disposition that predetermines their response and interpretation of situations. This is what makes someone tick.

Their fitness mindset may be determined by their past experiences (positive or negative), social media, narratives they have heard, their cultural schema, and their physiology.

- Successful fitness mindsets focus on growth. When your Client believes they have room to learn, grow, and improve their skills and abilities they are exhibiting a growth mindset. As their trainer, you want to encourage:
 - Their WHY (why they started)
 - Self-Compassion: Choosing self as an act of love
 - Connection between mind and body
 - Recognition of challenge as an opportunity
 - Consistency and what it looks like to them
 - Mental and emotional presence when your Client eats, trains, and recovers
 - Celebration, small wins, reframing what was done WELL!
- You also need to learn to recognize when your Client's fitness mindset is hijacked by doubt, cognitive distortion, and all or nothing thinking. Coach and support your Client to recognize that:
 - Progress is not linear
 - More is not necessarily better. Less is not necessarily better. There are always opportunities to learn and be educated.
 - There is more to this process than numbers on a scale.
 - Anything less than perfect is NOT a failure.
 - Their resilience, how fast they return to their training program, when they go astray, is what matters.
- Continually building rapport and creating a long-lasting relationship with your Client includes reflection, revisiting thoughts and actions, and continual check-in. **Here is a list of questions that can spark thoughtful conversations:**
 - What's important to you?
 - What do you do well with?
 - What makes you feel confident?
 - How are you aligning your actions with what is important to you?
 - What change can you make tomorrow to be one step closer to your goal?
 - What is currently not helping you and needs to be removed?

- What would you like to find out more about?
- What are you proud of?
- What goals do you want to achieve this week?

- These conversations **lead to improved client results, client retention, and referrals.**

- The next step in the growth mindset is identifying concrete goals and how to accomplish them. **Writing SMART goals provides structure to lifestyle changes and an outline HOW to accomplish the goal, as well as HOW to measure it.**

SMART GOALS	
S	Specific, well-defined
M	Measurable
A	Achievable, attainable
R	Realistic & relevant to the purpose
T	Timely, includes clearly defined timetable

- Here is an example of what SMART Action Plan Outline could look like, with sample goals, and a template for your planning purposes.

- Clients can get lost in big picture goals, “to live a healthier life,” “live longer,” or “to be more fit.” SMART GOALS put tangible action into meeting that big picture goal.

Short Term Goals (One week, 30 days, 8 weeks, 4 months--accomplished at max, within 6 months)	Action Steps	Potential Barriers	Barrier Plan
Example: <i>I will cook healthy dinner 4 nights/ week for 4 weeks.</i>	<ul style="list-style-type: none"> • Every Saturday I will plan my 4 meals and create a grocery list. • Every Sunday I will go grocery shopping. • On Sunday evenings, I will prep (wash, cut, dice, bag, etc.) protein, veggies, grains, and fruit, if possible, to get organized and reduce day-of prep time. 	We go away for the weekend. I have no time to prep meals on Saturday. I don't have time to go grocery shopping on Sunday. I get home too late to cook.	In advance, plan and bag three freezer meals to have ready to go. Identify two easy, healthy crock pot meals with items I usually have in my pantry. Make grocery shopping a team effort- assign hubby shop or do Kroger (grocery delivery or pickup...). Identify 2 local restaurant menus and circle the healthy options you can order.
Example: <i>I will do 10 minutes of yoga every day for 2 weeks..</i>	<ul style="list-style-type: none"> • Find a 10-minutes yoga sequence (or find a few!) I like from YouTube, Gaia, podcasts, etc. • Set up a space for my mat, water, towel that does not have to be moved every day. • Explain to my family that when I am on my mat I am to be left alone. • Identify the best time of day to get my 10 minutes in-schedule it! 	Sick kid, grandkid or pet. Too many errands to run or things to do around the house. Spouse keeps nagging me while I am trying to do yoga.	Participate in a family yoga sequence for 10 minutes. Repeat the affirmation: "I will not worry about things I cannot control." OR "I will stay calm even in the midst of chaos." Do chair yoga on the couch. Wake up 10 min earlier to get time in before anyone wakes up.

Figure 2: Example of a SMART GOALS Outline



SECTION 3

Exercise Science

As it is for land-based Personal Trainers, Aquatic Personal Trainers must possess an understanding of anatomy, physiology, and kinesiology to ensure clients are performing strength training and muscular endurance exercises safely and effectively. Anatomy is science that studies the structure of the body while kinesiology is the study of the principles of mechanics related to human movement. Compared to the more static nature of land-based exercise, the water offers periods of instability due to turbulence and leads to positive changes in balance and the body's postural alignment. In addition, the following chapters will address the properties of water that influence both this support and challenge. To examine those properties, it is necessary to be able to identify the major muscles and understand some basic kinesiology principles including important terms about the muscles and joints of the human body.

Note: Appropriate components and graphics have been borrowed from the SCW Personal Training Certification Manual, as written by Keli Roberts, and the SCW Aquatic Fitness Certification Manual, as written by Ann Gilbert.

Special Client Populations



Special Populations of Clients are addressed throughout this certification. From neurodegenerative disease to IBS, active agers to athletes. When you see this graphic, please pay special attention to the population addressed, as it could be beneficial for your Clients.

Human Anatomy

The understanding of human anatomy begins in the anatomical position, the body is standing upright, feet are hip width apart with the toes pointing forward, the arms are hanging to the sides of the body with the palms of the hands facing forward, and the head and eyes are looking directly forward. Figure 3 illustrates the anatomical position. This position will serve as a reference point from which structures of the body are named and located in relation to each other.

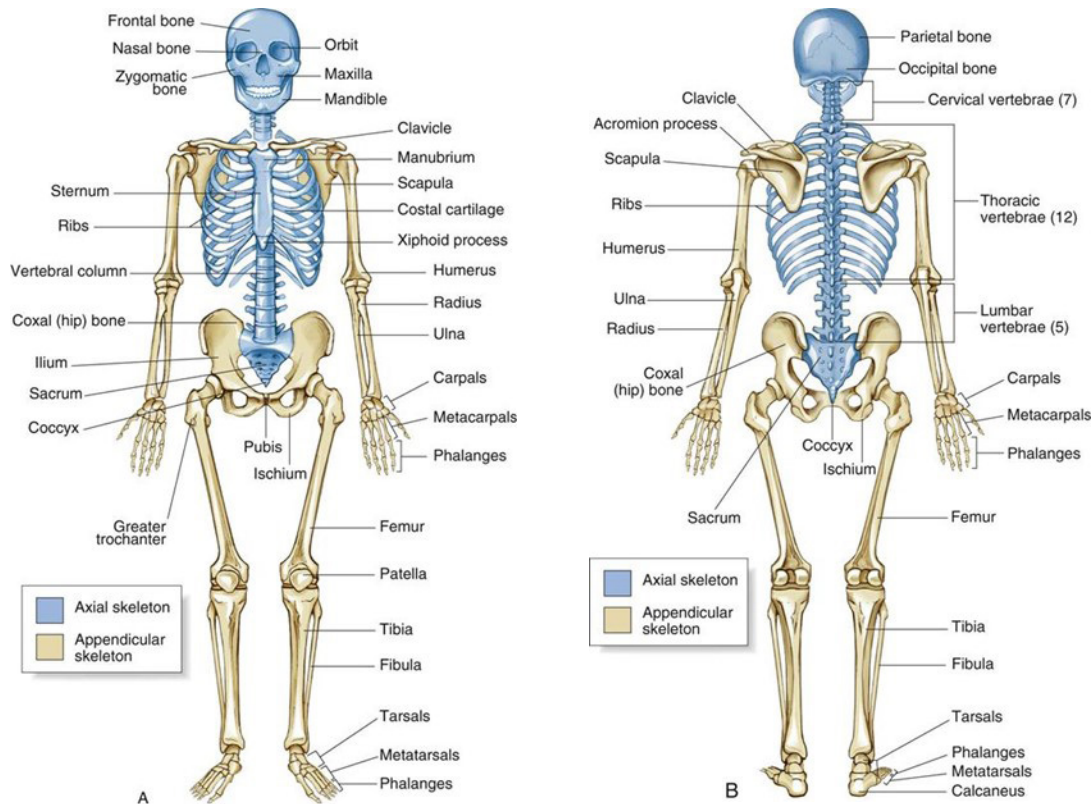
Table 2: Location Terminology

Term	Description
Anterior (ventral)	Toward the front
Posterior (dorsal)	Toward the back
Superior	Toward the head
Inferior	Away from the head
Medial	Toward the midline of the body
Lateral	Away from the midline of the body
Proximal	Toward the attached end of the limb, origin of the structure, or midline of the body
Distal	Away from the attached end of the limb, origin of the structure, or midline of the body
Plantar	The sole or bottom of the feet
Dorsal	The top surface of the feet and hands
Palmar	The anterior or ventral surface of the hands
Cervical (Spine)	Regional term referring to the neck
Thoracic (Spine)	Regional term referring to the portion of the body between the neck and the abdomen; also known as the chest (thorax)
Lumbar (Spine)	Regional term referring to the portion of the back between the abdomen and the pelvis
Sagittal Plane	An imaginary line that divides the body or any of its parts into right and left sections
Frontal Plane	An (imaginary line that divides the body into anterior and posterior parts; lies at a right angle to the sagittal plane)
Transverse Plane	Also known as the horizontal plane; an imaginary line that divides the body or any of its parts into superior and inferior sections

Musculoskeletal Anatomy

Muscles and bones comprise what is called the musculoskeletal system. For an adult, this consists of 206 bones and more than 600 muscles. This system provides a supportive internal framework, facilitates movement, protects internal organs, produces blood cells, stores ions and regulates the endocrine system.

Figures 3 and 4 illustrate the major bones of the human body.



Source: <https://basicmedicalkey.com/orthopedic-surgery-3/>

Keeping it as basic as possible, please be familiar with the following skeletal system highlights.

Figure 5: Anatomy of the Ribcage

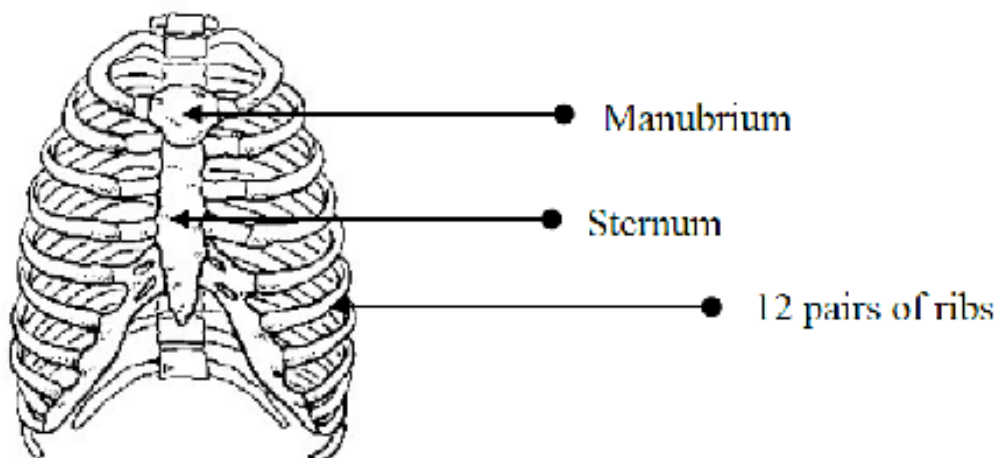


Figure 6: Vertebral Column

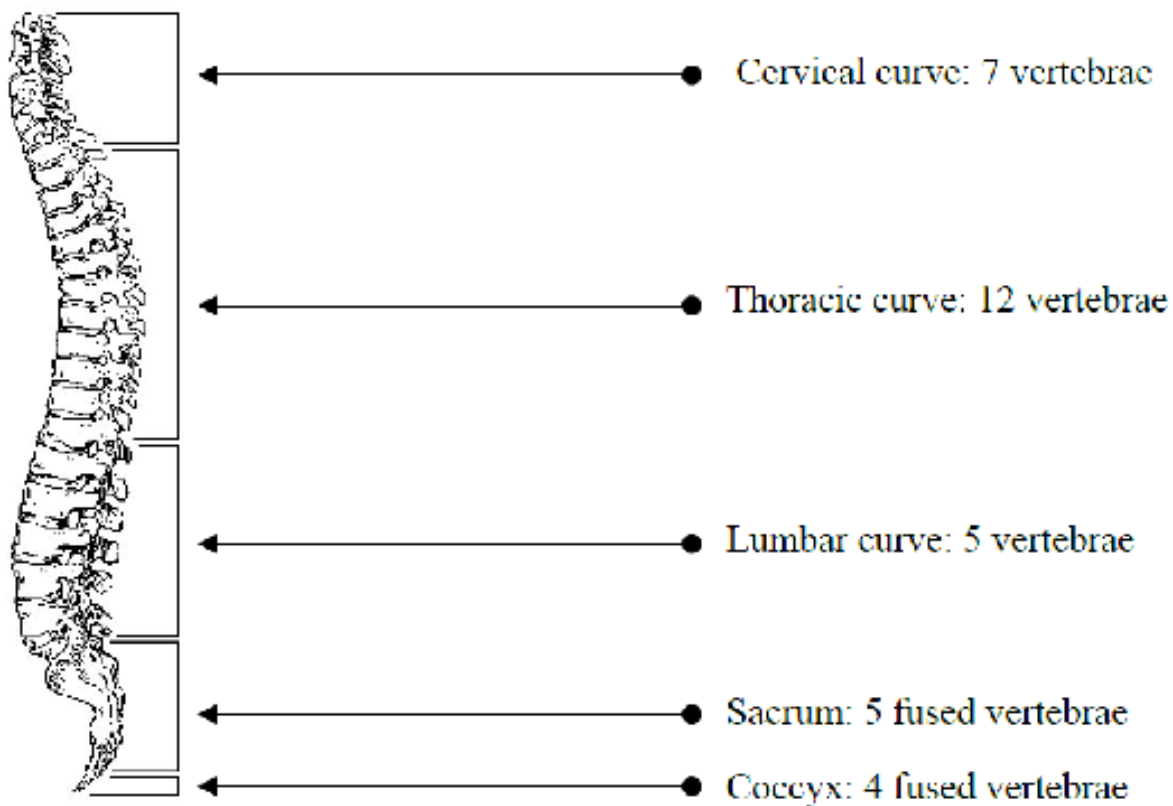


Figure 7: Anatomy of the Shoulder

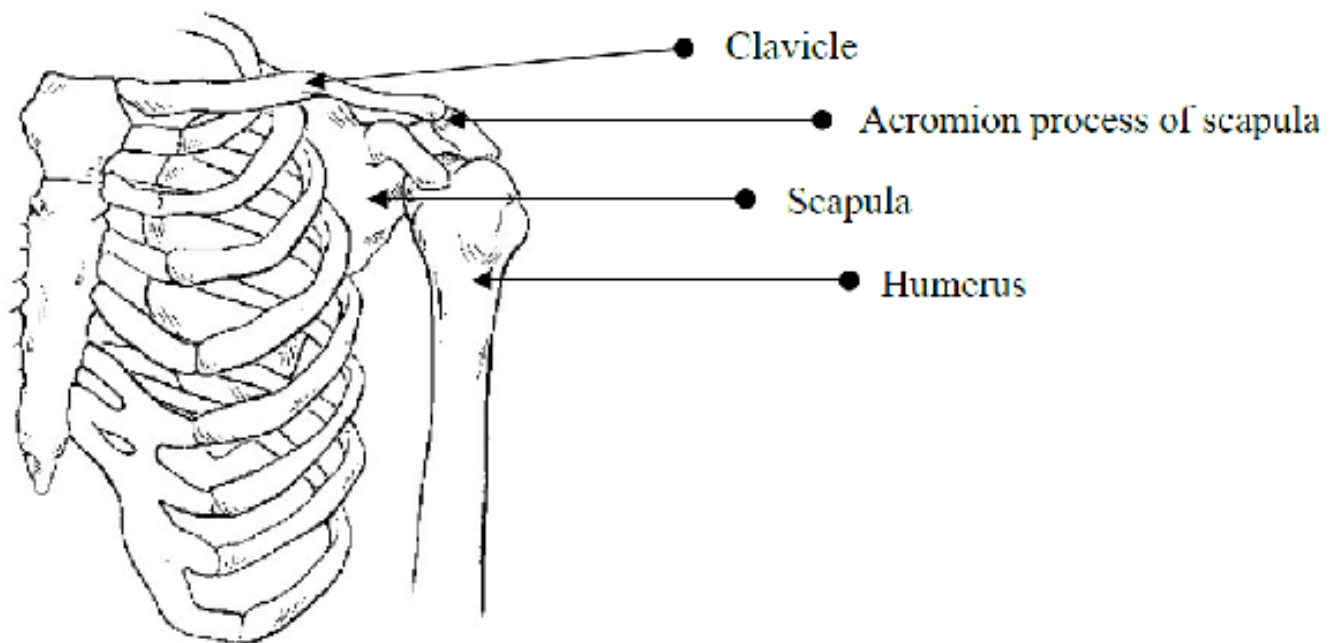


Figure 8: Anatomy of the pelvic girdle

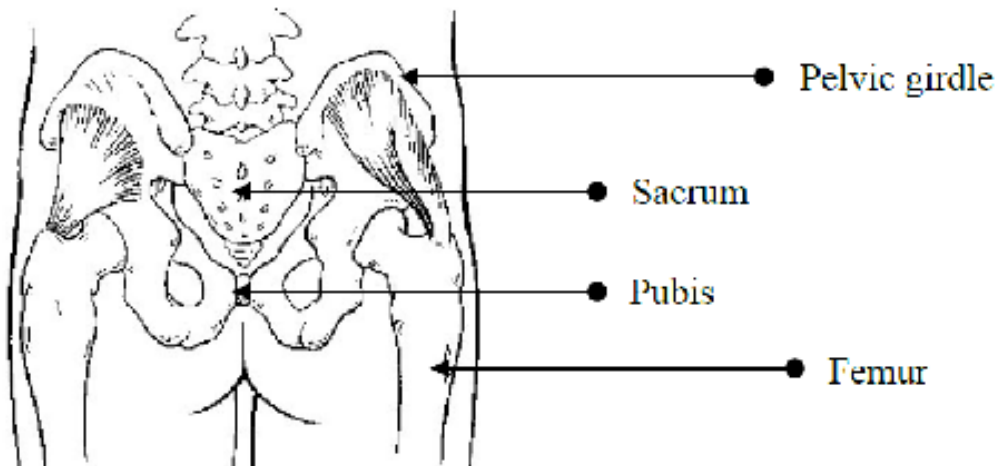
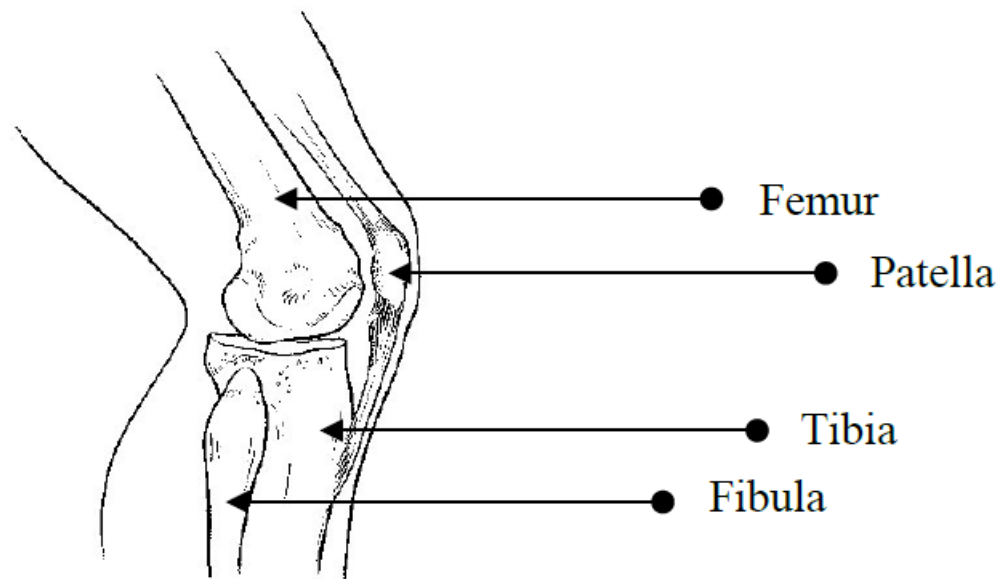


Figure 9: Anatomy of the knee



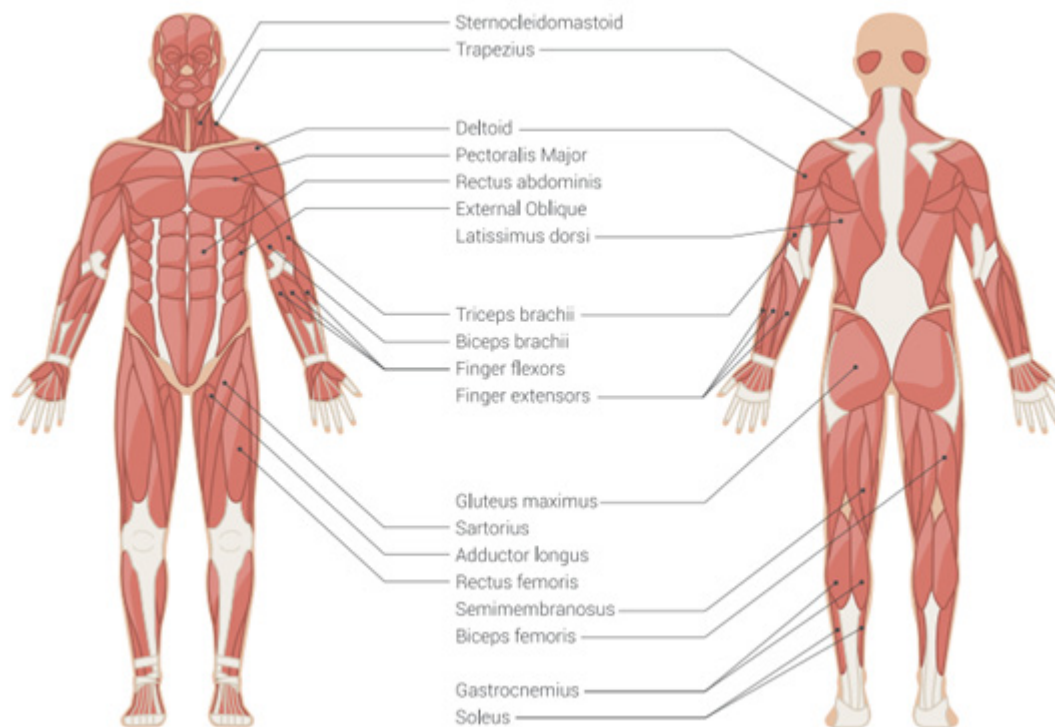
Muscles & Joints

To be purposeful in planning for your clients, it is necessary to be able to identify the major muscles and understand some basic kinesiology principles including important terms about the muscles and joints of the human body. Throughout the body there are three general classifications of muscle tissue: cardiac, smooth, and skeletal.

- **Cardiac muscle tissue** compromises the walls of the heart, is very efficient and fatigue resistant, but is involuntary, we do not have any control over this action.
- **Smooth muscle tissue** is also involuntary, and lines the internal organs, such as the intestines and blood vessel walls.

- **Skeletal muscle tissue** is the most abundant, with over 600 different skeletal muscles in the human body, and is largely under our conscious control to accelerate, decelerate and stabilize.
 - Primarily comprised of water (about 75%), about 20% contractile proteins and 5% high-energy phosphates and key minerals.
 - Consists of long, cylindrical muscle fibers comprised of threadlike myofibrils.
 - Mitochondria, the “powerhouse” of muscle fiber, are found within the gelatin-like sarcoplasm surrounding the myofibrils. Mitochondria produce the energy needed to support aerobic activity.

Figure 10: shows major skeletal muscle groups in both the anterior and posterior views.



Muscle Terminology

1. Prime Movers or Agonists:

- Muscles primarily responsible for the given joint movement (for example: the iliopsoas are the prime mover or agonist for hip flexion).

2. Antagonists:

- Muscles that produce the opposite joint movement when compared to the agonist (for above example: the gluteus maximus is the antagonist to the iliopsoas).
- On land, this muscle works against gravity, typically relaxing when the prime mover is active. In the water, opposing muscles are working simultaneously, due to the water's viscosity. This means you can work both muscle groups with one single exercise.

3. Synergistic Muscles:

- Muscles that act as secondary movers or generally assist the prime mover (for hip flexion, the synergists are the rectus femoris, sartorius, and the pectineus).

4. Stabilizer Muscles:

- Muscles that stabilize one joint to allow for movement at another joint. Stabilizers are usually located more proximally in relation to the agonist (for example: the muscles around the scapula act as stabilizers to fixate the scapula to the thorax during arm movements).

5. Muscle Origin:

- Defines the more fixed end of a muscle.

6. Muscle insertion:

- Defines the more moveable end of a muscle.

7. Ipsilateral:

- Referring to muscles on the same side of the body (for example: the left Hamstrings and left Gluteus Maximus).

8. Contralateral:

- Referring to muscles on the opposite side of the body (for example: the left Latissimus Dorsi and Right Gluteus Maximus).

NOTE: Complete breakdown of muscle anatomy can be found in Appendix ____.

Planes of Motion & Movement in the Water

The body moves in three dimensions. The best way to experience the planes of motion is to get in the pool and move! Practice changing from one movement or exercise to another. Notice that moves performed on different planes of movement (like lateral movements versus front and back movements) flow less consistently than moves performed in the same plane. For example, lateral pendulums do not smoothly flow into straight front kicks. This is because pendulums move in the frontal plane and front kicks move in the sagittal plane.

Three Planes of Motion:

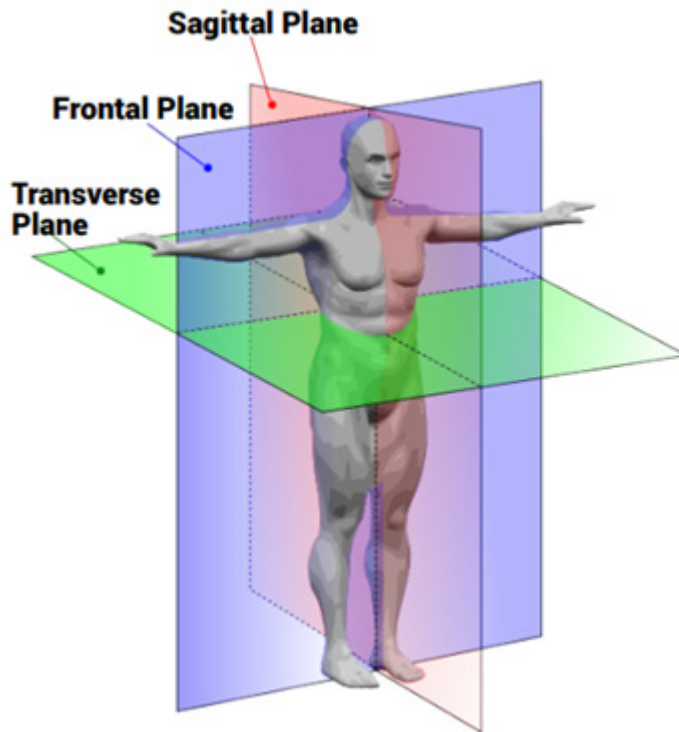
- **Frontal Plane:** bisects the body into front and back halves
- **Sagittal Plane:** bisects the body into right and left sides
- **Transverse Plane:** bisects the body into top and bottom halves

During continuous aerobic segments of training, consider inserting a **transition move**. In the above example, a transitional jumping jack could be used between a lateral pendulum and a front kick to enhance flow, a feeling of balance, and to not overload your clients' core musculature to compensate for challenging transitions. Additionally, traveling moves offer a greater transition issue because of the added resistance of inertia.

Movement changes offer more challenges to clients with special conditions such as pregnancy, injuries, neuromuscular, and musculoskeletal conditions, age, and weight.

Recognize, analyze, and accommodate conditions that may limit a client's ability to change moves. For instance, obese clients may create more full body inertia when traveling and require a transition move in place before changing to a different move or direction. In addition, participants with a knee injury may need to minimize lateral traveling and quick directional changes to avoid further injury. Practicing in the water before presenting new movement patterns to a client is a sure way to facilitate safe and effective exercises.

Figure 11: Planes of Motion



Muscle Action & Function

To choose and implement appropriate exercises for your clients, it is important to understand movement. Reminder, the anatomical position serves as the starting point from which movements are identified. Muscles are strengthened when they are contracted and properly overloaded.

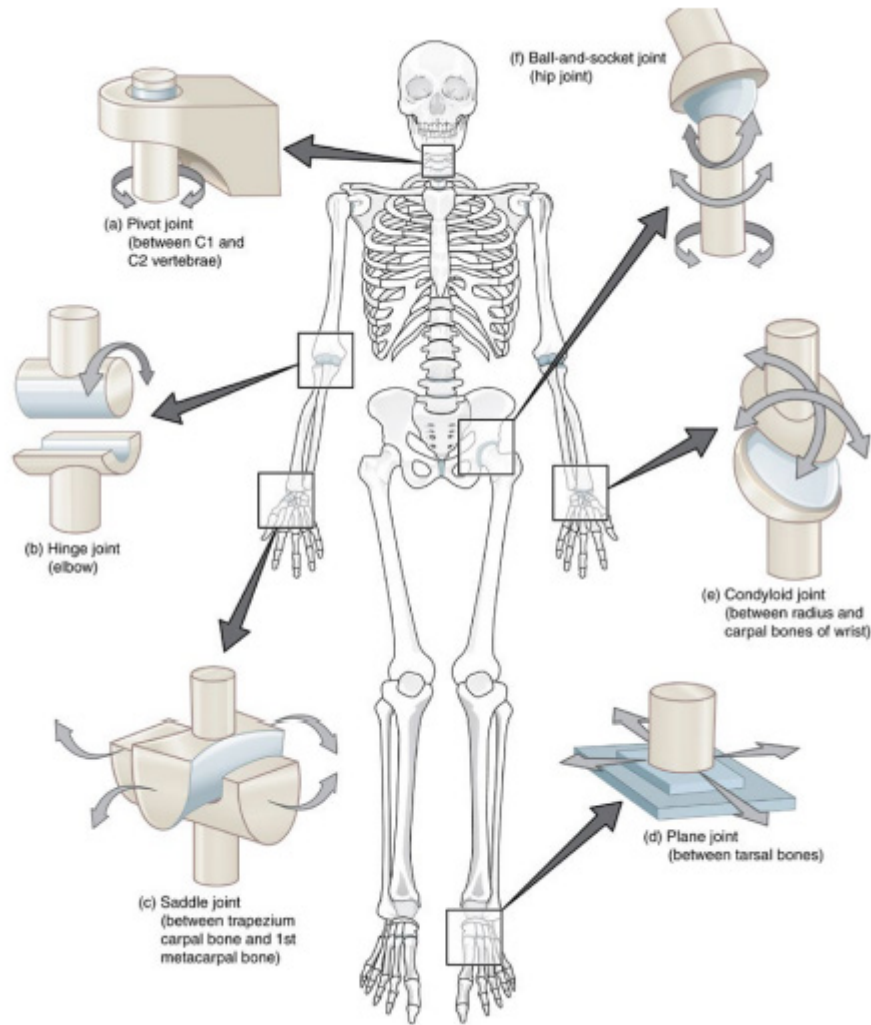
- The joint is where one bone connects to another. The connection is made mostly by ligaments, and muscle contraction will cause movement at the joint.
- Muscles are attached to the bones by tendons. Note: Bones, tendons and ligaments do not have the ability to make your body move, only muscles do.

Let's review some basic joint actions:

Table 2: Movement of the Human Joints

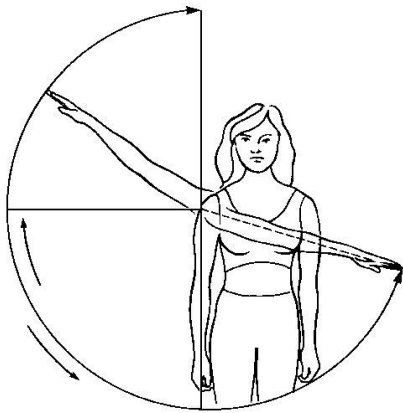
Movement Terminology	Examples
Sagittal Plane	
Flexion – Decreasing the angle between two bones	Elbow flexion; knee flexion
Extension - Increasing the angle between two bones	Elbow extension; knee extension
Dorsiflexion – Moving the top of the foot towards the shin	Ankle dorsiflexion
Plantar flexion – Moving the sole of the foot downward	Ankle plantarflexion
Frontal Plane	
Abduction – Movement away from the midline of the body	Shoulder (arm) abduction; hip (leg) abduction
Adduction – Movement toward the midline of the body	Shoulder (arm) adduction; hip (leg) adduction
Elevation – Moving towards a superior position	Scapular elevation
Depression – Moving towards an inferior position	Scapular depression
Upward Rotation – Rotational movement to a superior position	Arm rotation upward
Downward Rotation – Rotational movement to an inferior position	Arm rotation downward
Transverse Plane	
Rotation – Internal (inward) or external (outward) turning around the axis of a bone or the spine	Spinal rotation
Internal Rotation – Rotation of the humerus around the long axis	Internal humeral rotation
External Rotation - Rotation of the humerus around the long axis	External humeral rotation
Horizontal Flexion – From an abducted arm position, the humerus moves forward towards the midline	Arm movement into horizontal flexion
Horizontal Extension - From an abducted arm position, the humerus moves backwards	Arm movement into horizontal extension
Pronation – Rotating the hand and wrist so palm faces downward or foot inward	Forearm pronation; foot pronation
Supination – Rotating the hand and wrist so palm faces upward or foot outward	Forearm supination; foot supination

Figure 12: Types of Joints



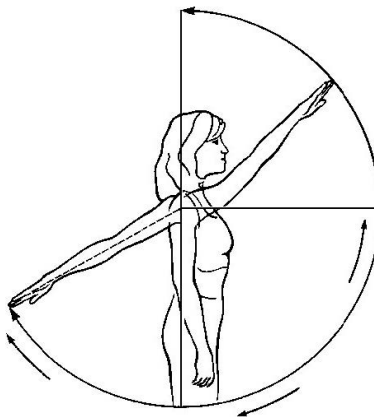
Applied Kinesiology: Plane/Motion Recognition

ACTIVITY: Take a moment to analyze the following illustrations and identify which plane of motion and movement is being executed. Once complete, check your answers in Appendix B.



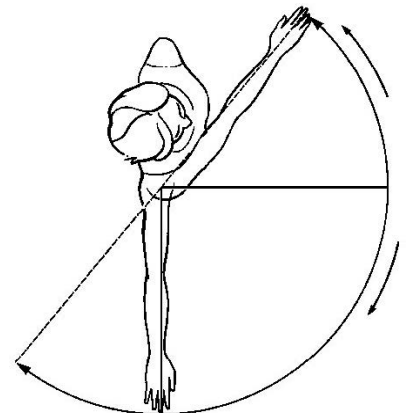
Plane: _____

Movement: _____



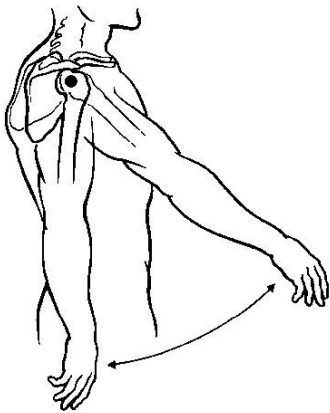
Plane: _____

Movement: _____



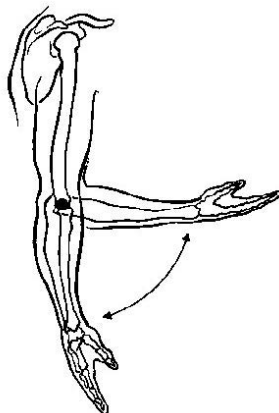
Plane: _____

Movement: _____



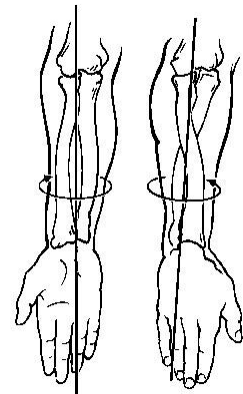
Plane: _____

Movement: _____



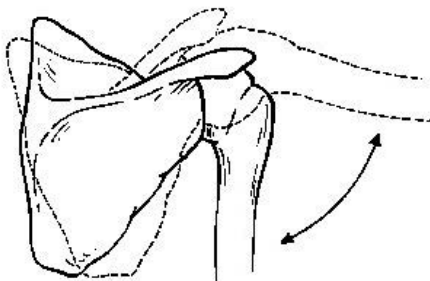
Plane: _____

Movement: _____



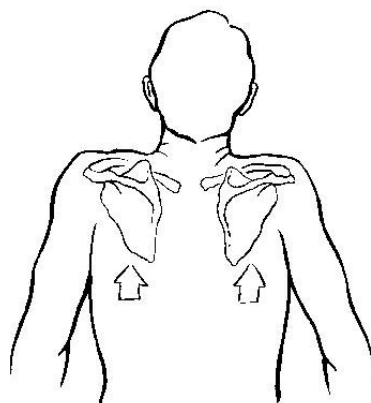
Plane: _____

Movement: _____



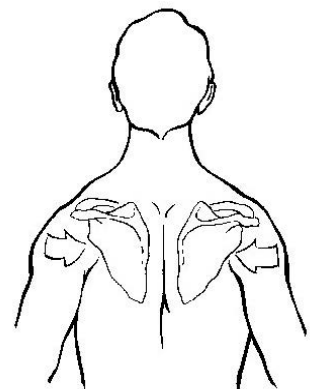
Plane: _____

Movement: _____



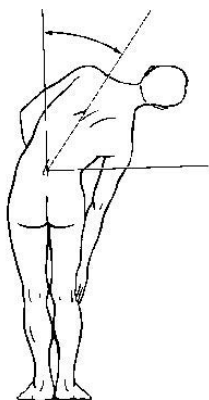
Plane: _____

Movement: _____



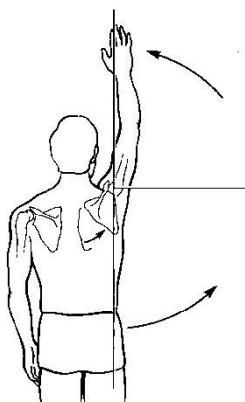
Plane: _____

Movement: _____



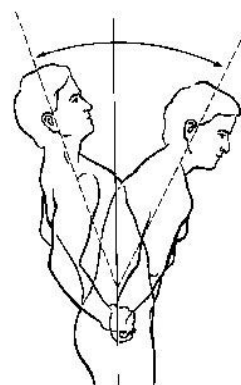
Plane: _____

Movement: _____



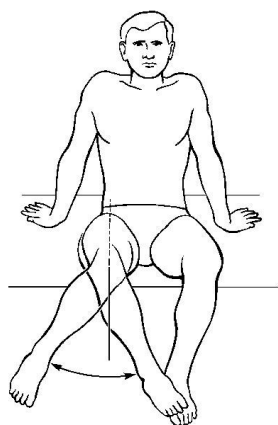
Plane: _____

Movement: _____



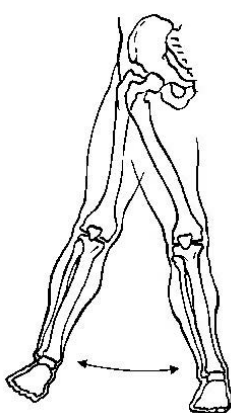
Plane: _____

Movement: _____



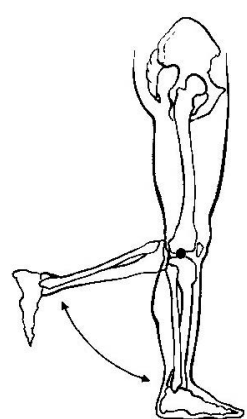
Plane: _____

Movement: _____



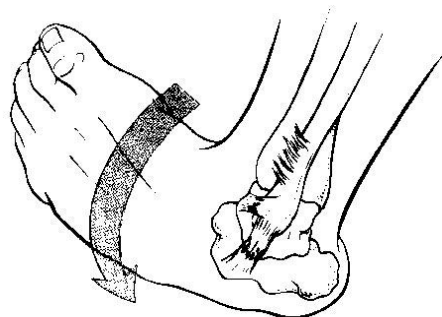
Plane: _____

Movement: _____



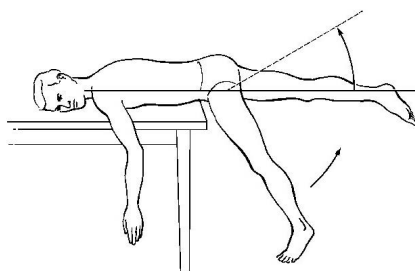
Plane: _____

Movement: _____



Plane: _____

Movement: _____



Plane: _____

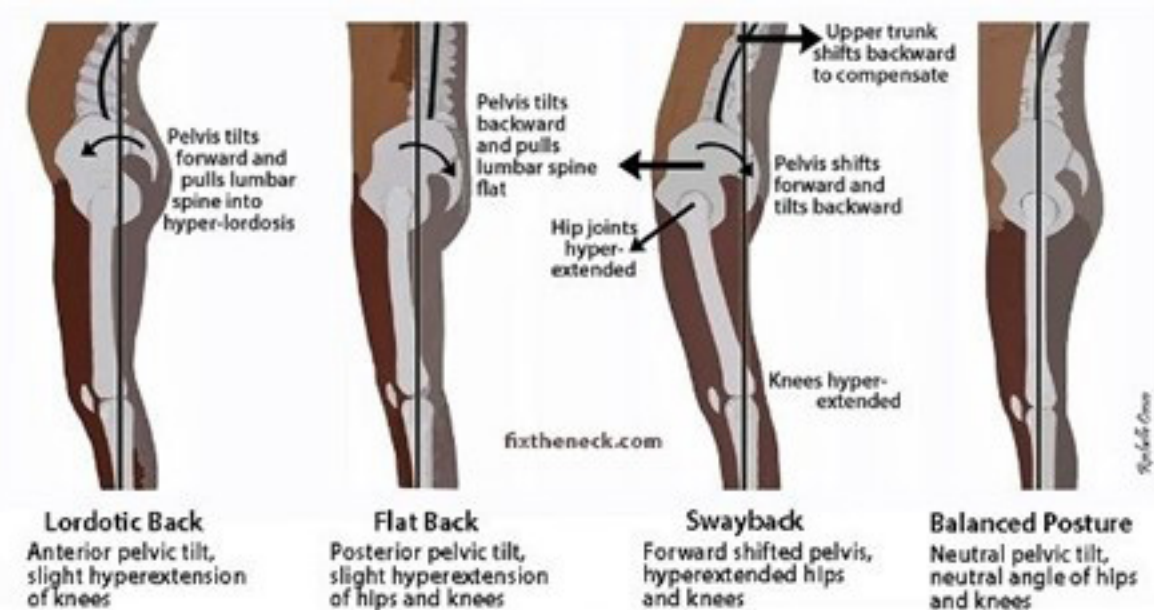
Movement: _____

Posture & Pelvic Alignment

In your aquatic training sessions, you want your Client to maintain appropriate posture, working in neutral spine, the natural position of the spine when all three curves of the spine- cervical (neck), thoracic (middle) and lumbar (lower) are present and in good alignment. Although some variation may exist, from client to client, as trainers, we typically evaluate proper posture in a static standing position, regarding the plumb line (an imaginary vertical line that drops down from ear to ankle). See section ___ for postural assessment. Over time, poor posture can exacerbate conditions and contribute to muscle imbalances and inefficient movement.

- Spinal misalignments may be the result of structural abnormalities or muscle imbalances and may show up as a pelvic tilt.
 - **Lordosis** is characterized by an excessive curvature of the lumbar (low) spine and is associated with an anterior pelvic tilt, weaker core muscles and tight calves and hip flexors. An individual who wears or wore heels all day may exhibit this. When designing a plan for a client with lordosis, avoid excessive flexion of the hips. Focus on strengthening glutes, hips, and core.
 - **Flat-Back** is a condition when the lumbar spine loses its natural curvature, causing a flattening of the lumbar spine and posterior pelvic tilt. This posture often leads to feelings of fatigue in day-to-day activities and trying to maintain balance. While some individuals may be born this way, others develop flat-back because of arthritis, osteoarthritis, or degenerative disc disease. When designing a plan for a client with flat-back, put a lot of emphasis on proper posture and form while water walking or jogging to avoid neck strain. Focus on exercises to strengthen core, glutes, back and rear shoulder muscles.
 - **Kyphosis** is characterized by an excessive curvature of the thoracic spine and is associated with rounded shoulders, a sunken chest, and forward head position. A person who sits all day may exhibit this. When designing a plan for a client with kyphosis, avoid excessive flexion of the spine. Focus on open arms and stretching the pectoral muscles and hamstrings.
 - **Sway-back** is a posture characterized by a posterior pelvic tilt, and the appearance of leaning back when standing. Clients may have sway-back, as well as kyphosis and/or lordosis. A person who sits all day, has had traumatic injury or suffers from a neurodegenerative disease may exhibit sway-back. When designing a plan for a client with sway-back, focus on strengthening the core and stretching hamstring and hip flexors.
- It is more difficult to watch posture and form when your Clients are in the water. Consider taking your client out of the water (or move to shallow water) to practice form, so that you can observe their posture and movement.

Image: <https://www.starkwoodchiropractic.com/fixing-posterior-pelvic-tilt/>



Nutrition

Food Matters! Clients will have a difficult time achieving optimal results without utilizing sound nutritional principles. Those who exercise on a regular basis but have a poor approach to nutrition will become frustrated when they do not see the results they anticipate. The following information will provide you with some general guidelines regarding basic nutrition that can be shared with your Clients.

For the most updated dietary guidelines, please visit: www.dietaryguidelines.gov

Macronutrients

- *Carbohydrates:*
 - **Carbohydrates serve numerous roles with the most important being the body's main fuel source.**
 - Carbohydrate classification depends upon the number of individual sugar units that combine to form the entire carbohydrate structure
 - **Monosaccharides** – single sugar units- glucose, galactose and fructose – these represent the absorbable and usable forms of carbohydrates within the body
 - **Disaccharides** – 2 sugar units- Sucrose, lactose and maltose -Must be digested to monosaccharides for absorption

Collectively, monosaccharides and disaccharides are called “simple sugars.” Simple sugars represent 50 % of total US carbohydrate consumption (vs. recommendation of 10 %).

- **Oligosaccharides** – 3-10 sugar units - Starches comprising short chains of glucose molecules and must be digested to monosaccharides for absorption
- **Polysaccharides** – ≥ 10 sugar units- Starches and fiber comprising long chains of glucose molecules and must be digested to monosaccharides for absorption (except fiber, which is nondigestible)

Collectively, oligosaccharides and polysaccharides are called complex carbohydrates, including starches, glycogen, and dietary fibers.

- Fiber plays an important role in normal bowel function, decreases the likelihood of Type II Diabetes, heart disease and diverticular disease, lowers cholesterol levels, provides satiety, and stabilizes blood sugar.
- The body can store glucose in:
 - Blood (5 – 15 g)
 - Liver (90-110 g) as glycogen (storage form of glucose in the body)
 - Muscles (250 – 600 g +) as glycogen
- *Nutrition Label Coaching:*
 - There are 4 calories in every 1g of carbs. When clients read a nutrition label, Total Carbohydrates are listed in bold. Total Sugars and the amount of dietary fiber is also listed. If there are added sugars, not naturally occurring, they are listed underneath the Total Sugars.
 - For example, if a product has 18 g of Total Sugars, but 11g of them are Added Sugars, this means that 7g are naturally occurring.
 - HINT: 5% of the Daily Value is considered a LOW source of added sugars, while 20% of the Daily Value is considered a HIGH source of added sugars.
 - According to the USDA Guidelines 2020-2025, the average American should aim to eat 45-65% of their daily calories from carbs such as fruits, vegetables, whole-grain choices, beans, peas and lentils. *This percentage could change based on fitness and nutrition goals.
- *Proteins:*
 - **While proteins serve vital roles in tissue synthesis, repair and maintenance, production of hormones, enzymes, and antibodies, they do contribute 2 – 5 % of the body's energy needs at rest and up to 5 - 15 % during intense or prolonged exercise**
 - Amino acids represent the building blocks of proteins and there are approximately 20 nutritionally important amino acids of which nine are essential, which implies we cannot manufacture them in our body, and they can only be obtained through our diets.
 - The nine essential amino acids are leucine, isoleucine, valine, methionine, tryptophan, lysine, phenylalanine, threonine, and histidine
 - Non-essential amino acids are manufactured in our own body and include alanine, arginine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine, tyrosine, asparagine, selenocysteine
 - Proteins digest from bigger molecules (long chain polypeptides - approximately 300 amino acids) to amino acids, di-peptides (pairs) and tripeptides (triplets) for absorption.
 - The body stores protein uniquely:
 - 99 % of usable protein is found as muscle tissue
 - 1 % of usable protein is found within free amino acid pools located inside cells and within the bloodstream

- *Nutrition Label Coaching:*
 - There are 4 calories in every 1g of protein. The amount of protein is listed on a nutrition label in bold.
 - A percentage daily value of protein is not required on the label, but according to the USDA Guidelines 2020-2025, the average American should aim to eat at least 10-35% of their daily calories from protein sources such as lean poultry, fish, certain cuts of red meat, eggs, Greek yogurt, vegetables, tofu, beans, and legumes. *This percentage could change based on fitness and nutrition goals.
- *Fats:*
 - While fats also serve numerous vital functions within the human body, including protection and insulation, transportation, nerve conduction and steroid manufacture, one key role is their availability as a significant energy source:
 - Fats can store 90,000 - 110,000 kcal worth of energy for the average adult. Stores of fat exceed the body's carbohydrate stores (2,000 – 3,000 kcal)
 - Three kind of fats exist within the body:
 - Simple or Neutral fats:
 - Represent ~ 95 - 98 % of all fat found within the body
 - Triglycerides are the most abundant form of simple fats
 - Compound fats:
 - Structures formed from the combination of a simple or neutral fat (lipid) and a non-lipid molecule to form a more complex structure (e.g. high density lipoprotein or HDL)
 - Derived fats:
 - Structures derived from either simple or compound fats (e.g. testosterone)
- *Nutrition Label Coaching:*
 - There are 9 calories in every 1g of fat. Total Fats are listed at the top of every nutrition label.
 - This category is broken down into unsaturated fats (primarily derived from plant sources- good fat!), saturated fats (primarily from fatty meat, full-fat dairy, and fried foods- keep these low!) and trans fats (primarily from highly processed foods- avoid, the worst kinds of fat!).
 - According to the USDA Guidelines 2020-2025, the average American should aim to eat at least 20-35% of their daily calories from fats. *This percentage could change based on fitness and nutrition goals.

Scope of Practice

Always be learning. This is your field. It is your job to provide the most up-to-date, evidence-based recommendations for training performance and overall health and well-being. Create professional partnerships with those in your community so that when questions are posed, beyond your scope of

practice, you can refer clients to them: dietitians, primary care, specialties such as chiropractic care, orthopedists, massage therapists, etc.

You CANNOT:

- Write and assign specific meal plans
- Prescribe diets or supplements to treat medical conditions
- Diagnose medical conditions
- Prescribe supplements or dosages
- Note: If you have the proper qualifications to do the above, these may not apply to you.

You CAN:

- Educate based on the USDA Dietary Guidelines for Americans
- Encourage clients to follow basic nutrition principles (eat lean protein, nutrient-rich veggies, etc.)
- Educate and explain the benefits of macronutrients and provide calorie management strategies
- Offer recipes and demo food prep
- Suggest good hydration & strategies
- Help them choose the right food to eat pre- and post-workout/ Food timing
- Provide behavior- based coaching to change eating habits
- **Research laws and statutes in your state**
- Share resources from recognized organizations such as American Heart Association, The Academy of Nutrition and Dietetics, Center for Disease Control and Prevention, etc.

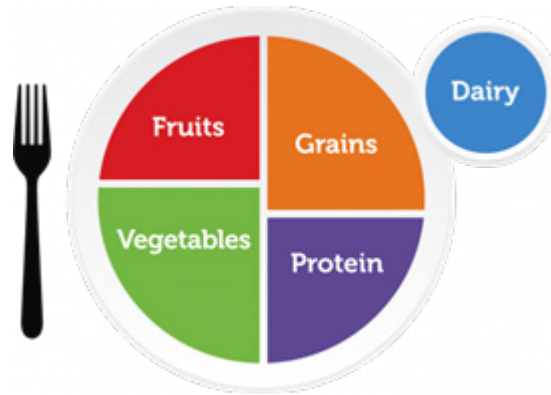
Opportunities to Educate and Coach Behavior Changes

It is a confusing time for your Clients to choose how to eat properly, for their body. They are constantly inundated by the media, social media, marketing initiatives, friends, co-workers, and others. Choosing what is “wrong” or “right” between fad diets and nutritional trends, as well as battling the old myths and research, is overwhelming. As a personal trainer you can support and coach your Client to eat how they feel best, while also educating them on general nutritional guidelines, cooking skills, and meal prep and hydration strategies.

Great Discussion Topics:

- Proper hydration
- Consuming a rainbow of fruits and vegetables
- Choosing nutrient dense foods and beverages, with an emphasis on fiber and whole-grain carb choices, healthy fats and lean protein options
- Portion Size
- Eating to FUEL the body so that it can perform at an optimal level each day
- The importance of increasing the consumption of whole foods while reducing the consumption of ultra-processed foods.

- A 2019 clinical study where participants either ate “ultra-processed” or “unprocessed,” for just two-week periods, resulted in those ultra-processed participants ingesting approximately 500 more calories a day!
- Processed food is very palatable, satiating, but can be easily overconsumed, and holds significantly less nutritional value.
- Use and pull information and worksheets from the USDA, myplate.gov website. There are terrific charts, graphics, and resources available for your use.



USDA, Myplate.gov

Weight Management

Conversation will arise with your Clients regarding weight management. There is a difference between what the body requires to LIVE, simply operate, and what it needs, on a day-to-day basis, participating in life. While some individuals may overeat, many will also undereat and some will eat the right number of calories but choose less nutritious options. The idea is FUEL. Weight management is influenced by energy intake and expenditure.



Total Daily Energy Expenditure (TDEE) is Influenced by three factors:

1. Resting / Basal Metabolic Rate represents 60 – 75 % TDEE
2. Thermic Effect of Food represents 10 % TDEE
 - This is the energy cost to digest, absorb, transport and store food in the body

- Food consumption increases metabolism (peaking within one hour after a meal – digestion and absorption)

3. Physical Activity, Recovery and NEAT (non-exercise activity thermogenesis) represents 15 – 30 % TDEE

Calculate TDEE using the **Mifflin-St. Jeor Equation**

Step One: Calculate RMR/BMR

Women: $RMR = (9.99 \times kg) + (6.25 \times cm) - (4.92 \times age) - 161$

Men: $RMR = (9.99 \times kg) + (6.25 \times cm) - (4.92 \times age) + 5$

OR use a website/app calculator you like

ACTIVITY: Calculate your RMR/BMR

Date:		
Gender:	Height:	Weight:
My BMR:		

Step Two: Calculate Energy of Activity. After estimating your RMR/BMR, you need to determine the additional calories burned by activity and digestion.

STEP 2: Calculate TDEE using a Standard Activity Factor (Institute of Medicine Method). Multiply the calculated BMR score by a standard activity factor score.

Exercise Levels	Daily Calorie Needs
Little to no exercise	BMR x 1.2
Light exercise (1–3 days per week)	BMR x 1.375
Moderate exercise (3–5 days per week)	BMR x 1.55
Heavy exercise (6–7 days per week)	BMR x 1.725
Very heavy exercise (twice per day, extra heavy workouts)	BMR x 1.9

ACTIVITY CONTINUED: Calculate TDEE

The purpose of this section has been to provide you with basic nutritional information. If you want to learn more about nutrition, and increase your scope of practice, SCW provides the following certifications:

1. Active Aging Nutrition
2. Nutrition Coaching for Fitness Professionals
3. Nutrition, Hormones & Metabolism
4. Sports Nutrition
5. Weight Management

Exercise Physiology

The Components of being physically fit include:

1. Cardiovascular Endurance
2. Muscular Strength
3. Muscular Endurance
4. Flexibility
5. Body composition

Cardiovascular Conditioning

In conjunction with the skeletal and muscular system, the cardiovascular system (heart, circulatory system, and lungs) aids in the accomplishment of physical movement.

- Cardiovascular conditioning is the term used to describe any exercise that creates an increased demand for oxygen in the body. Exercise of this type forces the heart (“cardio”) and the system of arteries and veins in your body (“vascular”) to work together with the lungs to efficiently deliver blood and oxygen to working muscles.
- Regular performance of cardiovascular conditioning exercise will result in a good level of cardiorespiratory fitness, which is defined as the ability to perform large muscle movements over a sustained period. It is related to the capacity of the heart-lung system to deliver oxygen for sustained energy production.
- To increase speed, endurance, and strength in this area, the more responsibly you train for each (with appropriate recovery periods), the more proficient your body will become at each piece.

Muscular Strength and Endurance

Muscular strength, or the ability of a muscle unit to exert force for a single maximal effort (1 rep max), is needed for most daily living activities. Muscular endurance in comparison refers to the length of time we can continue these activities.

- Building lean muscle mass can increase basal metabolism by 15 percent or more according to a recent study published by the Journal of Applied Physiology.
- Other documented benefits of strength training include:
 1. Increased bone density
 2. Increased vitality and strength
 3. Improved mood and sleep habits
 4. Better balance and flexibility
 5. Reduced risk of heart disease
 6. Decreased risk of diabetes, cancer, arthritis, and other debilitating conditions
 7. Reduced chronic aches and pains
 8. Enhanced body image

Strength training, according to ACSM guidelines, is performance of a set of repetitions “to exhaustion”. Do not confuse exhaustion with muscle failure.

- **“Exhaustion”** simply means that, if one more repetition was performed, a lack of control would be evident, meaning improper alignment, reduced range of motion, or compensation by other muscle groups.
- **“Failure”** means a total loss of control and/or the inability to perform another repetition. It is important to understand the difference between muscular strength and endurance when performing strength training exercises.
- **Muscular strength:** The maximum amount of force that a muscle can produce in a single effort, also referred to as 1RM (1 repetition maximum).
- **Muscular endurance:** The number of times a muscle repeatedly exerts a sub-maximal force, or the length of time a given muscular force can be sustained.

Certainly, these two properties are interrelated, but, in general, muscular strength is developed by lifting heavier weights for fewer repetitions, and muscular endurance is developed by lifting lighter weights for more repetitions.

Muscles are strengthened when they are contracted and properly overloaded. Often, muscle contraction will cause movement at a joint (where two bones meet), so let’s review some basic joint actions.

Adaptations to Training

While muscles generate force and produce movement, it is the nerves (or neurons - individual nerve fibers) that attach to muscle fibers within a large muscle or group of muscles and communicate the need for muscle action.

- When starting a resistance training program, a beginner will demonstrate some rapid, initial gains over the first two weeks that are not attributed to muscle growth.
 - Muscle growth or hypertrophy, which is the increase in the size of a muscle, does not typically occur until weeks four through six.
- These initial strength gains are attributed to improvements in neural patterns and muscle fiber recruitment, where the muscles fire and contract in a more coordinated fashion to generate greater amounts of force.
 - You can emulate this success by learning new lifts and implementing the Principles of Resistance Training (see page __).

Muscle Actions

There are two types of muscle contractions: isotonic (which include concentric and eccentric movement) and isometric.

Isotonic Muscle Contraction:

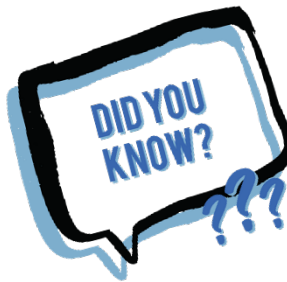
- Concentric (positive) contractions occur when the muscle fibers shorten (e.g., on land this would look like the upward phase of a bicep curl, when the Biceps brachii shortens)
- Eccentric (negative) contractions occur when the muscle fibers lengthen (e.g., on land this would look like the downward phase of the bicep curl, when the muscle lowers the forearm and extends from the elbow)

Isometric Muscle Contraction: takes place when there is a load applied to muscles, but no change in muscle fiber length occurs (e.g., holding a static contraction like when in a plank pose).

- *Reminders during training:*

- Make sure clients are breathing while lifting and lowering weights, hand buoys, etc.
- Always remind your clients to maintain correct posture and body alignment as this reduces the risk of injury.
- Exercises should be performed at the appropriate speed. If the movement is done too quickly, the muscle does not have time to sufficiently contract, and little strengthening can result. For maximum effectiveness, it is important to move the muscle through its entire range of motion.

The Land to Water Training Difference:



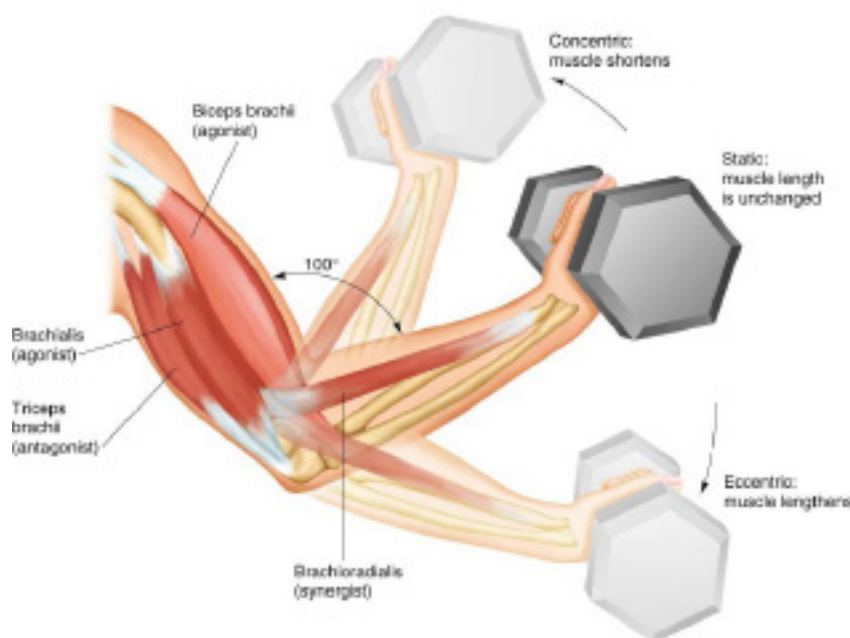
- Due to the property of drag resistance in water, both directions of the movement will be mostly concentric muscle activity, paired with some eccentric muscle contractions to control the movement, but of opposing muscle groups. This ultimately leads to a total body workout that is of higher workout intensity.
- On land, breath would be an exhale on the concentric phase of the movement, inhale on the eccentric. In the water, find a rhythmic breath.
- When training to build muscle strength, on land, focus is placed on the eccentric phase, where the greatest amounts of force are generated. During this phase, there is also an extensive amount of micro-tearing that occurs within the muscle, which also provides a stimulus for muscle growth. Post-exercise, anywhere from 12-72 hours, the onset of muscle soreness (DOMS – Delayed Onset of Muscle Soreness) is a muscle's protective mechanism to prevent use of that muscle and allow it time to heal and recover.
 - DOMS is experienced most frequently with novice exercisers or when starting a new phase or progression of a resistance training program.
 - Healing from DOMS can be accelerated with effective cool downs and stretching, and by training those same muscles very lightly (< 60 – 70 % of previous intensity) the following day. If your Client has DOMS from land-based training, stretching and cooldown in the water can help prevent lactic acid buildup.

Aquatic exercise is unique in that most people do not experience any DOMS after training in the pool. (Robinson)

- In the water, the resistance placed on the working muscles is almost always loaded onto the muscle when it is in the concentric phase of the isotonic contraction. As a result, very little, if any, DOMS is experienced.

- This is great for those who do not want to feel sore after exercise, especially if they are already living with a chronic condition that results in pain, stiffness or swelling, which is a frequently cited reason for participating in water exercise.
- Unfortunately, some clients may measure the effectiveness of a workout by how “sore” they get. Let your participants know that the muscles are getting stronger, either through increases in the muscle’s ability to overcome several repetitions (muscle endurance) or by improving the ability to push more water, even though their muscles are not sore after the workout.
- Make changes to movements by manipulating lever length, hand position, or when using equipment to increase intensity.

Figure 13: Muscle Action



Muscle Fiber Composition

Muscles also demonstrate different physiological properties based upon their fiber composition. Three basic fibers exist within the human body:

- **Type I** (also known as slow twitch) muscle fibers generate lower amounts of force but do so for longer periods of time (synonymous with muscle endurance).
 - These fibers are trained best with lower intensities, larger volumes (sets x reps) and shorter rest intervals.
 - Many of your deeper, postural muscles that act as stabilizers of the body’s joints have higher concentrations of type I fibers (e.g., core muscles).
- **Type IIx or IIb** (also known as fast twitch) muscle fibers generate larger amounts of force but do so for shorter periods of time – fatigue more rapidly (synonymous with muscle strength and power).
 - These fibers are trained best with higher intensities, smaller volumes (sets x reps) and longer rest intervals.

- Many of your larger, more superficial muscles that act as mobilizers to move the body's joints have higher concentrations of type II fibers (e.g., quadriceps).
- **Type IIa** are intermediate fibers with properties of both type I and type IIb fibers.
 - Type IIa can be trained for speed and power or endurance.

Table 1: Muscle Fiber Characteristics

Characteristic	Type I (slow twitch)	Type IIa (intermediate)	Type IIx / IIb (fast twitch)
Force Production	Low	Moderate	High
Anaerobic Capacity	Low	Moderate	High
Aerobic Capacity	High	Moderate	Low
Fatigue Resistibility	High	Moderate	Low
Ideal Training Style	Endurance & Hypertrophy	Hypertrophy & Strength	Strength & Power

On average, muscles contain 50 % type I fibers, 25 % type IIa fibers and 25 % type IIb fibers.

- Cardiovascular training as well as muscular endurance and hypertrophy training can increase the concentrations of type I and type IIa fibers.
- Explosive power training can increase the concentration of type IIb fibers.

Exercise Physiology

As an Aquatic Personal Trainer, you should have a basic understanding of exercise physiology including how the body produces energy and responds to exercise. The information below will introduce you to energy systems within the body, which will assist you with creating effective training sessions for your clients.

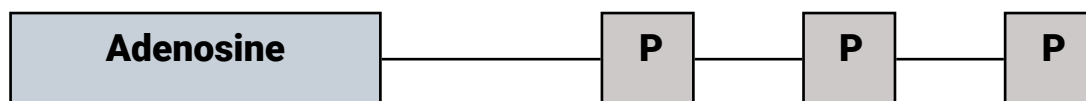
Energy Systems:

Adenosine Triphosphate (ATP) is considered the body's energy currency.

- ATP is a high-energy compound stored in our cells and is the source of all energy used at rest and during exercise.
- ATP is used to build molecules, contract muscles, generate electrical impulses and convert the energy found in food to power our bodies and brains.
- ATP consists of a molecule of Adenine (a protein) and Ribose (a sugar) - forms Adenosine, linked to three phosphate molecules.
 - Two outermost phosphate bonds are high-energy bonds containing the stored energy within ATP.
 - Work is possible by splitting the outermost high-energy bond from ATP releasing 7.3 kilocalories of energy, which does not require oxygen.

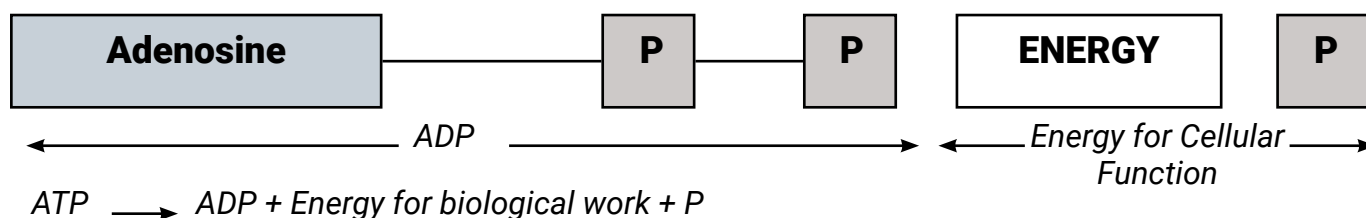
- At rest the body expends approximately 1.0 - 1.3 kcal/min (only ~ 20% used by skeletal muscle) whereas during heavy exercise the body can expend 20 - 25 kcal/min (~ 80% used by skeletal muscle).

Figure 1: A molecule of ATP



Note: _____ is an energy bond; P = Phosphate group

Figure 2: Energy Release from Splitting ATP

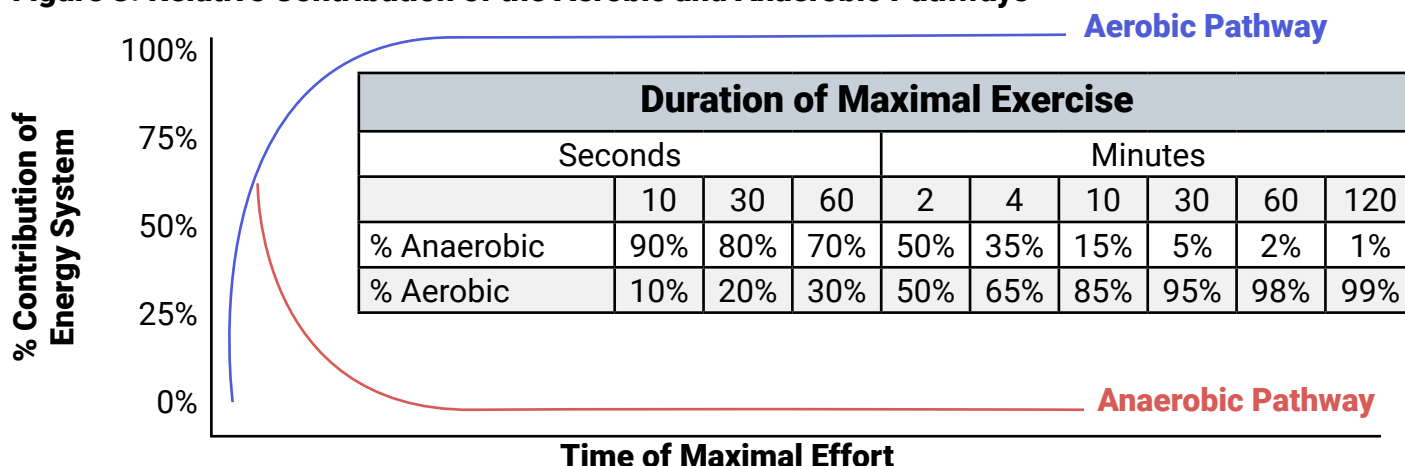


The Two Energy Pathways:

The body contains two energy pathways: **Aerobic** and **Anaerobic**.

- **Aerobic (oxidative) pathway** contributes most significantly to our energy needs; requires oxygen, generates energy at slower rates, and can use carbohydrates, fats and proteins as a fuel.
- **Anaerobic pathways** provide limited, more rapid energy; use ONLY carbohydrates as a fuel and provides energy when:
 - Additional energy is needed when intensities exceed the capacity of the aerobic pathway.
 - Immediate energy is needed during any increase/change in activity or exercise intensity.
 - When aerobic stores cannot supply the energy needed to fuel the increased capacity of the pathway, it is called the “anaerobic threshold,” which is the level at which the body burns stored sugars to help meet the demands placed on it, and produces lactic acid faster than it is cleared away.
- Within the anaerobic pathways:
 - **ATP-PCR system** (phosphagen system) creates energy for the body's most immediate needs, but also generates the least amount of energy (~10 seconds of all-out effort).
 - **Glycolytic (anaerobic glycolysis) system** takes over as the phosphagen system becomes depleted and generates a larger amount of energy.

Figure 3: Relative Contribution of the Aerobic and Anaerobic Pathways



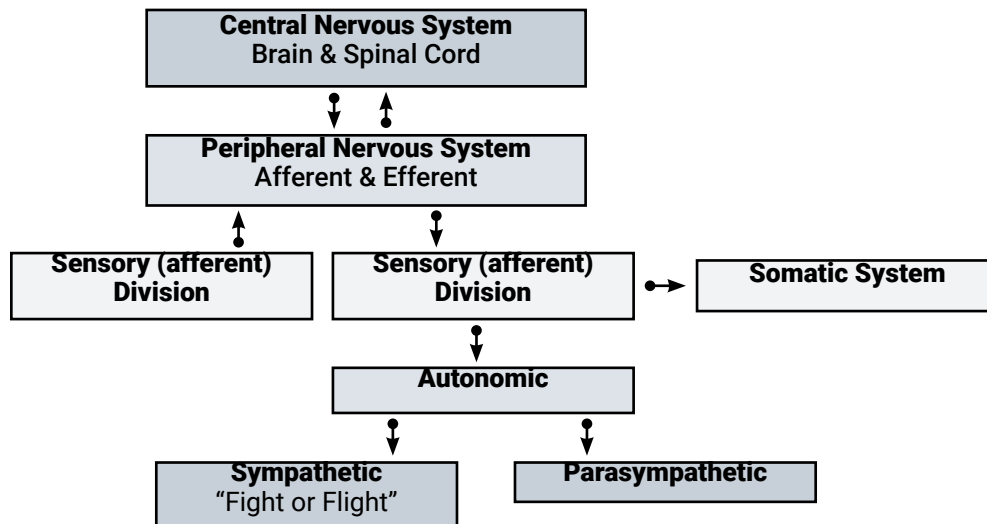
It is not only important to understand how the body works from an energy perspective, but a Personal Trainer must also have a basic understanding of how the body's nervous system and endocrine system work to produce muscular contractions. A basic understanding of how the cardiovascular and musculoskeletal systems work together will ensure your success when designing programs for Clients. The next section focuses on the neuromuscular and endocrine systems.

Neuromuscular Physiology:

The activity of the nervous system controls our ability to process information, maintain homeostasis, move, breathe, see, think, and more. The brain and spinal cord make up the **Central Nervous System (CNS)** and a complex system of nerves that send messages back and forth between the body and the brain make up the **Peripheral Nervous System (PNS)**.

- Neurons are the main cells in this system. They are connected to each other through synapses, or electrical signals and neurotransmitters, the body's chemical messengers.
- The PNS can be broken down into the somatic nervous system, made up of motor (efferent) and sensory (afferent) neurons that help the body perform voluntary actions, such as muscle movement, and the autonomic nervous system, which controls involuntary actions, like heart rate, sweating, shivering, and breathing.
 - In the somatic nervous system, the afferent (sensory) division relays information towards the CNS while the efferent (motor) division relays information from the CNS.
 - The autonomic nervous system is also responsible for how we respond to stress and emergency situations (sympathetic nervous system) as well as how we recover and rest (parasympathetic nervous system).

Figure 4: Organization of the Nervous System



Neural Arrangement

The nervous and endocrine systems are the two major communication systems within the body that help control maintain a stable internal environment (homeostasis) regardless of our surrounding environment or the stimulus placed upon the body (e.g., exercise).

- Both are instrumental in coordinating functions at a cellular, tissue, and organ level.
- The nervous system responds quickly to changes and has short-lived, more localized effects.
- The endocrine system responds more slowly in response to changes and has longer-lasting, more generalized effects throughout the body.



Neurodegenerative Conditions

Since water is a safer place to train for those struggling with balance and coordination, you may be exposed to clients with **degenerative conditions of the nervous system or nerve damage**.

- Parkinson's Disease and Alzheimer's Disease are the most common neuro degenerative diseases worldwide. Over time, symptoms gradually get worse in both. While exercise cannot reverse the symptoms associated with these diseases, it can enhance the quality of life and boost independence for activities of daily life (ADLs).
- Disease symptoms will vary greatly between individuals, and may vary day-to-day, week-to-week, even hour-to-hour. Begin each client session with a discussion on the client's status. Safety reminder: Getting into and out of the pool, especially at the end of the session, the client may be fatigued and unsteady.
 - Individuals with Parkinson's may exhibit muscle stiffness, speech changes and tremors during your sessions. The nature of buoyancy to reassure balance and improve posture will lead to less guarded movement in the pool. In addition, the continual adjustment to the

dynamic water environment will aid with motor control and body awareness.

- Under the umbrella of Dementia, Alzheimer's leads to continuous loss of brain tissue, and affects not only memory but also emotion, behavior, and thinking.
 - Training individuals in the pool, most likely in the early stages, will help with balance, gait recovery and increased range of motion without the fear of falling.
 - Sessions should have a consistent routine built in and have an added focus on movement that requires thinking and simple problem solving.



Nerve Damage & Neuropathy

- Clients with nerve damage and/or neuropathy may find the increase in circulation and increased oxygen movement in the bloodstream, from training in the water, reduces pain, and even aids with nerve regeneration.
 - Common causes of nerve damage and neuropathy include diabetes, injuries that involve a cut, tear, compression or crushing of tissue, past surgery, autoimmune disorders (such as MS), nutritional imbalances, infectious diseases, etc.
 - Peripheral neuropathy is a weakness or numbness, sometimes even pain, resulting from nerve damage that contributes to loss of sensory capacity, the loss of motor function, lack of confidence due to body imbalance, and ultimately leads to inactivity and deconditioned individuals. Personal training in the water is beneficial for all these factors.
 - Clients may feel stabbing, tingling, or burning sensations, and from one client to the next, symptoms may vary.
 - Water walking, dynamic balance challenges, resistance training, and gentle stretches in the water will improve not only strength and endurance, but also multidirectional movement.
 - Deep-water, suspended training can be ideal for clients with neuropathy on the bottoms of their feet, common to those undergoing chemotherapy, as often there is pain, or a tingling sensation, associated with impact or grazing the soles of the feet on the bottom of the pool. Water shoes will help!
 - In addition to boosting ADLs, clients will benefit from the transition from water, with increased awareness, to walking more steadily on land.

Neuroplasticity

- The nervous system, specifically the brain, can modify, change, and/or adapt its activity to responses in stimulation, and in response to life experience, basically the “rewiring of the brain.” This ability is called neuroplasticity.
- Contrary to early popular belief, the brain CAN regenerate brain cells naturally through learning new skills, exercise, social interaction, taking new routes, practicing meditation and more!
- Exercise increases neuroplasticity. While harder to accomplish in a group setting, personal training or small group training allows you to work with clients in very purposeful ways.

- The focus of aerobic exercise has always been on the heart, but it is beneficial for the brain too! Aerobic exercise stimulates the release of BDNF or “brain-derived neurotrophic factor” which promotes the rewiring of the synapses in your brain. According to the Journal of Neurology, in a BDNF study of after-death subjects, those who had exercised experienced 50% slower loss of cognitive function compared to those with the lowest BDNF levels.
- Water relaxes your blood vessels, increasing the cardiac output of blood in your body, including your muscles during exercise. Additional neuroplasticity elements in your personal training sessions can be as easy as having your clients:
 - Spell their name forwards or backwards.
 - Solve math problems (ie. count down from 50 by threes, multiples of 6, etc.).
 - Verbalize and share a memory.
 - Associate each of 5 exercises with a number, and you call out the number instead of the name of the exercise.

Endocrine Function

Hormones! The Endocrine System creates and releases the chemical messengers of the body, hormones, which control nearly everything, including metabolism, growth and development, emotions and mood, fertility and sexual function, sleep, and blood pressure. Exercise helps keep the body's hormones in balance, creating a sense of equilibrium and well-being.

At the beginning of exercise and during sustained exercise, several different hormones perform critical functions to prepare the body for the stress of exercise as well as sustain the body's ability to continue exercising. Some of the key functions performed by hormones during exercise include:

- Mobilizing fats from fat cells to use for energy.
- Breaking down stored glucose in the liver and muscle cells to utilize as fuel.
- Increasing blood distribution to the exercising muscles (vasodilation in exercising regions, vasoconstriction in non-exercising regions).
- Increasing heart rate, heart contractility and blood pressure.
- Dilating the airways to increase airflow into the lungs.
- Sweating helps eliminate heat from the body.
- Preserving body water and electrolytes lost to sweating.

Three components comprise the network of the endocrine system:

- **Host glands:** Tissues or glands that manufacture, store, and release hormones directly into the blood. Examples of these glands include thyroid, pituitary, adrenal, and pancreas.
- **Hormones:** Chemical messengers released from one area of the body and transported elsewhere within the body (single or multiple target cells) to exert their effect. Examples of hormones include adrenaline, cortisol, glucagon, insulin, and melatonin.
- **Target cells:** Specific region or regions (cells) where the hormone action is executed.

Hormones control all essential reactions within the body that strive to maintain our constant internal environment when the body is subjected to:

- Changing external factors (e.g., temperature change).
- External influences entering the body (e.g., sugar entering the blood).
- External stimuli (e.g., exercise, muscle overload).



As a trainer, there are two conditions that affect the endocrine system, which may benefit greatly from personal training in the aquatic environment: diabetes and osteoporosis.

- Diabetes is a condition in which blood sugars are not regulated and results in individuals having too much glucose in their blood.
 - As a result of high blood sugar, an individual with diabetes is more susceptible to plaque build-up in their blood vessels and ultimately, cardiovascular disease.
 - Like land-based exercise, aquatic exercise helps lower blood sugar, and has been shown to positively impact blood pressure and cholesterol. (Delevatti)
 - If an individual with diabetes is being held back from land-based exercise by joint pain, they may tend to lead a sedentary lifestyle, exacerbating their condition. The aquatic environment is perfect for them, supporting their body and reducing inflammation.
- Osteoporosis is a condition in which there is an abnormal loss of bone mass, resulting in weak and brittle bones. This may be caused by a variety of issues but is more common in individuals who have too much or too little of certain hormones, including estrogen and testosterone.
 - To slow bone loss, and build strong bones, strength training and weight-bearing exercises are encouraged. With a fear of falling, and bone fractures (most often being the hip in a fall) the pool provides a safer environment to acclimate your clients to full range of motion, as well as balance and resistance training. (Hinman)

Cardiorespiratory Physiology

This system is responsible for the exchange of oxygen and carbon dioxide between the body and the air. Specifically, lungs take in oxygen through the nasal passage and trachea, where it is then quickly diffused into the blood. The lungs also expel carbon dioxide, a byproduct of cellular respiration.

Note, while the heart is part of the circulatory system, it is responsible for transporting oxygen from the lungs to our cells.

- Exercise influences the respiratory system both in the short-term and long-term. As soon as your physical demand increases, your lungs must work harder to cater to the organs. Exercise increases your respiratory rate, tidal volume (the volume of air that is inhaled or exhaled in only a single breath, and the rate of gas exchange. Over time, this demand strengthens those respiratory muscles, intercostal muscles, and diaphragm as they work harder. This promotes a greater lung capacity, allowing the lungs to draw more oxygen from the air, increasing blood flow, and improving lung efficiency. With these elevated levels of oxygen, you can focus better, and your immune system is powered up.

- From the aquatic perspective, your clients will be gently increasing their pulse and breathing rate, and over time their lungs will get better at meeting the demands of the labor.

- **Roles of the cardiorespiratory system:**

- **Ventilation** (movement of air into and out of the body)
- **Delivery** (oxygen and nutrients)
- **Removal** (carbon dioxide and waste products)
- **Transport** (hormones)
- **Maintenance** (acid-base balance – pH and fluid balance)
- **Prevention** (immune function against disease and infection)

- **The cardiovascular system consists of three components:**

- 1. The heart (pump)**

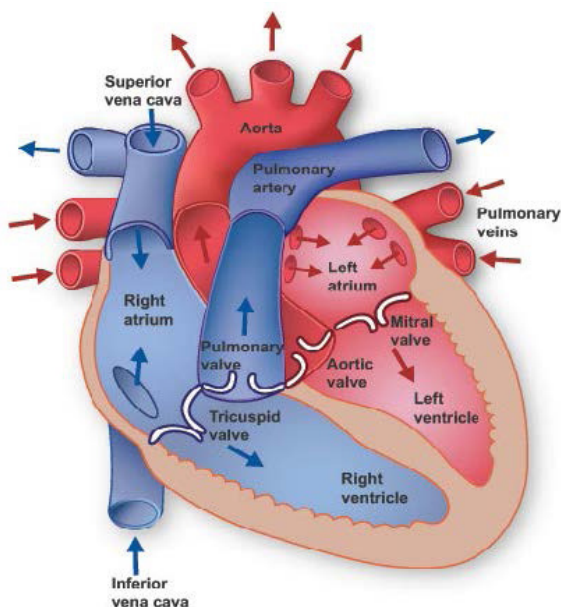
- One way flow-system consisting of 4 chambers (2 atria and 2 ventricles)
- Blood flows into the atria, then into the ventricles before being ejected back into circulation with high levels of oxygen.

- 2. The blood vessels (system of channels)**

- Arteries and arterioles transport blood away from the heart to the capillaries in a high-pressure system
- Veins and venules (very small veins) return blood to the heart from the capillaries in a low-pressure system
- Veins contain blood with low oxygen levels

- 3. The blood (fluid medium)**

- Plasma makes up 55% - 60 % of blood and is comprised of water (90%), proteins (7 %) and electrolytes, enzymes, fats, etc. (3 %)
- Formed elements make up 36% – 40 % (women) / 40% – 45 % (men) and comprised of red blood cells (99%) and white blood cells (1 %)
- Hemoglobin is the oxygen-carrying molecule found in red blood cells



- **Blood distribution throughout the body:**

- Blood enters the right atrium, passes into the right ventricle before being ejected into the pulmonary artery towards the lungs to exchange carbon dioxide (CO₂) for oxygen (O₂)
- After O₂ enters the capillaries in the lungs, venules, and veins (pulmonary veins) return blood to the left atrium, passing through the left ventricle before being ejected into circulation to deliver oxygen to the entire body.
- Blood returns to the heart entering the right atrium once again. 3 Blood pressure is a measure of the outward force exerted by the blood upon the vessel walls.
- During one single heart contraction cycle (approximately 1 second in duration at rest), the pressure within the vessels varies.
 - Coinciding with the heart contraction, the pressure is greatest and measured as Systolic Blood Pressure (SBP).
 - Coinciding with the heart relaxation or refilling phase, the pressure is lowest and measured as Diastolic Blood Pressure (DBP).

- **Risk Factors for Cardiovascular Disease (Centers for Disease Control and Prevention)**

- Genetic (Family History)
- Lifestyle (Diet, Obesity, Physical Inactivity, Cholesterol Levels, High Blood Pressure, Diabetes, Tobacco Use, Alcohol Use)
- Since there is a strong association between individuals with Type II Diabetes and cardiovascular disease, aquatic training can provide improvements in vascular function.

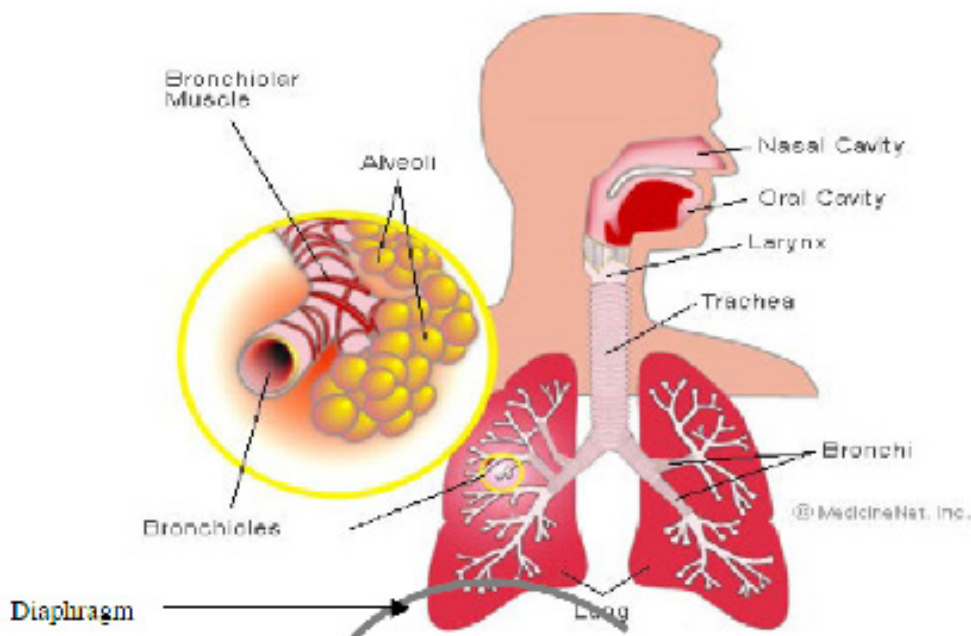


Figure 5: Lung Anatomy & Physiology

- The diaphragm, a dome-shaped muscle sits below the lungs and is the key breathing muscle.
 - When it contracts, it flattens and allows air to enter the body via the nasal and oral cavities.
 - Air passes through the rigid trachea, splits down the left and right bronchi into bronchioles and finally arrives at the alveoli where gas exchange occurs with the blood, exchanging O₂ for CO₂.
- During exercise, the muscle's demands for O₂ increases and the muscles produce more CO₂ as a result of respiration.

FUEL + OXYGEN = ENERGY + CARBON DIOXIDE + WATER

- Due to the increased demand for fuel and oxygen during exercise, the following acute adaptations occur:
 - Heart rate increases to circulate blood more rapidly and increases in proportion to exercise intensity.
 - Stroke volume (the amount of blood ejected from the heart with each beat) increases to circulate more blood.
 - Systolic Blood Pressure rises to increase the force of each heart contraction in order to eject more blood and overcome the resistance blood encounters when it reaches the exercising muscles.
 - Diastolic Blood Pressure changes very slightly or does not change at all as the refilling phase is unaffected by the exercising muscles.
 - Ventilation increases to deliver more O₂ to the working muscles and remove any excess CO₂ from the body.
 - Ventilation increases first by increases in tidal volume (volume of air moved with each breath) and then by an increase in breath rate (number of breaths / minute).

Thermoregulation

- Heat generated in the core of body must be transported to the periphery (skin) and is eliminated from the body via five mechanisms:
 - **Conduction – dry heat exchange**
 - Transfer of heat through direct molecular contact (touching).
 - Heat transferred is dependent upon the temperature gradient (difference) between the two surfaces and the thermal qualities of the surface.
 - **Convection – dry heat exchange**
 - Transfer of heat via the movement or removal of hot air blankets away from the skin surface.
 - For example, air currents (wind) remove air blankets from the skin surface.
 - **Radiation – dry heat exchange**
 - Transfer of radiant heat energy (heat) via electromagnetic heat waves to cooler, solid objects.
 - Heat moves along the temperature gradient without direct contact.

- **Evaporation**

- Removal of sweat, which contains heat from the skin surface.
- While an efficient system, it comes at a cost with dehydration (loss of precious water).
- *Yes, it is possible to sweat in the pool.*

- **Excretion**

- Heat contained within our breath, urine, and feces - contributes insignificantly to heat removal.

- Resistance to dry heat exchange is called insulation. In humans, the greatest insulators are fat, the number of layers of clothing, and the thermal properties of the fabrics we wear.
- Depending on air temperature and water temperature of the pool, choose to wear appropriate outerwear, such as neoprene or lycra, to help keep in the heat. Check-in with clients on their body temperature during session.
- The temperature of the water will continuously help keep their body cooler during workouts, which allows for a more strenuous workout without overheating.
- Heat that is produced in the body is “dissipated” into the water.

Table 2: Contributions of the Thermoregulatory Mechanisms at Rest and During Exercise

Thermoregulatory Mechanism	Rest	Exercise
Conduction & Convection	20 % of total	10 – 15 % of total
Radiation	55 – 60 % of total	5 % of total
Evaporation	20 % of total	80 % of total
Excretion / Lungs	5 – 10 % of total	< 2 % of total

- As sweating is the key mechanism during exercise and dependent upon hydration, during land-based training, dehydration will compromise our ability to remove heat and increase the likelihood of heat illnesses such as heat cramps, heat exhaustion, and heat stroke.
- In aquatic-training, the likelihood of these heat illnesses is significantly lower, especially if the pool is indoors. If training in an outdoor pool, proper hats, sunglasses, and garments can help your client protect themselves. In addition, the cooler pool temperature regulates the internal body temperature as it warms up.
- Fluid Intake Recommendations
 - 2 hours prior to exercise drink 400-600ml
 - Every ~15 minutes of exercise drink 200-300ml
 - Following exercise drink 400-600ml for every pound of BW lost during exercise

Digestive System

When you were young, you may have been told you needed to “wait at least 30 minutes after eating before getting back in the pool.” This is a myth (International Life Saving Federation), but there is a relationship between eating and aquatic exercise timing. From a training perspective, it’s important your Client understand how fueling pre- and post- exercise will affect their body and what their body systems are doing to be the most efficient. More can be found in the section on Nutrition.

- Prior to aquatic activity, the following food should be avoided, to prevent indigestion, cramps, or nausea: spicy and fatty foods, high fiber foods, sugary foods, alcohol, or any foods known to cause your client’s gut discomfort.
- Just like training on land, if a client is training at high intensity, it is highly encouraged for them to eat 1-2 hours prior to the workout, ideally a carbohydrate and a protein combination. Eating before high intensity exercise has been shown to increase performance and avoid dizziness/nausea. If a client is training at a low to moderate intensity, it is up to them on whether they want to eat prior to training.

When it comes to exercise and the digestive system, the bottom line is the two are mutually exclusive.

- When you exercise the body isn’t using its energy for digestion, instead it is redirecting as much blood as it can to feed your muscles and your lungs.
- The digestive system breaks nutrients down to fuel the body, providing cells with the necessary energy to carry out their functions for energy, growth, and cell repair. Food is moved through the digestive system by a mechanism called peristalsis, where muscles in the gut contract and push food along the GI Tract.
 - Peristalsis may be slowed down during exercise, but regular activity strengthens and stimulates the gut, increasing blood flow to the muscles, including the muscles that work in the digestive tract. This leads to improved bowel movements.



- For those suffering from digestive disorders (IBD, IBS, ulcers, hemorrhoids, etc.) the temperature, buoyancy, and support of the water can be a more comfortable environment for them to exercise in than land. In addition, the American Journal of Gastroenterology found that physical activity improves symptoms of IBS (Irritable Bowel Syndrome) and decreases the risk of gallstones forming.
- Consistent exercise enhances gut flora, more specifically, it promotes the diversity of bacteria and fungi in the gut. In short, the gut is directly influenced by an individual’s diet and lifestyle.
 - More than half of all the body’s cells that produce antibodies are found in the bowel wall and in the appendix (NIH,) the gut flora make it difficult for germs to spread and enter the body.
 - The gut microbiome is extensive with 70% of the immune system located in the GI Tract. For your active aging clients, boosting immunity is a focus, especially if they are coming out of a sedentary, isolated lifestyle.
 - Increased numbers of good bacteria can also help with symptoms of irritable bowel, regulation of bowel movements, and inflammation reduction.

Lymphatic System

The lymphatic system, a central part of your immune system, is a dynamic system with a multitude of key functions that support other body systems.

- First, it collects excess fluid, predominantly plasma, from tissues in your body and moves it along, back into your bloodstream.
- Second, it absorbs fat and proteins from your intestines and moves them back into your bloodstream.
- Third, it removes waste products and abnormal cells from the lymph fluid.
- Lastly, it serves to promote your immune system, protecting your body against bacteria, viruses, parasites and more, by producing and releasing white blood cells that target those invaders. From the bloodstream, the fluid is then filtered through your kidneys, where waste is removed and passed out as urine. Fluid balance between various fluid compartments of the body.

While there are a number of organs, including the thymus, bone marrow, appendix, tonsils, spleen that contain lymphoid tissue, for the purpose of this certification it is important to understand the movement of lymph and why that is important.

- The lymphatic fluid referenced above is a collection of plasma, proteins, fats, nutrients, damaged cells, and foreign invaders. The system is monitored by lymph nodes, glands that supervise and cleanse the lymph fluid, filter out waste and invaders, and produce the lymphocytes (white blood cells).
- Movement happens through lymphatic vessels, capillaries, and tubes throughout your body, very similar to how veins work, but unlike the veins (which move via high pressure from your circulatory system), lymphatic vessels operate under very low pressure, which is why exercise and activity is so important, to boost lymph flow! Lymph fluid is dependent on skeletal muscle contractions to move through the body.



Lymphedema

A very common condition that most often leads to swelling in the arms and legs, due to a blockage in lymphatic system, is lymphedema. Swelling may also appear in the chest, abdomen, neck, or genitalia. In addition to swelling, clients with this condition may experience a feeling of tightness and heaviness in their extremities, aching or discomfort in the afflicted body parts, or even inability to move the affected limb.

- While this condition can be genetic, lymphedema can also be caused by cancer treatments that remove or damage lymph nodes, including radiation and surgery.
- Compression garments typically work on the affected area, but due to its hydrostatic pressure, there may not be a need for a client to wear a compression garment in the water, unless the affected area is out of the water for periods of time, as recommended by physicians.
- Encourage adequate hydration so lymph fluid can easily move through the body to help control the symptoms and prevent the progression of the condition.

- Ways to get lymph fluid moving in the water:
 - Rebounding and pumping the arms (straight arms)
 - Press the palms of the hands together at the surface of the water several times
 - Calf raises
 - Water walking

Immune System

The immune system functions to defend the body. The goal of this complex network of cells and organs is to protect against harmful microorganisms, including viruses, parasites, bacteria, and fungi. The key players of the immune system are familiar, many of the organs and systems we have addressed before, in the lymphatic and digestive systems, as well as chemical components: the thymus and bone marrow, the lymph nodes, spleen and tonsils, the spleen and skin, the gut, and the mucous membranes in and around the nose and throat, bladder, and genitalia. Incredibly important to the body are white blood cells, also known as lymphocytes, which seek out, attack, and destroy germs.

- The immune system is affected by things in and outside of our control, such as age, sex, genetics, history of infection, etc.
- If working properly, the system can identify which cells are foreign to the body. White blood cells, residing in a variety of tissues all over the body, have their own mission- to respond to invaders and protect.
- When the system is not working properly, white blood cells may attack their own cells (autoimmune disorders), overreact to a harmless substance (allergies), grow cells uncontrollably (cancer), or even trigger widespread inflammation leading to a series of organ failures (sepsis).
- While sustained and regular exercise has shown to have an anti-inflammatory effect on the body, increasing the circulation of lymphocytes by 50% to 400%, research has begun on the effect of water temperature on boosting the immune system.
 - In water temperatures of 86 degree or less, it appears that immune function is increased by improving the body's ability circulation, moving oxygen and nutrients to cells, boosting lymphocytes.
- The presence of inflammation in the body distracts your immune system. Inflammation is caused by stressors. According to the CDC, aquatic exercise reduces depression and anxiety, relieving tension and improving mood. When stress is lowered, there is less inflammation in your body, which means your immune system can truly focus on other invaders.



SECTION 4

Properties & Benefits of Water Based Exercise

Each person in this certification comes from a different background, with varying experience. Perhaps you are an aqua fitness group instructor looking to start personal training in the water on a 1:1 or small-group scale, or maybe you are a land-based instructor looking to bring your clients into the water. Wherever you are coming from, it is important to note that there are differences in training in a land-based studio/gym compared to an aquatic environment, outdoor or indoor pool. For both you and the client, there are considerations. As an aquatic personal trainer, you have all the liability (both responsibility and legal obligations) to ensure the safety of your client(s).

When an individual trains on land, they are training in air, a gas, which is very different than water, a liquid. An obvious difference is that water is considerably denser (the same volume of it weighs more since it has more molecules per unit of volume and those molecules are bonded together and viscous (thicker). This means there is a huge difference in how we move on land versus how we move in the water. On land, your body works in opposition to gravity. Your postural muscles are working to keep you from falling over through constant adjustments to your balance, using stabilizing muscles. When you move faster on land- jogging, running, biking, high impact exercise movements, air resistance also plays a role. When you are in water, gravity is much less important due to buoyancy, and your focus becomes drag, water resistance. This next section will bring to light these differences.

Benefits of Regular Exercise

- Lowers the risk of premature death
- Reduces the risk of dying from heart disease
- Decreases the risk of developing diabetes
- Reduces the risk of developing high blood pressure
- Helps reduce blood pressure in people who already have high blood pressure
- Reduces the risk of developing chronic illnesses and cancers
- Boost happiness level/ Reduces feelings of depression and anxiety
- Helps to achieve and maintain a healthy body weight
- Improves the quantity and quality of sleep
- Helps build and maintain healthy bones, muscles, and joints
- Promotes psychological well-being/ Better self-image

Additional Benefits of Aquatic Exercise

- Improves flexibility and mobility
- Increases muscle strength and endurance, but decreases muscle soreness
- Improves joint health and provides a low impact option for Clients

- Reduces pain
- Improves core strength, overall balance and assists Clients in fall prevention
- Builds body awareness
- Keeps the body cool during exercise

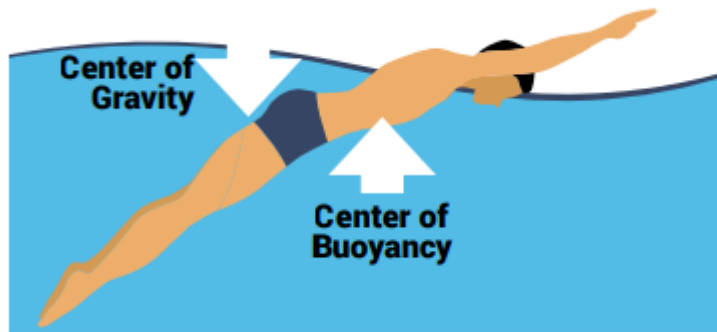
Properties of Water

Water, an inorganic compound, which can be found in three states (liquid, solid, vapor) has more than a few properties that when applied to an aquatic workout creates a unique experience. The properties of water, as explained from the SCW Aquatic Fitness Certification, include:

- Buoyancy
- Resistance
- Hydrostatic Pressure
- Viscosity
- Cohesion
- Adhesion
- Surface tension

Buoyancy

- Buoyancy is defined by Archimedes' Principle: **Any object, wholly or partly immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object.**
- Simply, your Client will experience a partial, floating feeling when they enter the pool because the amount of buoyancy is reflected by the amount of water displaced. Water both supports the body, as well as assisting and resisting movement.
 - Most people are buoyant, and the amount of buoyancy is based on body size, density, lung capacity, and body fat percentage. Knowing this will help determine the proper water depth for your Client, to perform varying exercises. While mid-chest is generally preferred, if you have a Client that floats easily, that depth may be too challenging to keep their feet on the pool bottom. Choose shallower water.
- This buoyant nature aids exercising in various ways and lifts the weight of the body upward thus relieving the spine and other joints from carrying body weight. For Clients with lower body or spinal injuries, pregnant, or those with physical limitations, the buoyancy of the water is a welcome benefit as it offers a gentle, floating feeling immediately upon entering the water.
- Here is an idea of how much weight load is changed depending on the depth of body immersion:
 - Neck-depth about 10%
 - Chest-depth about 25-35%
 - Waist-depth about 50%
- Buoyancy adds the challenge of maintaining control, thus enhancing core stability, and makes water exercise less jarring by reducing weight on the body joints which lessens impact shock and allows for less-restricted, full range of motion movement.



- In the above picture, if the two centers are off balance, caused by movement, then participants won't be vertically aligned. So, as a trainer, be sure to take this into consideration when planning portions of your session, with proper transitions and travelling to keep Clients aligned.

Resistance

Water is unique as it offers a wonderful tool - natural resistance. Instead of gravity as resistance on land, the pool environment alone is a liquid weight room. Water provides different types of resistance such as viscosity and drag.

- **Viscosity** is the quality or state of being viscous (sticky) and the property that creates the resistance that occurs between the molecules of a liquid affecting how that liquid flows. It can also be thought of as a measure of a fluid's resistance to movement.
 - Liquids of high viscosity, such as oil, flow slowly. Liquids of a low viscosity, such as mercury, run faster.
 - *Water is 790 times more viscous (or thicker) than the air we breathe.* This allows for a variety of ways to create resistance in the water.
- When considering the property of **drag, water offers 12 times the resistance of air**, and creates resistance in ALL directions of movement during the same workout. Exercising in the water affects the entire body, from all sides and directions always – multi-dimensional- which offers exercise balance in all planes of motion. On land, doing the same exercise, your Client may experience the resistance in only one direction.
 - **Consideration #1:** The water is a dynamic resistant force, which means the more push against it, the more it will “fight back”. The water's natural resistance requires your Client to apply more force to move it as opposed to the same movement out of the water. As the client walks or runs in the water, that person drags water molecules along. If the surface area of a body part is increased by a piece of buoyant equipment, like aqua dumbbells, or paddles, even more force is required to move the water in front of it. The larger the surface area of the object or body, the greater the muscles need to move. So, for example, if your Client moves with their chest leading, the surface area is greater and so is the resistance, versus walking with their shoulder leading the way.
 - **Consideration #2:** Movements in the water tend to be slower, about half the speed of land-based movements, which requires more control and lessens the risk of joint injury.
 - **Consideration #3:** Surface tension refers to the water resistance at its surface. **The cohesiveness among water molecules is responsible for surface tension**, i.e., the top layer of water molecules bond strongly to each other creating a surface membrane that makes

moving an object through the surface more difficult than moving an object that is completely underwater.

- When you design a workout for your Client, select movements that allow for an intentional disruption of surface tension before placing the arms back into the water, such as elbows entering first. For example, jumping jacks performed in the water should only have the arms come up to the surface, but never break it, to prevent the shoulder joint from being put under stress due to the resistance the hand makes when entering back into the water.

Hydrostatic Pressure

- Water exerts pressure against the body, the same in all directions, acting like, imagine this, “full body compression socks” during training sessions. **Hydrostatic pressure is the force put upon other objects when not in motion.**



- The deeper you are, the more pressure there is, which is a great benefit to many aquatic exercisers, especially for those with swelling due to inflammation (edema) or who are pregnant, because the water literally pushes on anything submerged in it. This aids the body's circulatory system by helping blood return to the heart (venous return). The hydrostatic pressure also encourages fluid absorption into the circulatory system.
- On the lungs, it is a beneficial property for the promotion of deep breathing. The muscles that expand the chest are subject to this hydrostatic pressure and are strengthened, allowing for more air to be inhaled, which means that when your Client returns to land, their air intake will be greater.
 - Note: Due to the nature of hydrostatic pressure, it is highly encouraged that all Clients with respiratory problems get clearance from their Doctors before performing aquatic exercise.
- Hydrostatic pressure of the water also helps to take the lactic acid out of the cells and delivers it to the liver more efficiently, which means your Client will not feel as sore! For some, this will be a relief, for others, who expect hard training sessions to leave them sore, this will be a learning curve—offer reassurance and explain why DOMS is rare in aquatic exercise.

Viscosity

Viscosity is the property of water that makes water resistant to motion. It is defined as **the state of being thick, sticky and semifluid in consistency due to internal friction**. More simply, a measure of a fluid's resistance to flow. Viscosity occurs due to water molecules' tendency to stick together (**cohesion**) and water molecules' tendency to stick to anything submerged in them (**adhesion**).

- When a person gets in the pool, water adheres to the surface of the body. The water molecules that are sticking to your Client are also trying to stick to other water molecules. As the person moves through the water, water molecules are being dragged not only on the body, but also to each other. So, when you combine the surface area of the person and the speed being travelled, that creates the amount of drag. Water flow can be either streamlined or turbulent. While swimmers prefer streamlined movement, you may choose to have your Client purposely create turbulence, by moving their arms and legs with different lever lengths or hand positions, changing the resistance.

Surface Tension

- **Surface tension refers to the water's resistance at its surface**, sort of like the surface of the water having skin.
 - The cohesiveness between water molecules is responsible for surface tension. The surface water molecules do not have other water molecules on all sides of them and consequently are more cohesive than those directly associated with them on the top of the water. This forms a "membrane", which makes it more difficult to move an object through the surface than to move it when it is completely submersed.
 - In aquatic exercise, surface tension is mostly a concern when directing clients to move their arms out of the water to shoulder level or higher. When an arm breaks through the surface, there is no longer any resistance, but when it returns and breaks back through the water, the shoulder joint is put at risk for injury because of the added resistance.
 - It is safe for a swimmer to break the surface when performing a front or back crawl due to the streamlined body, but aquatic exercisers should only break the surface tension when either moving very slowly or creating a point of entry such as a "blade hand" or bent elbow.
 - It is advised by the Aquatic Exercise Association to keep movement either above or below the water's surface, but not interchange between the two.

Table ____: Review of Water Properties & Terminology

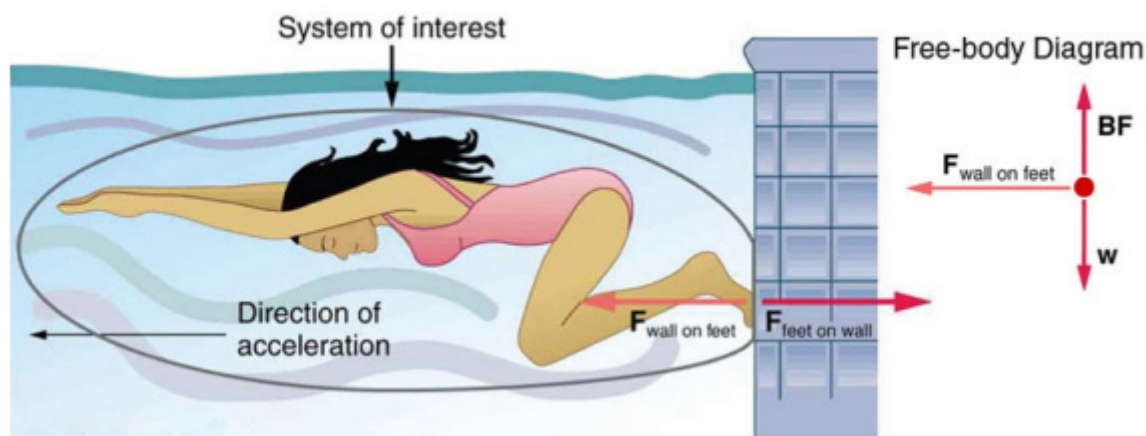
Concept	Review
Buoyancy	The client, wholly or partly immersed in the water, is buoyed up by a force equal to the weight of the fluid displaced by their body; the antagonist is gravity.
Drag Resistance	Depends on the shape and size of the individual and his/her speed relative to the water. The client moves forward in the water, the water pushes back; resistance to the body's motion in the water.
Hydrostatic Pressure	The force put upon other objects when not in motion; provides constant pressure to the body and/or limbs immersed in water
Cohesion	Water molecules' tendency to stick together; water is attracted to water
Adhesion	Water molecules' tendency to stick to anything submerged in them; water is attracted to other substances
Viscosity	The state of being thick, sticky and semifluid in consistency due to internal friction; a measure of fluid's resistance to flow; a result of cohesion and adhesion
Surface Tension	Water's resistance at its surface, as result of the cohesive nature of water molecules.
Turbulence	Currents and eddies contribute to resistance during exercise, working with or against the resistance; creates an unstable environment in which the stabilizing muscles much work harder.

WATER PRINCIPLES

To truly understand how a movement will feel in the water, you need to be in the water, especially if you have been primarily a land-based trainer/group fitness instructor. To swim forward, you must pull water backward with your hands. To stop movement suddenly, you can sink your feet while pulling your hands down in a circular motion in front of you. How your Client moves during exercise, how fast they move, and gravity's effect on their body, can be explained using Newton's Laws of Motion.

- Three types of inertia play a role in the water:
 1. The movement of the limbs through the water
 2. The movement of the water
 3. The movement of the entire body through the water.
- As a trainer, you can increase the intensity of the workout, by adding the element of travel through the water.

The First Law of Motion is the Law of Inertia, which was originally defined by Galileo, states that “a body remains in motion unless acted upon by an active force.” Once an object is moving, it requires an additional application of force to overcome momentum and stop, change the type of movement, or change direction. In addition, objects at rest tend to stay at rest, unless acted on by external forces.



- As your Client trains, they will go from a rest state to a moving state. The force will come from their legs (feet) pushing off the ground or their hands and feet propelling them. Movement in the pool requires more muscle strength to travel through the water versus on land. Just remember an object's inertia has the inclination to resist changes while moving and to go from rest to motion a person must exert enough effort to overcome the inactivity and overcome drag.
- Be aware of two kinds of physical movement: 1. **Movement within the body** refers to moving joints (knee flexion, hip extension, etc.) and 2. **Movement of the body** refers to moving through space from point A to point B. Both kinds of movement require energy, muscular contractions, and force.
- Since water is denser than air, when you move an arm or leg in the pool it creates drag. This can change depending on the length of the limb. If, for example, a leg is straight, as in a leg lift, then there is more surface area going through the water, creating more drag, and depending on the speed

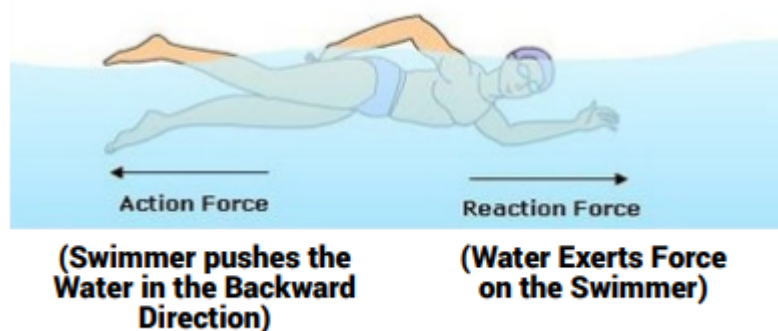
it's causing more inertia. If it is bent, as in an aqua jog, then the resistance isn't as great, but the speed is faster.

- Lastly, the water itself can create inertia. For example, when a client moves laterally to the right, and then changes instantly to move laterally left, the water doesn't follow and slows them down.

The second of Newton's laws is the Law of Acceleration, which states "acceleration is directly proportional to the summation of all forces that act on an object, and inversely proportional to its mass OR Force = Speed x Acceleration." Basically, if you use muscular effort, you accelerate or increase force.

- If we look at someone swimming, the force produced by the individual is equal to his/her mass multiplied by the acceleration of the swimmer in the water. This explains why some people swim faster than others. So, to relate this to aquatic cardio training, acceleration is the speed at which a client moves multiplied by the amount of force used to perform the movement.
- Your task is to assess the skills and abilities of your clients to determine the most effective amount of acceleration they need to experience a workout that meets their session goals.
- Acceleration can be increased with faster and/or stronger movements. Moving faster during exercise may not be the best choice for increasing acceleration. Participants can manipulate acceleration by pushing off the bottom and sides of the pool and against the water itself. Speed brings a risk of injury, so, in some instances, instead of moving faster, have the participant be more forceful, that way there is less momentum and more muscular control. The safer option for more intense, accelerated movement would be force. Learn to describe what this feels like in their bodies to help them identify their ability to use force.

Newton's third law, the Law of Action and Reaction states that for every action in nature there is an equal and opposite reaction. This means when one body pushes or pulls with another body force is exerted. There must be two bodies for a reaction to occur after an action. The properties of water cause a distinct noticeable reaction for every action with every movement. Let's look at our swimmer again, the swimmer pushes the water backward (action) as the swimmer moves forward (reaction.)



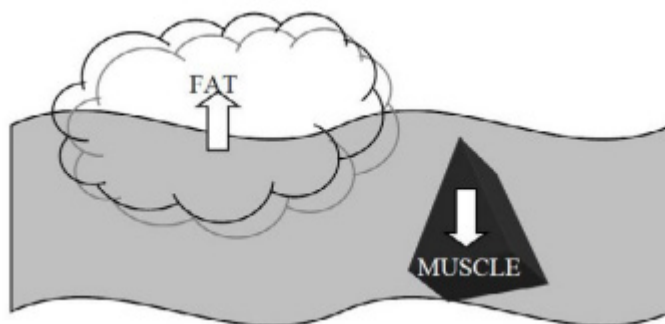
In water exercise, if a person performs a chest press, the force of the arms (action) against the water, pushes that person back (reaction.) Let's look at a leg extension. Stand in chest-deep water and flex your hip joint lifting your straight leg in front of your body(action). The reaction is the water around your leg moves upward and forward while your body will have a tendency to move backwards.

- Understanding the natural reactions in water to body movement will help you design appropriate exercises for your clients. Allowing your body to follow movements with natural reactions will feel intuitive and less resistant.

- In the pool, arm and leg patterns are often combined to create distinctive reactions. Designing movements that oppose natural reactions can offer challenges in resistance and balance. Be sure to understand how to modify and progress a movement in order to create success and confidence for your Clients.

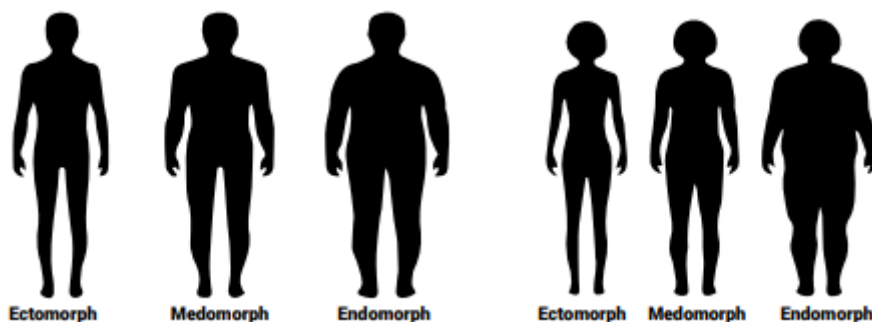
Floaters and Sinkers: Body types

When standing in the pool, participants are pulled down by gravity and up by buoyancy. Keep in mind that dense material (e.g., muscle) will tend to sink. Five pounds of muscle covers a smaller area than five pounds of fat. In the aquatic environment, **participants who have a low body fat percentage will be less buoyant (sink) and those with higher body fat will be more buoyant (float)**. This fact does affect how exercisers are able to move in the water.




Different body types “Somatotypes” in the water

- Body types developed in the 1940’s by psychologist Dr. William Herbert Sheldon associating personality characteristics with body fat distribution. (Reference: Atlas of Men; W. H. Sheldon, 1954.)



- There are three body types related to fat distribution:
 - 1. Ectomorphs** are long and lean build, regardless of height. They have a fast metabolism, do not gain weight easily, but also do not gain muscle easily. In the water, an ectomorph would most likely sink vs. float, although some ectomorphs have such little muscle mass, a combination of ecto-endo, with more body fat, they may find themselves struggling to stay connected to the bottom of the pool.
 - 2. Endomorphs** tend to be more stout, round, or curvaceous, and have no trouble gaining muscle, but they are prone to larger amounts of body fat and a slow metabolism. They tend to carry weight in their lower abdomen, hips, and thighs. In the water, your endomorphs will float much easier due to body fat.

3. Mesomorphs are naturally strong, athletic build, with broad shoulders and chest and often a smaller waist. They have no trouble gaining muscle but are prone to weight gain around the midsection. In the water, your mesomorphs will sink and struggle to stay afloat, due to their high percentage of muscle mass.

A woman with dark hair, smiling, is in a swimming pool. She is holding a blue ring-shaped object. Another person is partially visible in the background, also in the water.

SECTION 5

The Aquatic Teaching Environment

The Trainers environment is the pool deck.

- Since most pool decks are made of hard, unforgiving material, you may want to ask the management or bring in your own teaching mat. The area frequently becomes slippery. Non-slip water shoes or sneakers will keep you safe if the pool deck is wet. Check your space to make sure it is free of debris, and that you won't trip up on equipment.
- If there is no lifeguard, know where your emergency equipment (AED and First Aid equipment) and phone are in case of an emergency. Make sure to meet with your manager to learn your facility protocol and what to do if there is an emergency.
- Most likely, you will be close enough to your participant(s) that they can hear you. Learn to project your voice, especially if the environment is outside or tends to echo.
- Just as you would encourage your client to bring their sunscreen (if outdoors), and water, make sure you also protect yourself from the elements and stay hydrated.
- A water-resistant clipboard, a white board/white board marker, and notes saved under page protectors can be assets to your training.
- A stool can be very helpful when it comes to demoing exercises for your clients, especially if they are in shallow or suspended in deep water.

The Clients environment is the water.

Water Temperature is important to consider when facilitating training in an aquatic environment, both indoors and outdoors. If you train outside, especially in high heat, the water is a terrific alternative to land-based training/walking/running.

- Traditionally a pool used for aquatic fitness is **typically within the range of 80 to 84 degrees**. A specialized class, one used for physical therapy or arthritis, may be heated up to 90 degrees, according to the AEA Arthritis Foundation Program.
- Please note, the pool temperature should never be more than 94 degrees, as this may worsen pre-existing conditions, and add strain to the heart during activity.
- For gentle exercises, a slower paced class, with clients that may be in the water for 30-55 min sessions, 86-90 degrees will help to soften harden tissues and relax the muscles.
- Reminders:
 - Awareness of client medications and side effects are important as some meds may cause low blood pressure. For example, the nervous system of a Parkinson's client is more vulnerable to sudden or unexpected changes, including cool water temperatures.
 - Pool conditions vary from facility to facility and possibly day-to-day.

- “Chill bumps” and “shivering” are signs that the water temperature is too cold for the current level of exercise intensity. Options include appropriate clothing and exercise intensity modification.

Water Depth

What depth does your pool go to? Does it have a gradual slope? Your personal training sessions will have more possibilities if your clients can move in various water depths. Varying depths have advantages and disadvantages. The shallower your Client stands, the more impact on their joints. If the water is too deep for an exercise, your Client will come out of good form, or may not be able to complete the exercise.

1. Waist-high water exercise is typically conducted in 2.5-3.5 feet of water.

- Common for an individual just beginning a water walking routine.
- Ideal for non-swimmers, with anxiety about getting into the water.
- *Movement examples:* water walking and pool wall work such as heel slides, wall sits, etc.

2. Shallow water exercise is typically conducted in 3.5-5 feet of water. Depending on the height of your client, you may aim for mid-ribcage to mid-chest.

- This depth can accommodate clients of varying heights with control.
- There is consistent foot contact with the bottom of the pool which provides more stability and balance, and can be used for faster acceleration, changing exercise intensity.
- Ideal for non-swimmers or less confident swimmers to engage in aquatic personal training.
- Since the chest is only partially submerged, breathing is usually easier.
- Consider limiting upper body movement changes in and out of the water to minimize shoulder stress.
- Research shows that shallow water exercise enhances bone formation and decreases the breakdown and absorption of old bone.
- *Movement examples:* elbow flexion & extension, front kick, etc.

3. Deep water exercise is typically conducted in water over 5 feet. Depending on the height of your client, you will want them neck depth or suspended in the water.

- Ideal for clients who cannot tolerate any impact at all.
- A form of flotation is recommended- buoyancy belts, ankle cuffs, or noodle.
- Clients should be able to swim.
- Can provide a very challenging exercise opportunity for adept swimmers who do not want to wear a flotation device.
- Form and alignment can be compromised since the feet do not contact the bottom of the pool.
- Greater cooling effect on the body but breathing will be more difficult as more pressure is exerted on the body.
- Allows for uninterrupted, full range of motion (ROM).
- Ideal for obese and pregnant clients, as they can move without impact, and do not need to

hold their bodies upright against gravity.

- Clients may fatigue more quickly at this depth.
- *Movement examples:* aqua jogging, noodle tucks/twists, etc.

Air Temperature & Air Circulation

- It is very rare that the temperature in and out of the pool is the same and while it is much easier to control the air temperature in an indoor pool and air circulation is a non-issue if you are training in an outdoor pool, you are limited to your facility.
- If your Client is participating in a slow to moderate paced session, a more comfortable air temperature may be 80 to 84 degrees.
- If your Client is working at a higher intensity, a more comfortable air temperature may be less than 80 degrees, anywhere from 72 to 79 degrees.
- For an outdoor pool, the air temperature is beyond your control, but utilizing shade and wearing appropriate clothing is important for both you and your client. If the air temperature is too extreme, one way or the other, communicate with your Client about land-based cross-training.

Aquatic Safety Considerations

- **Chlorine** in pools is destructive to garments, compressions sleeves, etc. in addition to being destructive to rubber resistance bands neoprene land weights, etc. Rinse and dry garments and equipment thoroughly after training and always inspect the integrity of the equipment before using.
- **Skin Disorders** are common and while they may not be considered during land-based PT, you want to remind clients, if they suffer from any blisters, skin cancers, skin infections, rashes and dry skin, acne, disorders such as psoriasis and eczema, it is highly recommended to consult their primary care doctor and/or dermatologist. For most conditions, being in the water is fine, but it's important to not exacerbate any condition. *Note:* Cases of cellulitis, chickenpox, shingles, or impetigo should not enter the pool.
- Be consistently aware of the **level of fatigue** of your client using the RPE Scale.
- **Sunscreen and a hat, possibly a water shirt** for PT sessions outdoors will help protect exposed body parts- for both you and your Clients!
- **Shower before entering the water** to reduce the binding of substances, such as chlorine, to the skin.
- **Water Shoes** can reduce intense irritation on the bottom of the feet and rashes, in addition to providing a better grip on the bottom of the pool for multiplanar movement.
- **Flip flops** and/or effectively drying the feet post-session to reduce athlete's foot.

Water Fitness Equipment

During many sections of your training session, you may choose to incorporate equipment to aid in flotation, increase resistance, or aid your Client in reaching muscle fatigue. Equipment can also add variety and enhance the exercise itself. While pool noodles and hand buoys are obvious choices for equipment...think outside the box. There are so many new aquatic tools on the market, and more are designed every day!


- Ask yourself- what is the purpose of using this equipment?
 - Drag resistance equipment will increase resistance for your Client, the faster they move.
 - Buoyancy equipment, such as a kickboard or flotation belt, may be used to enhance form and alignment, or allow your clients to suspend in the water.
 - Tubing or bands will add resistance and assist in mobility and range of motion exercises.



Basic Equipment	Description & Use
Noodles	Buoyant, cylindrical foam, come in a variety of length and width
Paddleboards/ Kickboards	Dense foam board, with handles that can be used to engage the core and lower body, while adding an element of flotation
Resistance Tubing	Thick, snap-resistant bands with handles and varying resistance
Aqua Dumbbells	A foam dumbbell, offered in a variety of resistance with foam covered handles to reduce over gripping; may be used in a variety of ways to provide flotation, resistance or drag
Aka Hand Buoys	Adjustable foam belt used for buoyancy and balance
Flotation Belt	Neoprene, webbed gloves used to add resistance to upper body workouts
Aqua Gloves	Water's resistance at its surface, as result of the cohesive nature of water molecules.

Beyond the Basic	Description & Use
Ankle Cuffs	Adjustable foam ankle cuffs that offer flotation and resistance
Aqua Steps	A plastic step, usually with a rubber, anti-slip surface
Aquatic Ankle Weights	Adjustable neoprene ankle weights, sold in pairs, typically 2-4 lbs each; add in resistance to endurance training
Push Plate	Versatile plate with handles that allows water to flow through; used primarily for full body vertical motion and rotational movements
Exercise belt	Neoprene weighted belt that adds drag during walks or jogs

- The above is aquatic-specific equipment. Consider equipment from land-based exercises as well: dumbbells, kettlebell, Swiss stability ball, and plastic gliding discs.
- Care for equipment should include rinsing and properly drying it it post use.



SECTION 6

Health Screening & Fitness Assessments

A health screening is a vital FIRST step in the Personal Trainer/Client relationship. During onboarding, this pre-participation conversation and tool will allow you to truly gain an understanding of what their body has been and is going through.

- A Health Risk Appraisal (HRA)/Health Screening identifies the presence or absence of known cardiovascular, pulmonary and/or metabolic disease, or signs or symptoms suggestive of cardiovascular, pulmonary and/or metabolic disease.
- An HRA identifies individuals at increased risk who should:
 1. First undergo medical evaluation and exercise testing before initiating an exercise program.
 2. Be excluded from exercise or physical activity until those conditions are corrected or are under control.
 3. Should exercise in a medically controlled environment.
- HRA questionnaires are designed to provide information regarding existing risks for participation in activity and need for a medical clearance.
 - A pre-participation screening **MUST** be performed on all new participants (regardless of age) in any facility that offers exercise equipment or services.
 - The screening procedure should be valid, simple, cost- and-time efficient and appropriate for the target population.
 - Screening procedures range from self-administered questionnaires to elaborate tests:
 1. For individuals participating in self-guided or directed activity, they should minimally complete an HRA.
 2. **The Physical Activity Readiness Questionnaire (PAR-Q) has been used successfully when a short, simple medical/health questionnaire is needed.**
- Experts recognize the PAR-Q as a minimal, yet safe pre-exercise screening measure for low-to-moderate, but not vigorous exercise training. It is quick, easy, and non-invasive to administer.
 - Note: It is limited by its lack of detail and may overlook important health conditions, medications, and past injuries.

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age and you are not used to being highly active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly:

YES

NO

☐☐

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?

☐☐

2. Do you feel pain in your chest when you do physical activity?

☐☐

3. In the past month, have you had chest pain when you were not doing physical activity?

☐☐

4. Do you lose your balance because of dizziness or do you ever lose consciousness?

☐☐

5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?

☐☐

6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?

☐☐

7. Do you know of any other reason why you should not do physical activity?

If you answered YES to one or more questions:

Talk with your doctor by phone or in person **BEFORE** you commence any physically active program or **BEFORE** your fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want – as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those that are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

If you answered NO honestly to all PAR-Q questions:

You can be reasonably sure that you can:

- Start becoming much more physically active — Begin slowly and build up gradually. This is the safest and easiest way to go.
- Take part in a fitness appraisal — this is an excellent way to determine your base fitness level so that you can plan the best way for you to live actively.

Delay becoming much more active:

- If you are not feeling well because of a temporary illness such as cold or a fever — Wait until you feel better; or
- If you are or may be pregnant — Talk to your doctor before you start becoming more active.

Please note: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire consult your doctor prior to physical activity.

You are encouraged to copy the PAR-Q but only if you use the entire form.

Note: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

I have read, understood, and completed this questionnaire. Any questions I had were answered to my full satisfaction.

Name: _____

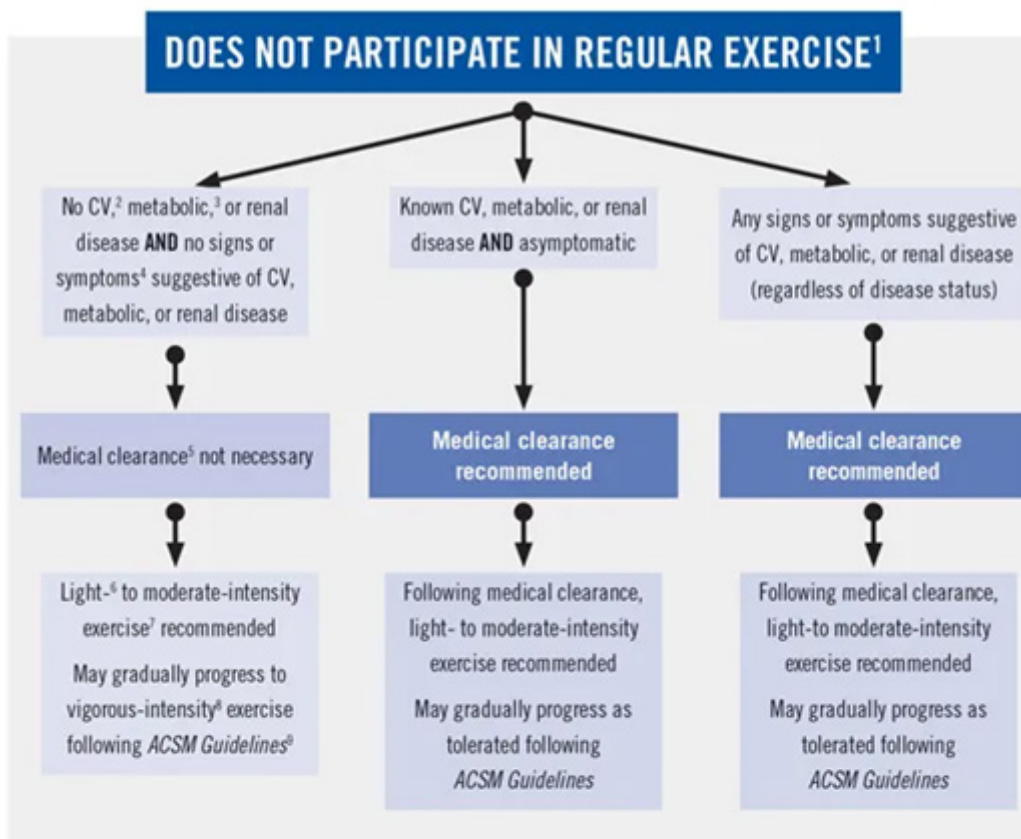
Signature: _____ Date: _____

Signature of Parent or Guardian (for under- age participants): _____

Witness: _____

Physical Readiness Questionnaire – PAR-Q © Canadian Society for Exercise Physiology

- Ultimately, when working with Clients, you will need to learn how to conduct a more complex health risk assessment than the simple PAR-Q presented here. The **ACSM/AHA Health/Fitness Facility Pre-participation Screening Questionnaire** investigates one's history, symptoms, cardiovascular risk factors and other health issues in greater detail. This is important in **determining if a Client should initiate an exercise program or contact their physician for a more detailed evaluation.**
- This updated health-screening process is based on three factors that have been identified as important risk factors of exercise-related cardiovascular events:
 1. The individual's level of current physical activity.
 2. Diagnosed cardiovascular, metabolic, or renal disease and/or the presence of signs or symptoms of those conditions.
 3. The desired exercise intensity
- The basis for recommending physical activity / exercise, a medical examination, exercise testing, or physician supervision is based on the risk stratification of the HRA and encourages client safety as they begin their exercise program.
 - Individuals are identified as low, moderate, or high risk.
 - Low risk: Less than 2 risk factors. No medical examination/supervision required.
 - Moderate risk: 2 or more risk factors. Medical exam recommended before rigorous exercise.
 - High Risk: Has a known cardiovascular, pulmonary, or metabolic disease. Medical exam and supervision recommended before exercise.
- The following algorithms were created by the American College of Sports Medicine, ACSM's Guidelines for Exercise Testing and Prescription (2018), to help you determine when medical clearance is truly necessary.



¹ **Exercise participation** Performing planned, structured physical activity at least 30 minutes at moderate intensity on at least 3 days/week for at least the past 3 months

² **Cardiovascular disease** Cardiac, peripheral vascular, or cerebrovascular disease

³ **Metabolic disease** Type 1 and 2 diabetes mellitus

⁴ **Sign and symptoms** At rest or during activity. Includes pain, discomfort in the chest, neck, jaw, arms, or other areas that may result from ischemia; shortness of breath at rest or with mild exertion; dizziness or syncope; orthopnea or paroxysmal nocturnal dyspnea; ankle edema; palpitations or tachycardia; intermittent claudication; known heart murmur; unusual fatigue or shortness of breath with usual activities

⁵ **Medical clearance** Approval from a healthcare professional to engage in exercise

⁶ **Light-intensity exercise** 30–39% HRR or $\dot{V}O_{2R}$, 2–2.9 METs, RPE 9–11, an intensity that causes slight increases in HR and breathing

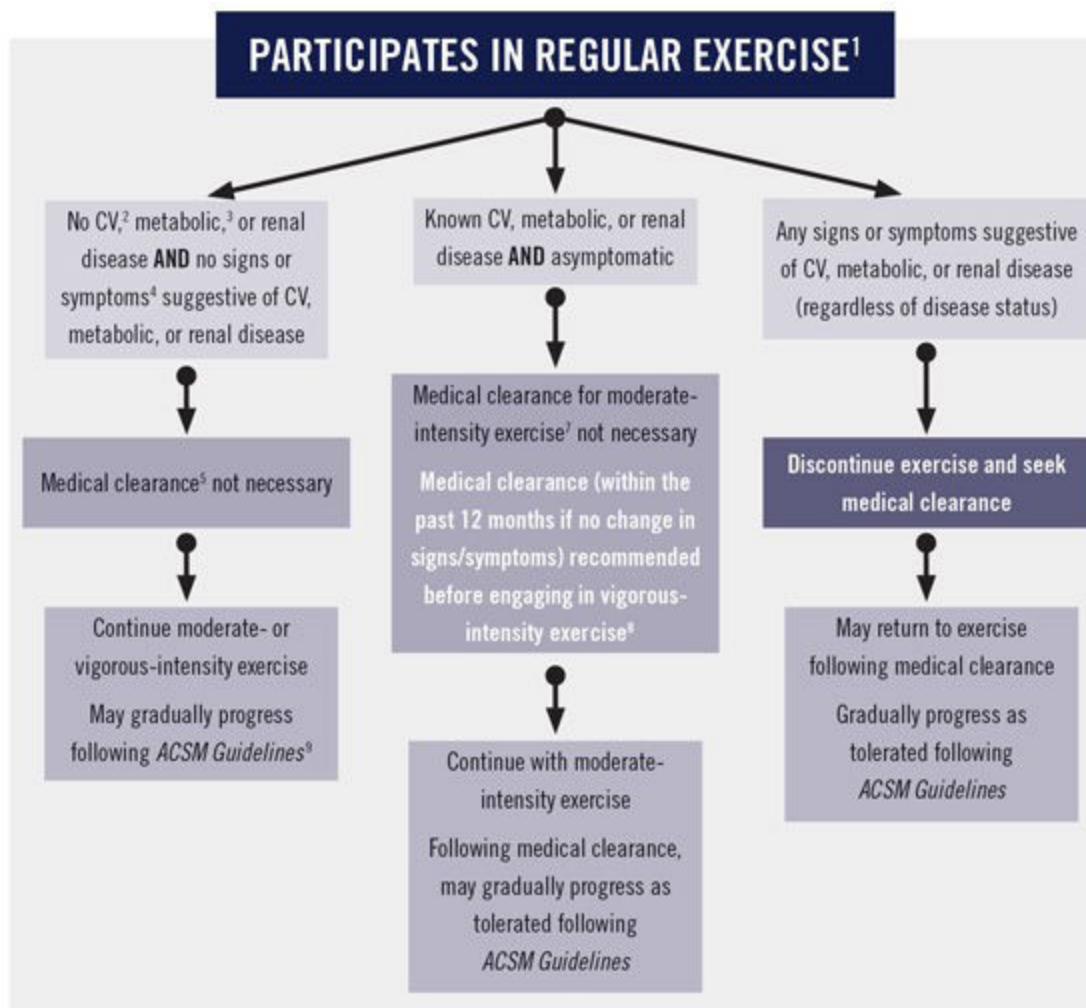
⁷ **Moderate-intensity exercise** 40–59% HRR or $\dot{V}O_{2R}$, 3–5.9 METs, RPE 12–13, an intensity that causes noticeable increases in HR and breathing

⁸ **Vigorous-intensity exercise** ≥60% HRR or $\dot{V}O_{2R}$, ≥6 METs, RPE ≥14, an intensity that causes substantial increases in HR and breathing

⁹ **ACSM Guidelines** See ACSM's *Guidelines for Exercise Testing and Prescription*, 10th edition

Note: CV = Cardiovascular; HRR = Heart-rate reserve; $\dot{V}O_{2R}$ = Oxygen uptake reserve; METs = Metabolic equivalents; RPE = Ratings of perceived exertion; HR = Heart rate; ACSM = American College of Sports Medicine

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Fitness Assessments

There are a variety of fitness assessments you can use to measure biometric information, test different components of your Client's fitness, assess stability, balance, and specific skills. You will select the and administer chosen tests according to your Client's needs, and information collected during the initial meeting. equipment available, level of comfort with the process and the amount of time you have. While you will train your Client in the water, you will conduct land-based assessments to identify a baseline and track progress over time.

The following fitness assessments have been customized for this certification but were originally explained in the SCW Personal Training Certification. A fitness assessment is important during the early stages of the personal training process as it:

- 1. Collects baseline data** to develop personalized programs and allow program evaluation (progress) using follow-up data.
- 2. Identifies areas of health / injury risk** for possible referral to the appropriate health professional(s).
- 3. Educates** Clients about their present physical condition by allowing comparisons to normative data for age and gender.
- 4. Motivates** individuals by helping them establish realistic goals.

Physiological assessments you should be familiar with and competent to administer include the following (* = see end of this section for more details on administering these assessments):

- Resting vital signs (heart rate and blood pressure).
- Static posture and range of movement screens* (Thomas Test, Overhead Squat, Postural Screening).
- Joint flexibility and muscle length.*
- Balance and core function.
- Cardiorespiratory fitness* (VO2 Max, Rockport Walking Test).
- Body composition (skin fold calipers, bio-impedance, tape measure).
- Muscular endurance and strength.
- Skill-related parameters of fitness (agility, coordination, power, reactivity, speed, etc.).

Some assessments may be de-motivating to some individuals as they may feel uncomfortable, intimidated, overwhelmed, or embarrassed by their current physical condition or by the complexity of the protocols.

- Fitness testing/assessments in this case, may prove to be counterproductive to the success of an exercise program.
 - For example, if you have a Client that will clearly have a high body fat percentage in their body composition, it would be unnecessary and likely counterproductive to do a skin-fold caliper or bio-impedance assessment. Tape measurements may be more appropriate and motivating to the Client, as the Personal Trainer can still take advantage of an initial assessment, but one that is more likely to encourage the Client and support their potential & goals.

Fitness Assessment

Reminders

01

Practice

Practice how to efficiently and smoothly conduct the assessment with a friend or colleague.

02

Prepare

Choose the assessment(s) you want to perform with your Client and gather the necessary equipment.

03

Paperwork

Ask your Client to complete your liability form, the Par-Q (Physical Activity Readiness Questionnaire) and any other health history worksheets you may require.

04

Personal Goals

Gather personal information (age, sex, weight and height) and conduct a thorough conversation with your Client about their goals. (see Section 1)

05

Perform the Assessment

Be clear and concise in explaining the assessment, its purpose, how the data will be used and then gather the data with your Client.

06

Share the Results

Record the data, compare to normative data, if applicable, and explain and share the results with your Client.

- Normative Data may be useful in helping guide Clients in the interpretation of test results, which may assist them with seeing where they fit in the larger picture* (Body Mass Index, Waist to Hip Ratio)*.
- Published norms for fitness assessments are generally based on group averages and the range of scores around the mean. Comparing test results to these norms will give the Client a perspective in understanding where they fall based on published average data.
- Before and after pictures are also very helpful in demonstrating the changes that have occurred through the fitness process. Again, suggest these with care, since many Clients will be too shy.
- “Before and after” pictures may also be useful in marketing your services and programs.
- Good Personal Trainers, therefore; always consider the need, appropriateness, type and time for conducting assessments on each Client on a case-by-case basis and prioritize their timelines in which to conduct tests.

The following fitness assessments over the next pages are examples of ones that can be used with your Clients.

Anthropometric Measure (Body Composition)

1. HEART RATE ASSESSMENT

Purpose: Assess resting and exercise heart rate. Generally, a lower resting heart rate is indicative of having a more efficient cardiorespiratory system and a higher level of cardiorespiratory fitness.

Equipment:

Stop watch.

- Resting Heart Rate (RHR):
 - Keep in mind that true resting heart rate is measured just before the client gets out of bed in the morning.
 - Heart rate changes by 7 - 15 beats per minute (bpm) when individuals transition from lying to standing due to the effects of gravity and the action of the postural muscles.
 - Personal Trainers need to consider in which position to measure RHR – ideally measured in the position in which the client will exercise.
 - Your pulse is generated by the left ventricle hitting the chest wall near the 5th rib on the left side of the thorax.
 - Measurement:
 - The client should be resting comfortably for several minutes prior to obtaining resting heart rate.
 - The resting heart rate may be measured indirectly by placing the fingertips on a pulse site (palpation), or directly by listening through a stethoscope (auscultation).
 - Place the tips of your index and middle fingers (not the thumb, which has a pulse of its own) over the artery and lightly apply pressure.
 - Commonly used pulse sites to palpate resting heart rate:
 - Radial pulse: Palpated with two fingers on the wrist at the base of the thumb.
 - Carotid pulse: Palpated by placing the fingertips on the neck, just to the side of the larynx (heavy pressure should be avoided because the carotid arteries contain baroreceptors that sense increases in pressure and respond by slowing the heart rate).
 - To determine the resting heart rate, count the number of beats for 60 seconds.
 - It is important to remember that you are counting cardiac cycles, thus the first pulse measured should commence with the number “zero”.
- Exercising Heart Rate Measurement:
 - Measuring for 60 seconds is difficult; therefore, exercise heart rates are normally measured for shorter periods of time.
 - Generally, a 10 – 15-second count is recommended over a 6-second count given the larger potential for error with a 6-second count
 - Count the first pulse beat as “zero” at the start of the time interval, then multiply the counted score by either six (for a 10-second count) or by four (15-second count) to determine beats per minute.

- The exercising heart rate should be taken as soon as possible after the individual stops exercising (within 5 seconds). $HR (bpm) = (\text{beats counted} / \text{count time}) \times \text{time interval to 60 seconds}$

- For example, Joe's 10-second count was 22 beats = $22 \times 6 = 132 \text{ bpm}$

- If a Client regularly wears a fitness tracker, such as a Fitbit, Apple Watch, Garmin, etc. compare the manual results with the tracker results and record both.

- Due to the water properties of hydrostatic pressure, heart rate will appear lower in the pool. This is discussed in Section ____.

2. WAIST TO HIP RATIO (WHR)

Purpose: Assess body fat distribution to evaluate the risk for cardiovascular disease and other significant health risks. This assessment looks at where a person carries his/her weight, the mid-section, commonly called "apple-shaped bodies" or around the hips, buttocks and thighs, commonly called "pear-shaped bodies."

Equipment: Cloth tape measure

Procedure:

Measurements are taken at the following locations:

1. Waist: Narrowest point of the torso below the rib cage and above the iliac crest.
2. Hips: Largest circumference around hips or buttocks region, above the gluteal fold.

Measurement instructions:

1. Take both measurements as close to the skin as possible.
2. Ensure that the tape runs horizontally around the entire body circumference.
3. Keep the tape flat and avoid any twisting.
4. The tape should be pulled snugly but not to the point of causing an indentation in the skin.
5. Take the waist measurement at end-tidal volume (following normal expiration).
6. Record scores to nearest millimeter or 1/16"

Test Interpretation: Calculate waist-to-hip ratio by dividing the waist measurement by the hip measurement: $\text{Waist (inches or cm)} \div \text{Hips (inches or cm)}$

Table 3: Waist-to-Hip Ratio (WHR) Norms

Gender	Excellent	Good	Average	At Risk
Males	< 0.85	0.85 – 0.89	0.90 – 0.95	≥ 0.95
Females	< 0.75	0.75 – 0.79	0.80 – 0.86	≥ 0.86

1. Body Measurements

Purpose: To record quantitative measurements over time to gauge weight management progress and body composition changes pertaining to loss of body fat and increase in muscle mass.

Equipment: Cloth Tape Measure

Procedure: Instruct your client to stand tall, feet together, with a relaxed body. Ideally, this is done prior to a workout. Record date and measurements. For the most accurate measurements, take each measurement twice.

Table: 4: Most Common Measurements to Record

Body Part	Instructions
Chest	Standing with a straight torso, measure widest part around the bust.
Arms (R/L)	Arms hanging freely, measure midway between the shoulder bone and the elbow.
Waist	Measure the natural waist or narrowest part of the torso
Hips	Measure the widest part of the buttocks
Midthigh (R/L)	Standing, one foot on a bench, bent knee at 90 degrees, measure midway between hip crease and knee cap.
Calves (R/L)	Measure halfway between the knee crease and the ankle
Aqua Gloves	Water's resistance at its surface, as result of the cohesive nature of water molecules.

Aerobic Fitness Assessments

ROCKPORT WALK TEST (VO2Max)

Purpose: Predict maximal oxygen consumption (VO2 max) using a 1 mile walk test.

- VO2 max is defined as the maximum amount of oxygen that one can consume while exercising, which is a valid indicator of cardiorespiratory fitness. Individuals with a higher VO2 max have a more efficient cardiorespiratory system and a higher level of cardiorespiratory fitness.
- This test will under-predict VO2max for fit individuals and is therefore not appropriate for that group.
- This test determines aerobic fitness by estimating VO2max from an exercise heart rate.

Equipment: ¼-mile track. (a treadmill can be used as an alternative although this test is truly only validated for the track. Heart rate monitor.

Procedure:

Warm-up: Allow your client adequate time to warm-up (at a low intensity) and stretch if necessary.
Test: The goal of this test is for your Client to complete the distance as quickly as possible while

measuring their steady state heart rate during the event.

- Instruct your Client to walk as briskly as possible to complete the 1-mile distance.
 - Pacing is necessary, as this is not intended to be an all-out test.
 - No jogging is permitted.
 - Steady state heart rate should be recorded during the last ¼ mile of the walk.
 - Record the amount of time it took to complete the 1-mile, in minutes and seconds.
 - Use a heart rate monitor: measuring heart rate via palpation, collect a 10-second count immediately following the completion of the walk and correct to 60-seconds (10-sec count x 6)
 - The time, heart rate, age, and sex are used to determine VO2 max. A calculator can be found at: <https://exrx.net/calculators/rockport>
- Due to the viscosity of water, participants will move slower in the pool. While the Rockport Test is not an accurate measurement of VO2 max in the water, consider adding a timed water walking test, from Point A to Point B, at a brisk pace. Record the specific start and end locations, distance, time and heart rate. This will serve as additional data to compare over time.

Flexibility & Range of Motion Assessments

1. STATIC POSTURAL ASSESSMENT

Purpose: Assess how a client holds alignment in a static position. Proper posture allows muscles, joints, and nerves to function efficiently. Bad posture or structural integrity can lead to imbalances in the muscle or joints.

With good posture, feet are hip width apart, with toes facing forward. The ears will be vertically aligned over the center of the shoulder, and the scapula would be slightly retracted and depressed so the shoulders are directly over the hips. Neutral position is maintained through the engagement of core muscles, with soft knees, the patella facing forward and in-line with the center of the foot.

Equipment: None

Procedure: Explain the purpose of the test. Instruct your Client to stand relaxed with feet shoulder width apart as you observe potential imbalances from the frontal plane (anterior and posterior) and the sagittal (side) plane. Observe these five kinetic chain checkpoints:

	Observation	No	Yes	Left	Right
Head	Is head tilted or rotated to one side? Does the chin protract forward?				
Shoulders & Thoracic Spine	Is one shoulder higher than the other? Are the shoulders rounded forward? Is the center of the shoulders aligned with plumb line? Is one scapula higher than the other? Is there excessive rounding of the thoracic spine? Is there excessive arching of the lumbar spine? Is there excessive flattening of the lumbar spine?				
LPHC (junction of upper and lower body)	Are the core muscles disengaged? Is one hip lower than the other? Are the hips internally rotated?				
Knees	Are the knees facing inward towards the body's midline? Are the patella pointing medially or laterally? Are the knees locked or hyperextended?				
Ankles/Feet	Are the feet pointing inwards? Outward? Are the arches of the feet flat? Excessively arched?				

2. BEND AND LIFT SCREEN

Purpose: Assess symmetrical mobility and stability during a bend and lift movement.

Equipment: Two dowels, pvc pipes, or brooms

Procedure: Explain the purpose of the test. Instruct your Client to stand relaxed with feet shoulder with apart and place the dowels on the outside of each foot. Have the client perform a squatting movement to bend and lift the dowels off the floor and repeat as many times as necessary. (Do not cue good form but observe the natural movement.) If necessary, balance the dowels between chairs so they do not need to squat all the way to the ground.

Test Interpretation:

Hip Adduction				
Observation	Compensation	Overactive/tight Muscle	Lengthened/ Underactive Muscle	Plane of View
Feet	Ankles collapse inward	Soleus, lateral gastrocnemius	Medial gastrocnemius, tibialis group, sartorius	Frontal (Anterior)
Knees	Move inward	Hip adductors, tensor fascia latae	Gluteus medius and maximus	Frontal (Anterior)
Torso	Lateral shift to side	Muscle imbalance due to potential lack of stability		Frontal (Anterior)

Feet	Unable to keep heels down to floor	Plantar flexors	N/A	Sagittal
Hip and Knee	Knee initiates movement	May indicate quadricep and hip flexor dominance, or underactive gluteus group		Sagittal
Tibia and torso relationship	Unable to achieve parallel between tibia and torso	Lack of dorsiflexion due to tight plantar flexors		Sagittal
Lumbar and thoracic spine	Back excessively arches Back rounds forward	Hip flexors, back extensors, latissimus dorsi Latissimus dorsi, teres major, pectoralis major and minor	Core, rectus abdominis, gluteal group, hamstrings Upper back extensors	Sagittal

Data from: Kendall, F.P. et al. (2005). Muscles Testing and Function with Posture and Pain (5th ed.). Baltimore, Md.: Lippincott Williams & Wilkins; Cook, G. (2003). Athletic Body in Balance. Champaign, Ill.: Human Kinetics; Donnelly, D.V. et al. (2006). The effect of direction gaze on kinematics during the squat exercise. Journal of Strength and Conditioning Research, 20, 145-150; Fry, A.C., Smith J.C., & Schilling, B.K. (2003). Effect of knee position on hip and knees torques during the barbell squat. Journal of strength and Conditioning Research, 16, 516- 524; Sahrmann, S.A. (2002). Diagnosis and Treatment of Movement Impairment Syndromes. St. Louis, Mo.: Mosby.

3. SHOULDER INTERNAL AND EXTERNAL ROTATION TEST

Purpose: Assess the rotation of the humerus at the shoulder joint

Equipment: Exercise mat (can also be done against the wall)

Procedure: Explain the purpose of the test. Instruct your Client to lie supine with their legs bent and back flat on the mat, with arms 90-degrees from the body with a 90-degree bend at the elbow. The upper arms must stay aligned with the shoulder and rest against the mat throughout the test

1. External Rotation: Have the client rotate their forearms backward toward the mat, aiming to rest the forearms and back of hands on the mat. (there should be no arching in the back and maintain a neutral wrist)
2. Internal Rotation: Have the client rotate their forearms forward towards the mat, aiming to rest their forearms and palm on the mat. (there should be no arching in the back and maintain a neutral wrist)

Test Interpretation: Normal external rotation is indicated by being able to rotate the forearms back 90 degrees to touch the mat. Normal internal rotation is indicated by being able to rotate the forearms forward 70 degrees toward the mat.



SECTION 7

Personal Training Programming

While aquatic personal training is a non-weight bearing activity, it is encouraged to plan with your client for a combination of low/moderate-impact activities, such as cross-training in combination with appropriate sessions of weight-bearing activities (walking, etc.) or partial weight-bearing activities (rowing, cycling, elliptical, etc.).

The Working Positions

Movement in the water can be broken down into impact levels, each having specific qualities and considerations. These qualities will help you select the types of exercises that are best for your clients.

1. REBOUNDING

This movement involves jumping up and down while contacting and pushing off the bottom of the pool to lift the upper body out of the water. This is perhaps the most common type of movement used in water fitness classes. As the body drops back down into the water, encourage students to land with the feet fully touching the bottom of the pool; toes first, then the ball of the foot, and lastly the heel – toe, ball, heel. On land it would be considered high impact, but in the water, it is a wonderful choice for aerobic movement, and many individuals are able to do multiple repetitions of these exercises (jumping jacks, run, tuck jumps) when they could not do any under gravity.

Reinforce this grounded landing technique especially for clients who are new to water fitness as they tend to stay on the balls of their feet not fully loading their foot onto the pool bottom. Delayed Onset of Muscle Soreness (DOMS) is quite common in the gastrocnemius (calf) for those not accustomed to jumping in the pool.



According to the Bone Health and Osteoporosis Foundation (BHOFF), it is estimated that over 10 million American have osteoporosis, a chronic condition that weakens bones over time, and 44 million more are at high risk due to low bone mass. Weight bearing exercises, high or low impact, require the muscles and tendons to pull on the bone, keeping the bone strong by stimulating bone cells to produce more bone. Osteoporosis leads to fractures in the hips and spine, and often, those experiencing this condition have decreased mobility and balance. Low impact rebounding in the water is an effective and safe alternative to high or low-impact exercises on land, as the buoyancy decreases impact on the spine and hips, and supports the body, releasing the fear of falling.

2. POWER REBOUNDING

This movement is a progression of rebounding. Adding power to rebounding offers the opportunity to increase acceleration while intensifying the push off the pool bottom. This technique is used to

increase intensity and range of motion. Movements such as Power tucks, Power Skis, and Rocket Jacks are examples of power rebounding. These moves can be easily regressed back to a regular rebound at any time.

3. GROUNDED or ANCHORED

This level requires always keeping one foot in contact with the pool. It is low impact but not non-impact. It requires an increased awareness and muscular control and is useful in testing students' balance and core strength because of the multi-directional drag. Most water exercises can be done in a grounded manner, and from the trainer position, is the easiest to demo.

4. NEUTRAL

To perform in neutral level, flex the knees and hips until the shoulders are even with the surface of the pool water. The body is fully submerged to the shoulder and neck area with the feet touching or leaving the bottom for brief periods of time. This level allows the upper body and core to be more fully engaged in water exercises, is close to non-impact, and can be used to reduce momentum and add extra challenge to some exercises.

5. SUSPENDED

As the name suggests, the whole body is suspended in the water without any foot support from the bottom of the pool. This level is used continuously in deep-water exercise but can be used in shallow water as well. Since the whole body is submerged in the water up to the neck, some participants may feel uncomfortable at this level. Non-swimmers rarely enjoy this suspended level and may experience fear. Offer other level options for those who are unable to exercise in a suspended state. However, some clients will really enjoy the intensity. Remember to cue your clients to maintain upright postural alignment. You may notice that they will tend to angle forward from the hip joint. As their trainer, you will need a way to demo suspended movement. Optional demoing methods include sitting on a chair or stool, showing the movements with shoes on your hands, suspending from bars, or even getting in the pool.

Client Needs

To make this as user-friendly as possible, your clientele has been narrowed down into three groups. Each group has a focus, three common issues experienced and brought to personal trainers. These issues could be the result of past injuries, surgeries, or conditions. The following programming templates will help you practice being intentional about your program design and give you ideas to draw from.

Group A: Deconditioned clients/post-rehab/arthritis/limited mobility/etc.

Three Most Common Issues	Explanation
Foot and Ankle Swelling & Neuropathy	Clients may be experiencing: Decreased or painful range of motion Inflammation and/or swelling Instability Neuropathy
Knee Issues leading to Gait Challenges	Clients may be experiencing: Decreased or painful range of motion Stiffness and/or swelling Instability Difficulty in walking
Upper Back & Neck Pain	Clients may be experiencing: Poor posture Muscle stiffness, tightness, or spasms Decreased ability to move head or upper back Headaches Inflammation and/or swelling

Group B: Moderately active, general fitness participants.

Three Most Common Issues	Explanation
Mobility of the Hips/Psoas & Mobility of the Shoulder/Rotator Cuff Issues	Clients may be experiencing: Pelvic pain Limping Pain in the groin, thigh, glutes Joint stiffness and decreased range of motion Clients may be experiencing: Shoulder pain Arm weakness Pain that disturbs their sleep
Flat Back Syndrome	Clients may be experiencing: Chronic pain in the cervical and thoracic spine Imbalance of the spine Difficulty standing and performing ADLs Leg and/or back pain
Weak Core & Balance Issues	Clients may be experiencing: Poor posture Lower back pain Lack of balance and stability in lower body Lack of strength and coordination Swaying side to side Difficulty walking Exhaustion by standing

Three Most Common Issues	Explanation
Flexibility	Clients may be experiencing: Joint stiffness and decreased range of motion Back pain Tightness in the shoulder girdle Neck pain Muscles tiring quickly Stress on joints far away from tight tissue
Overuse of Large Muscle Groups and lack of attention on Smaller Muscle Groups	Clients may be experiencing: Underuse of opposing muscle group Muscle weakness and/or imbalance Pain, aches, and cramps
Achilles & Calf Issues	Clients may be experiencing: Difficulty walking Stiffness and tenderness Swelling and pain Difficulty with ankle extension and flexion

CARDIORESPIRATORY PROGRAMMING FOR CLIENTS

Fitness programming, no matter which modality is being addressed (strength, endurance, flexibility, etc.), follows an easy-to-remember acronym called F.I.T.T.e (2010 ACSM General Exercise Guidelines). Let's apply the F.I.T.T.e. principle to Cardiorespiratory Programming:

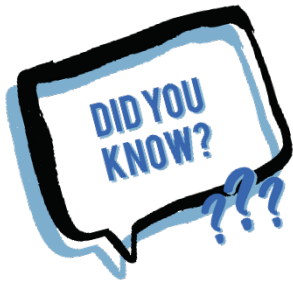
1. Frequency
2. Intensity
3. Type (modality)
4. Time (duration)
5. Enjoyment

- Exercise is usually monitored by intensity and progressed by manipulating frequency, intensity, and duration of exercise.
- Due to hydrostatic pressure, the conditioning phase for your client will happen faster in the water.
- On land, intensity is monitored by both heart rate, usually as a percentage of maximal heart rate (% MHR) or by percentage of heart rate reserve (% HRR) AND the Rate of Perceived Exertion (RPE).
- In the water, heart rate monitoring is typically less accurate for monitoring exercise intensity. While there is a direct correlation to increased heart rate and exercise intensity in the water, it will not increase at the same rate that it does on land. (Haff) Hearts rates are typically 13-17 beats per minute LESS in water than on land. Why?
 - Hydrostatic pressure applies constant resistance or compression to the chest wall, assisting the circulatory system, producing a lower heart rate during intense water exercise.
 - The lack of gravitational pull on the body means that blood flows from below the heart,

back to it, with less effort.

- Water cools the body with less effort than air, which means the heart does not need to work as hard

The “aquatic heart rate reduction” or “Kruel Protocol” model was developed by Luiz Fernando Martin Kruel.



An aquatic heart rate reduction is determined by subtracting a 1-minute in pool heart rate from a 1-minute land-based heart rate.

Step 1: Stand on the deck of the pool for 3 minutes and take HR.

Step 2: Stand in armpit depth in the pool for 3 minutes and take HR.

Step 3: Land-based Heart Rate- Pool Heart Rate = Aquatic Factor

Step 4: $220 - \text{age} - \text{resting heart rate} = \text{heart rate max} \times \% \text{ want to work at}$
+ resting heart rate = target heart rate - aquatic factor = aquatic target heart rate

- Please note, if your client is cross-training in both land and water, the percentage of Maximal Heart Rate (% MHR) is still popular, but we no longer use the $220 - \text{age}$ formula to estimate MHR. Instead, we use more accurate formulas:

The Tanaka formula has been found to be most accurate for men:

$208 - (0.7 \times \text{age})$

◦ Example: A 20-year-old male has an MHR of $208 - (0.7 \times 20) = 208 - 14 = 194$ bpm

The Gulati formula has been found to be more accurate for women:

$206 - (0.88 \times \text{age})$

◦ Example: A 20-year-old female has an MHR of $206 - (0.88 \times 20) = 206 - 18 = 167$ bpm

Frequency:

Moderate exercise = 60% – 75 % MHR should be performed ≥ 5 x / week.

OR

Vigorous exercise = > 75 % MHR should be performed ≥ 3 x / week.

OR

Perform a combination of either, 3 – 5 x / week.



- There is a population of individuals you will train in the water with autoimmune disorders, brain diseases, those who are obese, recovering from injury, or generally deconditioned and research has demonstrated that these individuals should strive to participate in more frequent, but less intense, exercise segments. For example, exercising 5-7 x/wk, but at a shorter, less intense duration.

- Segments can even occur in intervals of 5 - 10 minutes, three to five times daily. For example, an effective combination of water walking, treadmill or outdoor walking, a recumbent bike and an elliptical trainer can be used to improve cardiorespiratory endurance.


Intensity:

- Regarding cardiovascular health, the ACSM recommends a moderate to vigorous intensity level, about 60% – 85% of an individual's maximal heart rate during exercise sessions.
- Understanding what we talked about above regarding heart rate, there are two options you may find more helpful in aquatic training, and you may choose to combine them.

1. The Borg Rating of Perceived Exertion and The Talk Test

- By simply asking your client "How do you feel?" you initiate the **Talk Test**.
- Since this is very subjective, you may also ask your clients to give you their HR, as evident on their heart rate monitor, to collect data regarding their level of intensity. Record both their ability to speak and respond, as well as their HR. This serves as measurable data and can be compared over time.
- The **Borg Rating of Perceived Exertion** is a subjective rating scale of 6- 20, based on the sensations a client is feeling during their workout.
 - For most of the cardio programming, you will want your client to stay in the "aware of my breath, and it's uncomfortable to speak" level. This self-monitoring system also allows your Client to develop a mind-body connection and will become easier over time for them to adjust their intensity level.
 - As 6-20 can be a lot to remember, the Modified RPE scale, 0-10, can be used instead.

Figure __: The Borg Scale & Rate of Perceived Exertion



BORG RPE	Modified RPE	BREATHING	% MAX HR
6	0	No exertion	50% - 60%
7		Very Light	
8	1		
9			
10	2	Notice breathing deeper, but still comfortable. Conversations possible.	60% - 70%
11			
12	3	Aware of breathing harder; more difficult to hold a conversation	70% - 80%
13			
14	4	Starting to breathe hard and get uncomfortable	80% - 90%
15	5		
16	6	Deep and forceful breathing, uncomfortable, don't want to talk	90% - 100%
17	7		
18	8		
19	9	Extremely hard	
20	10	Maximum exertion	

2. Heart Zones Training (H2T)

- Developed by Sally Edwards in 1993. Edwards uses the following formula to determine Estimated MHR:

- **210- 50%(age)- 5% (body weight in lbs.) +4 (if male) OR +0 if female**

- Zone training refers to cardiorespiratory exercise that occurs in a variety of heart rate zones. The client begins by establishing their Base Zone before progressing to more challenging zones.

There are five heart rate zones:

° **Zone 1** is 50% to 60% of your MHR.

“Healthy Heart” zone or “Base” zone as well as the warm-up and cool down zone.

° **Zone 2** is 60% to 70% of your MHR.

“Fat Burning” zone because most of the energy used comes from fat.

° **Zone 3** is 70% to 80% of your MHR.

“Aerobic” zone improves your physiological and functional capacity.

° **Zone 4** is 80% to 90% of your MHR.

“Anaerobic Threshold” zone challenges the body sub-maximally but approaches and frequently crosses the anaerobic threshold.

° **Zone 5** is 90% to 100% of your MHR.

“Red Line” zone is an all-out effort not sustainable for greater than several seconds at a time. Frequently used in HIIT protocols

Exercise Description	Recommend for	Examples
Endurance activities requiring minimal skill or fitness	All adults	Land: Walking, slow dancing Water: water walking, basic aqua fitness classes
Vigorous-intensity endurance activities requiring minimal skill	Adults participating in regular exercise or having ≥ average fitness	Land: Jogging, rowing, spinning, elliptical, stepping Water: aqua jog and conditioning, specificity-based aqua fitness classes
Endurance activities requiring higher skill levels	Adults with acquired skill and fitness levels	Land: cross- country skiing, running races, golf, etc. Water: Lap swimming
Recreational sports that require intensity with skill	Adults participating in regular training with acquired fitness levels	Land: Soccer, basketball, racquet sports Water: aqua volleyball, competitive swimming, water polo, synchronized swimming,

Physical Fitness Classification	Weekly Calorie Expenditure	% MHR	% HRR	Duration / day	Weekly Duration
Poor	500 – 1,000	57 – 67 %	30 – 45 %	20 – 30 min	60 – 150 min
Poor-fair	1,000 – 1,500	64 – 74 %	40 – 55 %	30 – 60 min	150 – 200 min
Fair-average	1,500 – 2,000	74 – 84 %	55 – 70 %	30 – 90 min	200 – 300 min
Average-good	> 2,000	80 – 91 %	65 – 80 %	30 – 90 min	200 – 300 min
> Good-excellent	> 2,000	84 – 94 %	70 – 85 %	30 – 90 min	200 – 300 min

*Note: The above is calculated for land-based heart rate.

Enjoyment:

- Activity or exercise needs to be engaging and must be a positive experience.



- A client deconditioned or challenged by an existing illness or injury (such as Parkinson's Disease, a recent knee replacement, etc.), may need periods of rest during your session.
 - Individuals may be only able to tolerate a 20-minute session, two or three times a week, and eventually progress to a 45-minute to one hour. Over-exercising may not only cause fatigue, affect their safety, inhibit their ability to get out of the pool after your session, but their sense of accomplishment and enjoyment in exercising.

Recovery:

- Adequate recovery between workouts is essential for gaining the physiological and psychological benefits of exercise.
 - Allowing the body and mind time for recovery is one of the most important ways in which to gain fitness benefits as the body requires time to change and improve (Principle of Adaptation).
- While performing training on land, recovery may consist of both active and passive recovery, and anywhere from 24-72 hours recovery time between workouts. The water gives your clients more control. Due to the properties of water, your clients are incredibly supported in the water. Clients may participate in aquatic training up to 5 days a week or use aquatic training to complement land-based training on active recovery days.
- From a cross-training perspective, research has shown that land-based athletes use of water-based active recovery workouts significantly reduce recuperation time and contribute to:
 1. reduced muscle damage and soreness due to tissue temperature
 2. reduced level of perceived pain due to slower nerve conduction
 3. reduced inflammation and swelling due to stimulated and supported circulation

4. increased blood flow
5. greater muscle elasticity
6. enhanced range of motion

Resistance Training Programming

As a fitness professional, you know exercise can both impact and mediate quality of life, chronic illness, functional challenges, and more! Extensive scientific evidence supports the recommendation that all Americans participate in regular physical activity and that substantial healthy benefits for adults occurs with 150-300 minutes a week of moderate to intense physical activity. Only 26% of men and 19% of women report sufficient activity to meet aerobic and muscle strengthening guidelines (Center for Disease Control and Prevention, NHI Survey). YOU are so important!

With water, you can appeal to individuals that may never participate in land-based exercise. Perhaps they are active agers, with fears of falling or hurting themselves in a group fitness class, or individuals who have recently had surgery and been cleared by their doctor to exercise. In addition, your personal training offerings can complement the work individuals are already doing, such as performance-based athletes who need off-season training, runners who need options to exercise while protecting their joints, endurance training for those who lift heavy in the gym or a way to target other muscle groups for those who only participate in group fitness classes.

While limited aquatic resistance training guidelines and research exist, here are guidelines based on land-based protocols, taking into consideration the properties of water. When beginning to work with a client, especially one who is transitioning from land to water, work together to identify the proper number of reps, sets, or length of time it takes your Client to fatigue and build from there.

Principles of Resistance Training

The resistance training program is planned around the needs, goals, and current condition of the Client (information collected during the assessment process). Resistance training doesn't just build muscle, it improves the health of your ligaments and tendons, which leads to less pain, better mobility, and a more stable joint.

- Effective, long-term adaptation to a resistance training is guided by key principles that enable the body to adapt to the stress response from resistance training:

- **Principle of Specificity (“SAID” Principle):**

- Specific Adaptations to Imposed Demands (SAID): The body will adapt to the demands put on it and how it trains will dictate the way it will perform, outside of the training session.
- A specific stress stimulus will create a specific physiological response (e.g., training with light resistance and high repetitions will improve muscular endurance).

- **Principle of Overload:**

- To increase the load placed on a muscle, forcing it to adapt (i.e. exercises are performed at intensities greater than those the muscles are accustomed to producing).
- Program design must include continual progression over time
- On land this may look like increased weight, or reps. In the water this may look like increased time, travel, or adding drag.

- **Principle of Progression:**

- To apply overload safely, the intensity of training stress must gradually increase over time.
- On land, it would take 2 – 3 weeks for neuromuscular adaptations, in the water, you may notice the conditioning phase is quicker. It will take another 2 – 3 weeks for connective tissue strengthening and expect muscular strength increases of 5% – 10 % within the first six to eight weeks of the onset of a training stimulus.

Variables of Exercise Program Design

Every client is unique. Their “why”, their personality, body, experience. Personal training is about individualism and creating a functional and practical program that will meet the needs of your Client. Following the needs analysis and fitness assessments, additional training variables need to be considered. These variables are dependent on the Client’s current condition, their abilities and skills, commitment to training, and most importantly, their training goals.

Manipulate application of variables to control training stress, ask to receive feedback from your Client as they participate in the workout, and allow Client’s time to adapt to the imposed demands of the workout. Use only 5% – 10 % a week increases to avoid injury.

Intensity:

- Intensity defines the specific amount of resistance or external load applied to muscles.
 - If the same resistive force is consistently applied, then the muscle will not be stimulated to produce greater levels of force and a training overload will not be created.
 - Intensity is written as a % of the maximum amount of weight lifted for one repetition (e.g., one repetition max is written as 1RM).
 - Greater intensities increase motor unit recruitment and muscle force production, which translates into gains in strength and power.

Volume:

- Volume defines the total amount of work performed (weight lifted/water moved) during an exercise session.
 - It is generally expressed as a product of (intensity) X (sets) X (number of repetitions).
 - The total volume of a workout should be dictated by training experience and training goals.
 - Volume increases time under tension, which translates to increases in muscle size and mass (hypertrophy).

Sets:

- A set is defined as a group of repetitions.
 - 1 set x 10 – 12 repetitions to muscle fatigue is sufficient to create initial strength improvements for Clients with little-to-no training experience. However, once a Client experiences initial strength gains, the number of sets needs to be increased to create the desired overload and training effect.
 - In the water, muscles will not fatigue as fast. Improvements in strength, from aquatic

training, can be measured on land using pre- and post- assessments.

- Personal Trainers must remember that increasing the number of sets also requires additional time.

Repetitions:

- Repetition (reps) refers to the consecutive number of times a particular exercise movement is performed before resting.
 - The number of repetitions that can be performed is inversely proportional to the intensity.
 - The greater the intensity, the fewer number of repetitions that can be completed.
 - The lighter the intensity, the greater number of repetitions that can be completed.

Rest Interval:

- A rest interval is the period of rest between sets in a particular workout session and is needed to enable muscles to replenish energy stores (ATP) and allow the nervous system to recover from fatigue.
 - During a workout, the heavier the load or the greater the stress on the CNS, the longer the inter-set rest interval needed.

Table __: Rest Period as determined by Exercise Intensity

Training Goal	Rest Interval Length
Muscular Endurance	≤ 30 seconds
Hypertrophy	30 - 90 seconds
Strength	2 - 5 minutes
Power (single multiple-event effort)	2 - 5 minutes

Reference: NSCA Essentials of Strength Training and Conditioning (3rd ed.) 2008.

Training Frequency / Recovery:

- Frequency refers to the number of training sessions completed within a specific time and can be viewed as a recovery period or the amount of time between consecutive workouts.
- Adequate recovery is important to allow the trained muscles sufficient time to adapt, repair and restore energy reserves before being trained again.
 - Strength gains (adaptations) occur during recovery and NOT during the actual training session.
 - Insufficient rest and recovery between workouts can lead to injury or overtraining and affect your Client's ability to achieve their goals.
 - The frequency of training a muscle group is dependent upon the individual's training goals, experience, conditioning level, and available time.
- Appropriate recovery intervals for land-based endurance training programs are 24 – 36 hours between workouts. Appropriate recovery intervals for hypertrophy and strength training programs are 48 hours or greater between workouts for the same muscle or muscle group. Due to the properties of hydrostatic pressure, recovery from water-based training programs occur faster than

land-based training.

- If you are familiar with land-based personal training, the concept of periodization may be familiar to you. Periodization is the deliberate manipulation of training variables to optimize performance and prevent overtraining.
 - The 3 Phases of Periodization include:
 - **Macrocycles:** long-term, big-picture cycle, months to years
 - **Mesocycles:** medium-term, 4–6-week cycles, periods of progressive intensity training and recovery with low intensity training
 - **Microcycles:** short-term, 1-week cycles, variable intensity training
- While little research exists to support aquatic periodization, the fundamental understanding of these cycles holds true to training, whether you are on land or in water.
 - If you apply the concept to Aqua PT, during cardio/muscular endurance exercises, you will vary the speed/effort, distance, and time.
 - If you apply the concept to Aqua PT, during primarily resistance exercises, you will vary the amount of resistance (the load) and the number of reps (the volume).

Exercise Order and Selection:

The order of exercises refers to the sequence of performing resistance training exercises.

Basic Guidelines to Aquatic Exercise Order & Selection

Stability before Mobility
Large muscle groups before small muscle group exercises
Train the muscles proximal to distal
Multi-joint before single-joint exercises
Explosive or power type exercises before non-explosive and single joint exercises
Most intense to least intense
Most important to least important
Alternate push-pull exercises (total body sessions)
Alternate upper/lower body exercises (total body sessions)

- Power and explosive exercises should be performed at the beginning of the workout session when the Client has the highest levels of energy. In the water, these movements will promote a combination of cardio, muscular endurance, and resistance.
- The same exercise can be done by changing the lever length, for example, a jumping jack will begin with elbows in, short levers and progress to extended arms, long levers. This safely trains the muscles proximal to distal.
- You may be tempted to change exercises frequently to keep the program interesting, consider the need for consistency to promote success. Mastery of the exercises and development of confidence will lend themselves to the development of self-efficacy.
- Since their body is underwater, you may need to demo and then train a movement ON LAND. Insist that your client uses excellent form and technique. If needed, ask them to come onto the pool deck so you can watch their form and provide accurate feedback.

- “More is Not Better”

List of Commonly Used Exercises

- The below charts are NOT exhaustive. These are ideas. Add to the list!
- Consider the use of equipment to increase resistance in movement patterns and exercises.
- Plyometric or “jump training” exercises can be included in shallow water training depths, for power and function, as buoyancy reduces joint load on impact, serves to increase bone density, and alleviates the fear of falling, especially for active aging clients.

Programming Toolbox

Muscular Endurance/ Cardio Exercises	Exercises	Plyometric & Power Exercises
Heel Digs	Moguls (var. single single double)	Power Tucks
Heel Touch Front/Back	Pendulum	Power Skis
Wide & Narrow Aqua Jog	Cross Country Shuffle	Rocket Jacks
Jumping Jack- short and long levers/arm variations	Kicks: Front, Side & Back	
Swing Kicks (rebounding, neutral, anchored or suspended)	Tuck Jump/Wide Tuck Jump/ Lateral Hurdle Jump	
Cross Country Skis	Single-leg Star to Slide-Out	Double Rear Kicks/Switch Kicks/ Elevated Kicks
Boxing Jabs, Uppercuts & Hooks	Side to Side Noodle Swing with Alternating Knee Drives	Dribble x 3, Jump & Shoot
Corkscrew (Twist Hops)	Cross-body punches	Wide Jack, Knee Tuck
Rocking Horse	Figure 8's	Tuck with Fly Arms
Fast Feet	Side Kick to curtsy lunge	Single leg bound with inner thigh push
Knee to Sidekick	Hoedown	Star Jump
Butt Kicks	Tuck Jumping Jacks	Single or Double Leg Shoutouts
High Knees	Flutter Kicks	Leap Right, Leap Left
Front & Back Snap Kicks	Plie pulse on tip toes	Scissor Jumps
Kickboard Laps	Speedball	Spread Eagle Jumps
Wiper Arms Side to Side	Side Steps	Lateral Travel Cross Country Ski
		Plie Hops

Pool Wall Exercises	Description
Front Taps on the Wall	Alternating foot tap to the wall while rebounding (or side taps, single let taps, reverse foot taps, suspended taps)
Cross Country Ski	Two feet on the pool bottom, switch to pool wall, cross country ski, R/L, return to pool bottom
Mountain Climber	Plank at wall, alternate high knees towards surface of the pool
Criss Cross Legs	Two feet on the pool bottom, feet to the wall, cross over R/L, return to pool bottom
Push & Swim back	Push off the wall, swim back
Leg Dips	Contracting abs to slowly lift zipped up legs and slowly lower down
Getting Out or Gutter Push Ups	Standing at pool wall, facing edge, palms to pool deck, jump up and out of water, and then release back in
Scissor Kicks	Side lying position with hands to pool deck and wall

Core Exercise	Core Exercise	Core Exercise	Noodle Location
Stir the Pot	Alternating Elbow to Knee	+ Noodle or Buoy	
Closed-fingers Cross body Hand Sweep	Oblique Pivot	Seated Toe Taps	Under sit bones
Plie tick tock	Wood Chops	Windshield Wipers	Under arms
Single Leg Side Crunches	Pikes with Arm Pull Downs	Single Leg Stretch to Bicycle	Under arms
Sunshine Superman	Helicopter	Scissor Legs	Under arms
Rollouts	Pike Hold	Plank Hip Dips	Two hands- front
Spinal Rotation/Upper Body Windshield Wipers	Side to Side Ball Drops with a Bound	Side Plank	One Hand side
Helicopter Circle	Staggered Leg Paddle side to side	Butterfly oblique crunch	Under arms
Sunshine Superman	Plank hold with underwater ball	Traveling Push Downs	Under both feet
Tik-toks	Side Kick to lower leg lift and connect	Oblique Knee Ins	Under arms

Resistance- focus Exercise
<i>Lower Body</i>
Thigh contract- relax (noodle behind body under one or both tops of feet)
Hamstring Extensions & Rainbows
Donkey Kicks
Clamshells
Leg Circles/Knee Circles (and reverse direction)
Inner Thigh Squeeze
Ham Curls
Pool Box Step Overs
Heel Slides against the Wall
*Pull from Muscle Endurance & Cardio Moves (jumps, lunges, squats, kicks, etc.)
<i>Chest</i>
Chest Fly
Kickboard Chest Press
Wall/Edge Pushups
Scarecrow Arms or Chicken Wings
Staggered Stance Aqua DB Pushes
Noodle Speedball
Figure 8's
<i>Shoulders</i>
Noodle Push Down aka Plunge
Shoulder Circles (and reverse direction)
Upright Row
Banded Movements (example: Shoulder Press)
Shoulder Abduction/Adduction
Deltoid Rotation
Breaststroke Arms
Boxing Hooks
<i>Back</i>
Arm Extension Squeeze and Lift (optional noodle behind the back)
Seated Row at the Pool Wall
Banded Movements (example: Reverse Fly)
Suspended Noodle Bike Ride (noodle between legs)
Suspended Leg Circles (legs zipped together)

Floating Plank with Flutter Kicks & Flies
Wood Chops
Water Walking/Side Steps
Suspended Tuck Ins/plus Twist
Kickboard
Single Leg Balance and Reach
Lat Pushdown
Arms
Speedball & Reverse Direction
Arm Curls (pull towards the body) & Bicep Curls (flex elbow with hands towards pool bottom)
Banded Movements (example: Bicep Curls)
Triceps Kickbacks & Press downs
Push-ups at the Pool Wall or Pool Corner- wide elbows, triceps push-ups, etc.
Triceps Dips at the Wall
Getting Out (power move at pool edge)
Straight Arm Push Backs, side to side
Straight Arm Extension

Creative Training Options

VIIT- Variable Intensity Interval Training

- Not shooting for a maximal or near maximal effort like we do in HIIT or high volume like we do in HVIT.
- VIIT includes a pre-determined variation in the intensity and duration of the work rounds, experience through high, medium and low intensity phases.
- A well-rounded workout that is time efficient, giving clients a high caloric burn, with a decreased potential for injury.
- Improves stability and posture, challenges body adaptations, provides stress relief.

Interval Timing WORK: REST ratio	Timing Examples		
1:3 work:rest	15 sec: 45 sec	20 sec: 60 sec	30 sec: 90 sec
1:2 work:rest	15 sec: 30 sec	20 sec: 40 sec	30 sec: 60 sec
1:1 work:rest	15 sec: 15 sec	20 sec: 20 sec	30 sec: 30 sec
2:1 work:rest	30 se: 15 sec	40 sec: 20 sec	60 sec: 30 sec

Other Options	60/45/30: 2 min Work:rest	60/30R/30 L: 2 min	
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Circuit Training

- Consider using a variety of equipment and aim for total-body training.
- Alternate muscle groups, lower and upper extremity exercises, and movements, to prevent fatigue, but allow for continuous movement.
- Each exercise may be performed for a certain amount of time (i.e. 2 min) or for a certain number of repetitions.
- Exercise options are easy to regress and progress depending on client needs.
- Idea: Choose both land and water options during the circuit.

Example Circuit Template:

Circuit Exercise & Equipment Required	Muscle Group	Sets/Reps/Rest OR Timed Work/Rest
1.		
2.		
3.		
4.		
5.		

Aqua Walking/ Jogging

While it goes by many names, aqua walking, jogging, aqua running, deep water running, or pool running, the movement is simply walking or running in the pool. Aqua Walk/Jogg is the perfect complement to an athletes' off-season training, cross-training regime, an alternative to walking or running outside when summer temperatures are too hot, a way to add variety to client workouts, and a great way for those with joint pain, imbalances, or inflammation to participate in endurance and resistance training. Aqua Walk/Jog can be used as a recovery tool to facilitate the repair of damaged muscles after hard workouts, or to ease back into workouts post-injury.

- Technique: replicate land-running form as best as possible, posture straight up and down, hips under shoulders, arms pumping or see below variations. Client should not lean forward. An "aqua belt" can be worn to assist with buoyancy and form.
- Can be executed with low to no impact. Many of those listed can be modified to a water walk/gait drill.
- Clients with hip flexor strains or injuries should avoid aqua jogging
- Deep water running, without ever touching the bottom of the pool, is even more demanding on the cardiovascular system than even an easy run outdoors, due to the demands put on the upper body

Aqua Walk/Jog Examples:

Aqua Jog/Walk Variations		Hand Options
Aqua Jog with a 180 turn	Zig Zag Run	Pontoon boat arms
Forward One, Back One	Retro Run (backwards)	Breaststroke
Fast feet	Figure 8 Run	Speedbag hands
Out/In aka Wide/Narrow	Wide Jog	Hands behind back
Sideways Lateral Run	Swim	Jabs/Uppercuts/Hooks
Forward 4, Back 4	Backwards Curls and Kicks	Cactus arms
Single, single, double stomp		Sculling
Circle Run		Hands lifted to the sky

Creative Interval Options for Aqua Jogging

Fartlek	Pyramid	The Child
10 min warm up 30 sec sprint @95-100% MHR 30sec medium @85-95%MHR 30 sec sprint 30 sec medium 30 sec rest Repeat up to 15 times 10 min cool down	10 min warm up 1 min hard, 30 sec rest 1:30 min hard, 30 sec rest 2 min hard, 30 sec rest 2:30 min hard, 30 sec rest Continue through 5 min and then back down the pyramid 10 min cooldown	10 sec easy 10 sec medium 10 sec hard Continue with 20/20/20, 30/30/30 up to 70 seconds and then back down 60, 50, etc. 10 min cooldown

- Options to Add Variety and/or Increase Difficulty Level:
 - Use of hand buoys
 - Use of bungee/resistance band secured around both waist and sturdy, stationary object
 - Wear an aqua jogging belt

Flexibility & Balance Training

- One way to improve your Clients' flexibility and balance is to include Aqua Yoga within your training. For those that cannot participate in a traditional class on land, the aquatic version is a very accessible practice.
- Water will affect the grounding of the feet.
- Improves balance- not as frustrating as land balance poses, which leads to increased confidence.
- Helps to relieve pain, very gentle, no impact.
- Focus on alignment, mind body connection.

- Hold each pose for 5-10 breaths. What you do on one side, repeat on the other side.

Aqua Yoga Toolbox

Pose	Description	Focus
Mountain Pose Tadasana Option: Upward Salute Pose Urdhva Hastasana Option: Bound Hands Mountain Pose Baddha Hasta Tadasana	Option: Noodle Stand upright with feet facing forward, hip width parallel. Arms relax alongside body, palms forward. Shoulders drawn back and down OR sweep your arms up and out of the water and stretch towards the sky.	Full body engagement. Releases tight shoulders. Mind-body connection.
Standing Side Bend	Stand upright with feet facing forward, hip width parallel. Reach both arms up overhead, inhale. Arms parallel OR bound, exhale, engage core and bend to the right. Inhale, come back to center, reach up. Exhale, bend to left. Option: 1 arm at a time, instead of both arms up.	Stretch and strengthen TFL, shoulders, obliques, and intercostals. Improve breathing efficiency
Warrior I Virabhadrasana I	From mountain pose, bend your R knee and step R foot forward. R knee in line with R ankle. Anchor your R foot flat to the pool bottom. Pivot on the L foot, angled to about 45 degrees, straight back behind you, foot flat on the floor. Extend arms to sky, palms face in OR hold noodle above the head. Shoulders away from ears.	Stretch ankles and calves, strengthen back, quadriceps. Lengthen psoas, and upper body.
Warrior II Virabhadrasana II	From Warrior I, reach both arms towards the front and back of the mat and turn your head to look past your front fingertips. Distribute weight evenly among both legs and relax shoulders away from ears.	Hip flexibility. Strengthens the core, hip flexors, gluteal muscles, pelvic floor, calves, and ankles. Stretches chest.

Warrior III Virabhadrasana III	<p>From Warrior 1, bring weight into your front leg. Roll your back outer hip forward, then pivot onto your back toes into neutral position. Inhale. Exhale and tilt your torso forward, reach out arms out ahead, and push off with back leg. Lift back leg until parallel to the pool bottom. Frame your ears with your inner arms.</p> <p>OPTION. Use a noodle or the pool wall or edge to hold onto in this balance pose.</p>	Balance. Strengthen legs, ankles, and core. Stretches hips and thighs.
Extended Leg Squat Pose Utthita Malasana	<p>Unless done in very shallow water, utilize the side of the pool as the base, feet to base, with hands on the pool deck. Chin neutral, shoulders low. One bent knee, one straight leg. Tailbone hangs freely, let hips sink towards the heel of the bent knee. To release, slowly slide the extended leg back into position</p> <p>Option: Add rotation. Twist from the torso, towards bent leg.</p>	Balance. Hip opener. Stretch through spine, pelvis, and back of legs.
Twisted Variation		Decrease in back pain Improved digestion
Dead Bug Sukha Balasana	<p>Utilize the side of the pool as the base, feet to base, with hands on the pool deck. Chin neutral, shoulders low. Both knees bent, feet slightly wider than hips. Tailbone hangs freely</p>	Strengthens core. Relieves lower back tension and pain.
Chair Pose Utkatasana	<p>Back against the pool wall, feet hip width apart. Bend the knees, sink glutes, as in a wall sit. Hands in prayer. OR Face the wall, feet hip width apart, hands to the pool edge. Bend the knees, sink the glutes and come into chair pose.</p>	Strengthens ankles, calves, thighs and back. Stretches shoulders and chest.
Seated Eye of the Needle Pose Sucirandrasana OR Figure 4	From Chair Pose, shift bodyweight into one leg and lift, bend and cross the opposite foot to the stationary knee. Sink into pose.	Stretches glutes, and muscles around hips and lower back.

Tree Pose Vrikshasana Namskar	From Mountain Pose, shift your weight into your right foot, lift your left foot off the floor. Keep your right leg straight but don't lock the knee. Bend your left knee and bring the sole of your left foot to your inner ankle or high onto your inner right thigh. Avoid pressure into the knee. Press your foot into your ankle/thigh and your thigh back into your foot with equal pressure. Focus your gaze on something that doesn't move to help you keep your balance. Repeat on other side.	Strengthens legs and core. Opens the hips and stretches inner thighs. Balance
Half Moon Pose	Intermediate Pose Aqua dumbbells or noodle. Begin in Warrior II holding water weights or a noodle in your front hand. Bring your weight into the front leg, float your back leg upwards, straight behind you. Roll your top hip up to the sky. Press into buoy to remain upright.	Opens the hips, strengthens ankles, knees and lower body. Stretches tights abdominals. Balance Tight abdominals
Extended Hand to Big Toe Pose Utthita Hasta Padangushtasana	Intermediate Pose From Mountain Pose, extend one arm towards the wall or noodle. Bend your outside leg and raise your knee to the level of your choice, grab big toe and straighten leg, as much as possible. Option to gaze out over opposite shoulder. Repeat on other side.	Build strength in the back of legs and ankles. Stretches hamstrings, arms, abdominals, and shoulders. Improves posture and balance.
Lord of the Dance Pose Natarajasana	Begin in Mountain Pose. Option to hold onto pool deck or noodle with right hand. Shift your weight onto your right foot, lift your left heel towards your left buttocks and catch your foot in your left hand. Option to kick up your left foot into your left hand, lifting the foot up and back at the same time, lowering your chest slightly.	Increases the flexibility of the spine. Stretches hamstrings and quads. Balance

Corpse Pose Shavasana	Float on your back, using two noodles, one under your neck and one under your ankles. Option to add a third under your lower back or knees, whatever is comfortable. Rest at the surface of the water. Option to use aqua dumbbells.	The final resting pose. Deepen the connection between physical body and mind.
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PLANNING FOR CLIENTS: Aquatic Cross-Training

This section is geared towards intentional planning and program design for your Clients. Personal training should not be approached as one-size fits all. Aquatic personal training presents new opportunities to help Clients reach their desired goals, while giving them a safe, comfortable, and supportive environment to master foundational movements. The method is cross-training as all the elements of well-rounded fitness are included- cardio, endurance, strength, flexibility and body composition- can and will be included in your program, due to the properties of water and how the body moves through it.

In this next course section, you will practice how to:

1. Design an exercise plan that prioritizes the needs of the client and moves them forward
2. Deliver a results-driven and consistent program
3. Add variety, to keep your Clients engaged, enjoying themselves, and feeling accomplished

Phase 1	Hypertrophy Phase / General Preparation (high volume, low intensity) Duration: 4 weeks to 6 months
Phase 2	Basic Strength (moderate volume, moderate- high intensity) Duration: 4-8 weeks
Phase 3	Strength-Power (low volume, very high intensity) Duration: 2-3 weeks
Phase 4	Peaking / Maintenance Duration:
Phase 5	Active Rest (very low volume, very low intensity) Duration: 2-5 weeks

The Warmup

- The warm-up should take 5-15 minutes to adequately prepare the body and mind for your upcoming client session. The purpose includes the following:
- Increase the core body temperature
- Lubricate the joints for full range of motion movement
- Increase the blood flow and heart rate
- Prepare the body for the upcoming work

- Put the brain on notice that there will be an increased need for certain hormones to be released into the blood stream
- Water removes heat from your body about 25-40 times faster than air at the same temperature. It takes a much longer time for your body to warm up. The temperature of the water and the air will dictate how long the thermal warm-up will last.
- During the warm-up, slowly increase joint range of motion, cardiovascular intensity, and movement complexity. Always begin with short lever movements and gradually build to movements that involve longer levers.
- Gradually introduce traveling, directional changes, and intensity to adequately prepare the body for some of the more advanced and intense movements that may come later in the session.
- Highly specific goals require specific warm-ups, but more general goals can perform a general warm-up, where specificity is not as important.
- **Warm-Up Template:**
 - 1. Stability: Core/Glute Activation**
 - 2. Hip Mobility**
 - 3. Shoulder & Spine Mobility**
 - 4. Ankle & Knee Flexion/Extension**
 - 5. Multi-planar Movement**

*Begin the warm-up with stability and mobility movements, specific to the planned exercises. By strengthening the core musculature, your Client will experience less strain to their back, and proper alignment means no abnormal stress on spinal joints.

Warm-Up Stability & Mobility Examples

Many of the exercises begin in neutral position: standing upright, feet hip width apart, parallel, and core actively engaged. Shoulders over hips, hips over knees, knees over ankles. Slight bend in the knees. **These exercises are best done with just bodyweight or very light resistance from equipment in the pool.**

Note: There are additional rows for you to add exercises as you learn more and want to add to your chart.

Table __: Stability Core& Glute Activation

Stability Exercise	Description	Sets
Water walking	Walk forward and backward across the pool while holding a hand buoy in each hand. The drag resistance will encourage proper pelvic alignment.	2-5 minutes

Wall Slide/Wall Squat	Perform a squat against the wall of the pool, feet hip width apart, knees over ankles, shoulders against the pool wall. Draw the abs in, align the hips under the shoulders.	10 reps
Wood Chops	While holding a hand buoy or push plate at one hip, push diagonally across the body to the opposite shoulder and return. *This needs to be done in water where the equipment does not break the surface of the water.	8 reps right 8 reps left
Supine Planks	Lay supine with floating dumbbells in each hand and under each ankle. Activate the posterior muscle chain and pull the core into proper position while floating.	Hold for 3-5 breaths. Relax. Repeat up to 5 times.
Core Crunch	Using a small to medium Swiss ball in the water, wraps arms around the ball and push it underwater to create a small abdominal crunch	10 reps
Standing Kickbacks	Stand facing the pool wall and put your hands on top of the deck. Standing on one leg, bend the opposite knee, and hold the leg up, shin parallel to the bottom of the pool. Lead with the heel and kick back as far as you can and return to parallel thighs.	8 reps right 8 reps left
Abduction & Adduction	<p>ABDuction: Stand facing the pool wall and put your hands on top of the deck. Neutral alignment. With a flexed foot, lift your right leg out to the side, as far as you can, and return to the center. Repeat on opposite side.</p> <p>ADDuction: Stand facing the pool wall and put your hands on top of the deck. Neutral alignment. With a flexed foot, press your right leg across the midline of your body and return to the center. Repeat on the opposite side.</p>	8 reps right 8 reps left

Mobility & Stability Options
Table ____: Ankle Mobility

Mobility/Flexibility Exercise	Description	Sets
Ankle Flexion & Extension	Begin in neutral position or sitting on pool deck with legs extended over water, extend one leg straight out in front of you. Moving just the ankle, begin in plantar flexion, with toes away from the body, and then pull to dorsiflexion, toes towards the shin. Repeat.	5R/5L
Ankle Side Tilts (Inversion & Eversion)	Begin in neutral position or sitting on pool deck with legs extended over water, extend one leg straight out in front of you. Moving just the ankle, keeping your toes pointed up, turn your foot inward (towards your midline) and then outward (towards the outside of your leg.) Repeat.	5R/5L
Toe Curls	Begin in neutral position or sitting on pool deck with legs extended over water, extend one leg straight out in front of you, heel to the pool floor, toes facing upward. Curl the toes into the foot and extend to release the curl. Repeat.	5R/5L
Feet ABCs	Begin in neutral position or sitting on pool deck with legs extended over water, extend one leg straight out in front of you, bend at the knee. Make believe the floating big toe is a pencil and write out the alphabet or your name, etc.	TBD

Table ____: Knee Mobility

Mobility/Flexibility Exercise	Description	Sets
Seated Knee Flexion & Extension	Sit upright on your pool noodle. Bend one knee as far back as possible, hold for 5-10 seconds. Straighten your knee as far as possible and hold for 5-10 seconds, then relax.	5R/5L

Resistance Band Calf stretch	Sit upright on a pool noodle or sit on pool deck with one leg extended over the water. Loop a resistance band around one foot and extend the leg straight. Keeping your back straight, ease into the stretch, and pull the band toward you until you feel the stretch in your calf. Hold for up to 30 seconds, release, and switch to the other leg.	30 sec R 30 sec L
Foot Rockers	Begin in neutral position, roll into the balls of your feet, lift your heels, gently bend your knees. Hold for 5 seconds. Roll back into the heels of your feet, pulling your toes towards your body. Hold for 5 seconds. Repeat.	5-10 rolls
Egg Beaters	Holding hand buoys in front of the body, bend the knees to float the body. Engage the core, zip up the legs, and move both legs simultaneously in a circular motion. Repeat in the opposite direction.	15- 30 seconds in each direction

Table ____: Hip Mobility

Mobility/Flexibility Exercise	Description	Sets
Hip Circles	Begin in neutral position. Using your pelvic floor and lower abdominal muscles, circle your hips forward, around, and back. Repeat.	5R/5L
Leg Swings: Sagittal & Frontal Plane	Begin in neutral position, balancing on one leg. the leg that is floating in the water will be the one performing the exercise. While keeping the leg straight, swing it forward like a pendulum, and then backwards. The movement is coming from the hip. Keep the torso upright and brace the core. After moving in sagittal plane, complete leg swings on the frontal plane. Swinging legs across and in front of the body, and then beyond the outside of the body.	5R/5L
Squats	Begin in neutral position with your hands floating at the surface of the water, feet shoulder-width apart, and toes pointed forward. Keep your back flat and core braced, push your hips back, bend your knees, and lower your body until your shoulders are submerged in the water, or what is possible for your body. Pause, and then push yourself back up to the starting position. Repeat.	10 reps
Internal and External Hip Rotation	Begin in neutral position with hands to your hips. Lift one leg and bend your knee, until the thigh is parallel to the surface of the water. Gently, externally rotate the hip towards the outside of the body. Then internally rotate the hip towards the midline of the body. The knee stays in front of the hip the entire time. Repeat	5R/5L

Table ____: Neck Mobility

Mobility/Flexibility Exercise	Description	Sets
Extension & Forward Flexion	Extension: Standing in neutral, place hands behind head and extend head in a backwards direction, resist gently with hands to make the muscles in the neck work harder, return to starting position Flexion: Place hands against the forehead, push the heads forward, against the hand, and press until the chin touches the chest, reverse back to starting position	3-5R/L
Lateral Flexion	Stand in neutral position, left hand to the head, directly above the left ear, flex slowly to the left and push against the hand, repeat. Switch sides and do the same.	3-5R/L
Cat/Cow with Noodle	Begin in neutral position, holding a noodle at the surface of the water. As you inhale and move into cow pose, press gently into the noodle, press your chest forward and allow your belly to sink. Lift your head, relax your shoulders away from your ears, and gaze straight ahead. As you exhale, come into cat pose while rounding your spine outward, tucking in your tailbone, and drawing your pubic bone forward as you release the noodle back to the surface of the water. Release your head toward the pool floor. Repeat.	30 seconds in and out of cat/cow
Levator Scapulae Stretch	Begin in neutral position. Place your right hand behind your head, with your elbow pointing up. Gently pull your head down, at an angle, pointing your chin toward your right armpit. Hold for 30 seconds, then repeat on the other side.	3-5R/3-5L

Table __: Shoulder Mobility

Mobility/Flexibility Exercise	Description	Sets
Arm Circles	Stand in neutral position, extend arms out of the water to a T, or submerged under water for more resistance, rotate both shoulders clockwise and do the same in counterclockwise direction. Identify the size of the circle desired (ie. Size of a soccer ball, etc.)	10R/10L
Open Chain Circles	Stand in an upright position, legs hip width apart, parallel. Sweep right arm overhead, palm facing in towards body. At the top, rotate palm away from body. Continue to circle the arm back behind the shoulder, with thumb pointing down and return to starting position. Repeat.	3-5 circles, forward and back
Seat Belt Reach	Begin in neutral position. With one arm reaching across the body towards the opposite shoulder, reach as if you are putting on a seatbelt. Pull hand back down to hip. Hand may break surface of the water. Repeat	5R/5L
Scapula Glides at Pool Wall	Begin in neutral position, arms distance from the pool wall. Keep the elbows straight as you shrug your shoulder blades together. Push shoulder blades apart, press your hands into the wall.	15 reps

Figure __: Example Warm-up Template for ALL GROUPS A B & C

Movement	Joint Action	Muscle Group	Execution & Alignment
Core & Glute Activation:	Hip Flexion/Extension	Gluteal, quadriceps, hamstrings,	Keep a long torso and upright position. Core engaged,
Water Walk	Knee Flexion/Extension	gastrocnemius, anterior tibialis, and ankle muscles	Single leg balance with lifted flexed foot. Press back.
Wall Squat	Hip Flexion/Extension		
Standing Kickbacks			

<p>Hip Mobility: Leg Swing Front to Back</p> <p>Sidestep</p>	<p>Hip Flexion/Extension</p> <p>Hip Abduction/ Adduction</p>	<p>Hip Flexors, Gluteal</p> <p>Hip Flexors, Gluteal</p>	<p>Stand upright in the water. Lift one leg up and in front of the hip (hip flexion). Then pull the leg down and back (hip extension), being careful to avoid hyperextension of the spine.</p>
<p>Shoulder & Spine Mobility:</p> <p>Wide Plie with Sweeping Arms</p>	<p>Shoulder Abduction and Adduction</p> <p>Shoulder Abduction/ Adduction with Lateral Spinal Flexion and/or Rotation</p> <p>Elbow & Spine Extension & Flexion</p>	<p>Posterior deltoid, Upper back</p>	<p>Stand upright with legs wider than hip width apart, slight turnout in the feet. Bend your knees up to a 45-degree angle. Extend arms out to shoulder height, palms face down. Sweep down and across the abdomen and return. Extend arms out to shoulder height, sweep palms face forward, in front of the chest and return.</p> <p>Stand with one foot forward of the other in a lunge position. Position outstretched arms in front of the chest. Open both arms out to the side of the body about chest level under the water's surface</p>
<p>Knee Flexion to Extension:</p> <p>Foot Rockers</p> <p>Water Walk with knee flexion to extension</p>	<p>Ankle Flexion/ Extension</p> <p>Knee and Hip Flexion/ Extension</p>	<p>Gastrocnemius</p>	

Multi-planar movement: Aqua Jog with Vertical Sculling	Knee & Hip Flexion/ Extension Wrist Rotation	Gastrocnemius, Hip Flexors, Gluteal	Flex the knee and hip. Extend your knee, pushing your foot up. Alternate side to side, with small rebounds off the bottom of the pool. Scull hands palms frontwards and then palms backwards
Traveling Corkscrew Sideways	Trunk rotation	TA, obliques, gluteal, hamstrings, Gastrocnemius	

ACTIVITY: Design a Client Warm-Up

It is your turn to design a 5-10 minute warm-up for your client. Review the focal areas for each client population.

Group A: Deconditioned/Post-Rehab/ Arthritic/ Limited Mobility	Foot and Ankle Swelling/Neuropathy, Knee Issues & Gait Challenges, Upper Back and Neck Pain
Group B: General Fitness Participants/ Moderately Active	Mobility of the Hips and Shoulders, Flat Back Syndrome, Weak Core & Balance Issues
Group C: Athletes & Advanced Exercisers	Flexibility, Overuse of Larger Muscle Groups, Underuse of Smaller Muscle Groups, and Achilles and Calf Issues

Since Groups B and C are conditioned individuals, you may consider:

- Additional more multi-planar movement
- Movement that lands on alternating feet (i.e., rocking horse, pendulum, side steps, etc.)
- Movement that takes arms above the head and out of water

Part 1: Warm-Up for Client in Group B

Client Data: Male, Age 62. Height: 5'10". Weight: 218 lbs. Body Type: Endomorph.

Recently retired commercial pilot. Experiencing tight hips and hamstrings, lower back pain and noticeable balance issues. Trains in the gym twice a week lifting weights and walk dog daily for .5 mile.

Pool: Indoor pool, around 84 degrees water temperature; access to shallow and deep-water depths

Equipment: kickboard, aqua dumbbells, pool noodles, resistance bands

Brainstorm:

Warm-up for Client in Group B

Movement	Joint Action	Muscle Group	Execution & Alignment
Core & Glute Activation:			
Hip Mobility:			
Shoulder & Spine Mobility:			
Knee Flexion to Extension:			
Multi-planar movement:			

Design a Client Warm-Up, Part 2

Part 2: 5-10 minute Warm-Up for Client in Group C

Client Data: Female. Height: 5'7". Weight: 145 lbs. Body Type: Mesomorph
Triathlete: shoulder impingement (left); experiencing knee pain (right), small amounts of swelling, on and off
Pool: Outdoor pool, around 86 degrees water temperature; access to waist-height, shallow and deep-water depths
Equipment: aqua dumbbells, pool noodles, flotation belt, aqua step

Brainstorm:

Warm-up for Client in Group C

Movement	Joint Action	Muscle Group	Execution & Alignment
Core & Glute Activation:			
Hip Mobility:			
Shoulder & Spine Mobility:			
Knee Flexion to Extension:			
Multi-planar movement:			

Part 3: Design an Aqua Walk or Jogging Component

Create a Client:

Name:	
Client Group:	A, B, C
Client Data:	
Pool:	
Equipment	
Brainstorm	

NOW, Progress that Client.

- Remember when you change direction, movements, repetitions or timing, the intensity changes.
- Consider:
 - moving hands and feet together
 - cardio plyo
 - agility movements
 - quick changes of direction (example: aqua run while jabbing 4 reps followed by 2 jack sprints)

Progression Brainstorm:

Client: _____

Aqua Walk/Jog Movement Patterns	Directions (include tempo, hand positions, direction, etc.)

Client Progression:

Aqua Walk/Jog Movement Patterns	Directions (include tempo, hand positions, direction, etc.)

Part 4: Progress an Existing Strength Training Component

Here is a strength training component during a Phase 1 Workout for a Group A Client who participates in PT twice a week.

Exercise Supersets	Workout 1	Workout 2	Workout 3	Workout 4
1a. Heel Slides against the Pool Wall	8 reps each side	8 reps each side	8 reps each side	10 reps each side
1b. Elbow Flexion/ Extension w/ Aqua DBs	8 reps each side	8 reps each side	8 reps each side	10 reps each side
Active Recovery: Walk with arms pumping at side	1 minute REPEAT 1a 1b	1 minute REPEAT 1a 1b	1 minute REPEAT 1a 1b	1 minute REPEAT 1a 1b
2a. Pool Box Step-overs	8 reps each side	8 reps each side	8 reps each side	10 reps each side
2b. Standing Push-ups at the Pool Wall	10 reps	10 reps	10 reps	12 reps
Active Recovery: Walk with hands to reverse prayer or bound, behind back	1 minute REPEAT 2a 2b	1 minute REPEAT 2a 2b	1 minute REPEAT 2a 2b	1 minute REPEAT 2a 2b
3a. Cross Country Shuffle w/ Aqua DBs	10 reps	10 reps	10 reps	12 reps

3b. Seated Row at Pool Wall w/ band	8 reps	8 reps	8 reps	10 reps
Active Recovery: Walk with pontoon boat arms	1 minute Repeat 3a 3b	1 minute Repeat 3a 3b	1 minute Repeat 3a 3b	1 minute Repeat 3a 3b
4a. Alternating-Single Leg Hip Abductions w/ noodle for balance	8 reps each side	8 reps each side	8 reps each side	8 reps each side
4b. Chicken Wings w/ Aqua Dbs	10 reps	10 reps	10 reps	10 reps
Active Recovery: Walk with hands behind the head	1 minute Repeat 4a 4b	1 minute Repeat 4a 4b	1 minute Repeat 4a 4b	1 minute Repeat 4a 4b

Instructions:

After working with the Trainer for 4 weeks, this Client is ready to move to Phase 2 and progress their strength training. Use this basic superset template. Remember when you change direction, movements, repetitions or timing, the intensity changes. Also consider combining endurance-based movements and strength-based movements to add intensity and variety.

Exercise Supersets	Workout 1	Workout 2	Workout 3	Workout 4
1a.				
1b.				
2a.				
2b.				
3a.				
3b.				
4a.				
4b.				

Notes:

Part 5: Create a high-intensity circuit

One of your clients is an athlete training in their off-season. They are in Phase 3 of their fitness training. After determining who your client is, create a variety of high-intensity circuits that utilize ALL types of movement patterns, in all planes of motion. Think fun! Think energy! All three need to be consistent in what they are training but have variety in movement selection.

Ideas:

- Moving hands and feet together
- Cardio plyo, agility movements
- Movement skills and/or movements that change direction quickly (i.e. run in place while jabbing 4 reps followed by 2 jack sprints)
- Combinations of 2-3 cardio endurance exercises in one movement (i.e. shoutout, hold tuck, mogul R, mogul L)
- Unilateral movement that challenges only one side of the body

Name:	
Client Group:	A, B, C
Client Data:	
Pool:	
Equipment	
Brainstorm	

Please note, you are not limited to 5 exercises in the circuit. That is just a template.

Circuit Exercise & Equipment Required	Muscle Group	Sets/Reps/Rest OR Timed Work/Rest
1.		
2.		
3.		
4.		
5.		

Circuit Exercise & Equipment Required	Muscle Group	Sets/Reps/Rest OR Timed Work/Rest
1.		
2.		
3.		
4.		
5.		

Circuit Exercise & Equipment Required	Muscle Group	Sets/Reps/Rest OR Timed Work/Rest
1.		
2.		
3.		
4.		
5.		

General Training Template:

Movement	Joint Action	Muscle Group	Execution & Alignment
Core & Glute Activation:			
Hip Mobility:			

Shoulder & Spine Mobility:			
Knee Flexion to Extension:			
Multi-planar movement:			

Aqua Walk/Jog Movement Patterns	Directions (include tempo, hand positions, direction, etc.)

Strength Training	Reps	Sets	Equipment

Progression/Changes to Intensity: Exercise Variety:			

Flexibility/Stretch	Execution	Purpose
1.		
2.		
3.		
4.		

Superset Template

Exercise Supersets	Workout 1	Workout 2	Workout 3	Workout 4
1a.				
1b.				
2a.				
2b.				
3a.				
3b.				
4a.				
4b.				

Circuit Template

Circuit Exercise & Equipment Required	Muscle Group	Sets/Reps/Rest OR Timed Work/Rest
1.		

2.		
3.		
4.		
5.		



APPENDIX A

Trainer Resources

Professional Fitness Organizations

www.scwfitness.com	1-877-SCW-FITT
www.aeawave.com	888-AEA-WAVE
www.acefitness.org	888-825-3636
www.afaa.com	877-968-7263
www.idealit.com	800-999-4332, ext. 7
www.irhsa.org	800-228-4772

Shoes and Apparel

www.H2OWear.com	800-321-7848
www.aviaselect.com	800-275-3565
www.rykafit.com	888-834-7952
www.swimoutlet.com	800-691-4065
www.landsend.com	800-963-4816

Liability Insurance

C.M. Meiers Company, Inc.	800-596-0969
FitnessPak, Interwest.	800-873-FPAK (3725)
Insurance Services, Inc IDEA Insurance	877-438-7459
Elite Risk Insurance Solutions	800-334-5120

Aqua Fitness Equipment

www.hydrofit.com	800-346-7295
www.performbetter.com	888-556-7464
www.power-systems.com	800-321-6975
www.spriproducts.com	800-222-7774
www.fitnesswholesale.com	888-FW-ORDER (39-67337)
www.swimoutlet.com	800-691-4065

The market for aquatic exercise tools proves a continuous stream of exciting and new equipment for the water exerciser. Unfortunately, many facilities budget tightly and restrict equipment purchases. As an aquatic fitness professional, you will need to understand the benefits, disadvantages, costs, and intuitiveness of various tools so you will be prepared to acquire and introduce equipment to your clients. In addition, you may also choose to use land-based equipment IN the pool with your clients.

Equipment	Purpose	Skill/Level	Cost
Aquatic Gloves and Aquatic Combat Gloves	Resistance, balance and coordination, muscular endurance, cardiovascular work	novice to advanced	\$10-\$20
Hand Buoys	Buoyancy and resistance, muscular endurance, flotation assistance	novice to advanced	\$15-\$65
Noodles	Buoyancy and resistance, muscular endurance, flotation assistance	novice to advanced	\$3-\$20
Flotation Belts	Buoyancy, flotation assistance	novice to advanced	\$20-\$50
Kick Boards	Buoyancy and resistance, muscular endurance, flotation assistance	novice to advanced	\$5-\$30
Buoyant Cuffs	Buoyancy and resistance, muscular endurance, cardiovascular work, flotation assistance	intermediate to advanced	\$20-\$50
Paddles	Resistance, muscular endurance	intermediate to advanced	\$8-\$30

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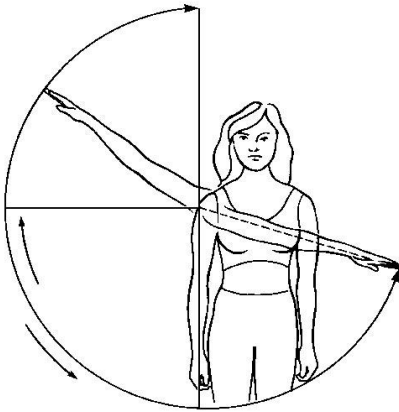
Haff, G. 2008. Athletic cross training for athletes: Part 11. *Strength & Conditioning Journal*, 30 (3), 67–73

Delevatti, R., et al. 2016. Glucose control can be similarly improved after aquatic or dry–land aerobic training in patients with type 2 diabetes: A randomized clinical trial. *Journal of Science and Medicine in Sport*, 19 (8), 688–93

<https://pubmed.ncbi.nlm.nih.gov/17142642/>

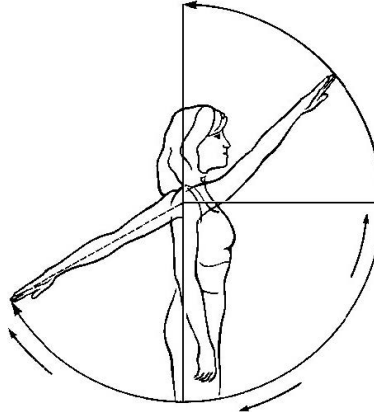
APPENDIX B

Planes of Movement



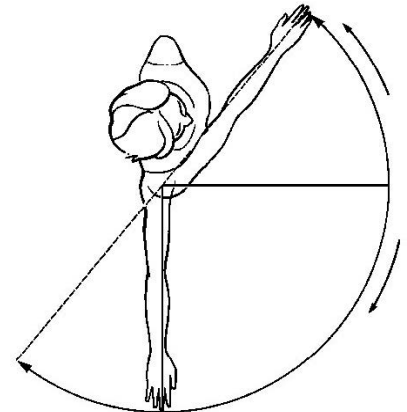
Plane: **Frontal**

Movement: **Shoulder Abduction/ Adduction**



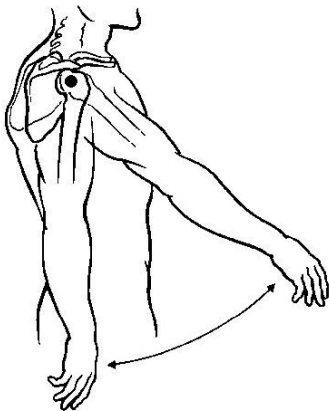
Plane: **Sagittal**

Movement: **Shoulder Flexion/ Extension**



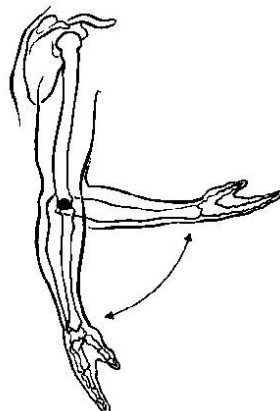
Plane: **Transverse**

Movement: **Shoulder Horizontal Flexion**



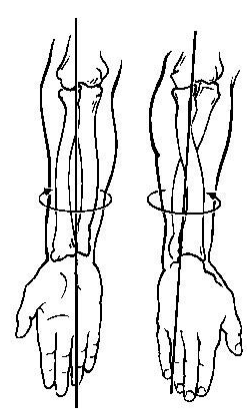
Plane: **Sagittal**

Movement: **Shoulder Extension**



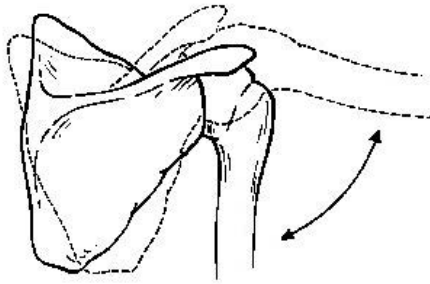
Plane: **Sagittal**

Movement: **Elbow Flexion**



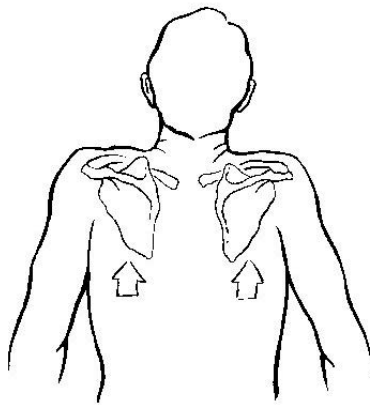
Plane: **Transverse**

Movement: **Internal Rotation**



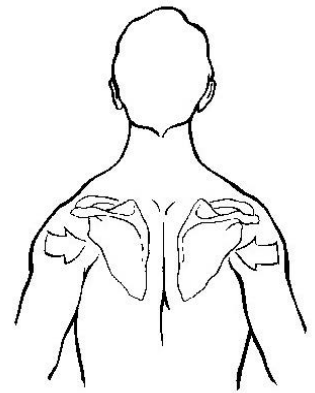
Plane: **Frontal**

Movement: **Shoulder Abduction**



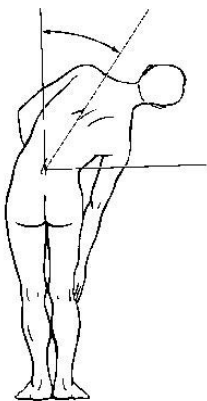
Plane: **Frontal**

Movement: **Scapular Elevation**



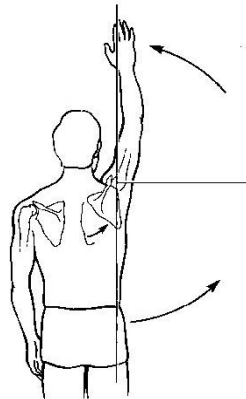
Plane: **Frontal**

Movement: **Scapular Retraction**



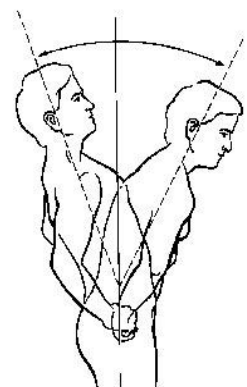
Plane: **Frontal**

Movement: **Lateral Flexion**



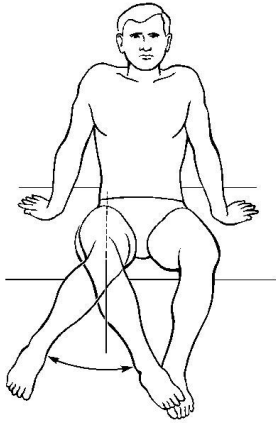
Plane: **Frontal**

Movement: **Scapular Upward Rotation**



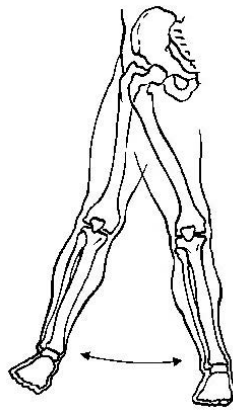
Plane: **Sagittal**

Movement: **Hip Flexion/Extension**



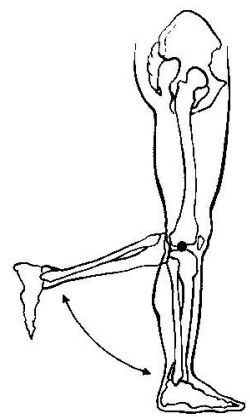
Plane: **Transverse**

Movement: **Hip Internal/
External Rotation**



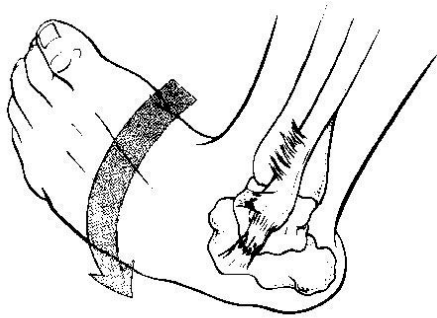
Plane: **Frontal**

Movement: **Hip Abduction**



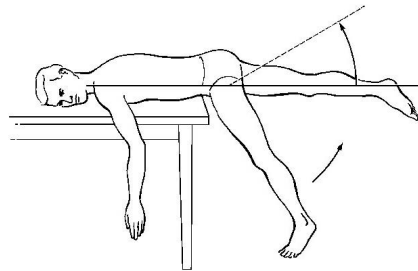
Plane: **Sagittal**

Movement: **Knee Flexion**



Plane: **Transverse**

Movement: **Ankle Supination**



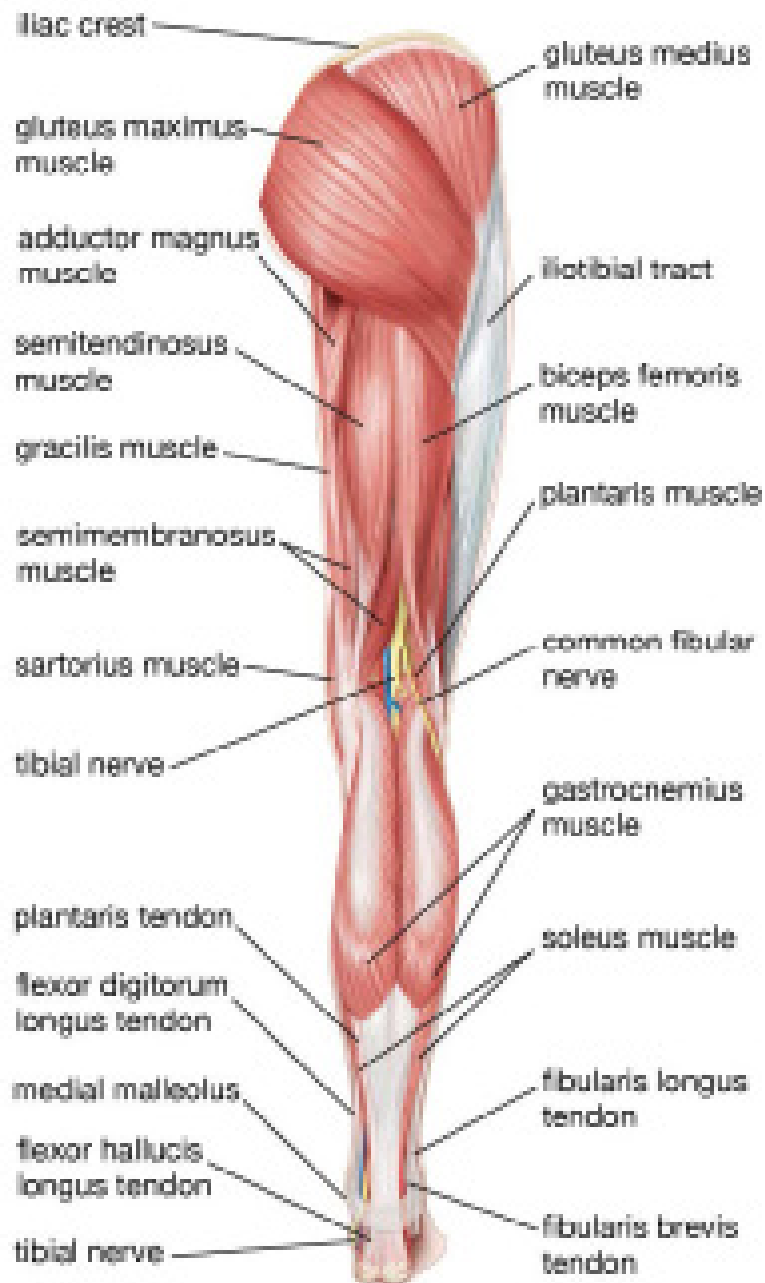
Plane: **Sagittal**

Movement: **Hip Extension**

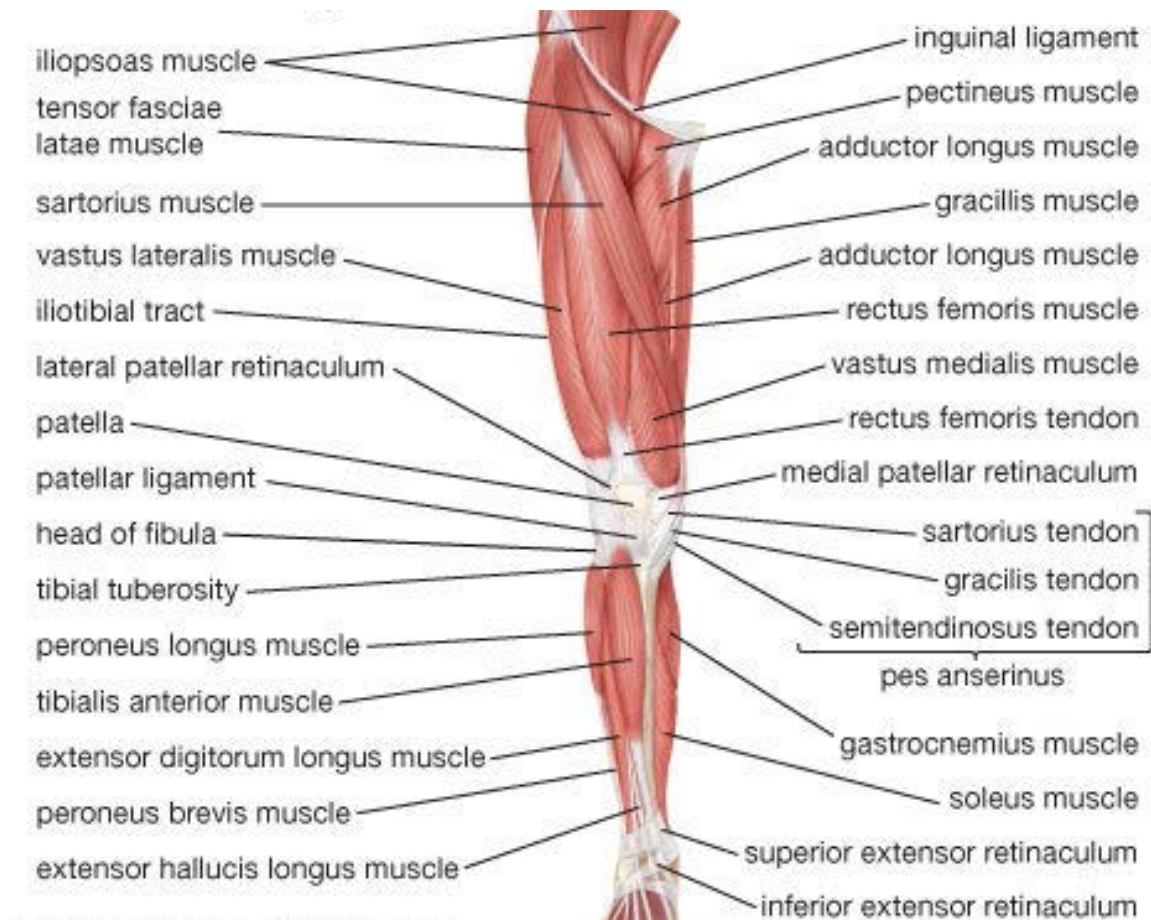
APPENDIX C

Muscle Anatomy

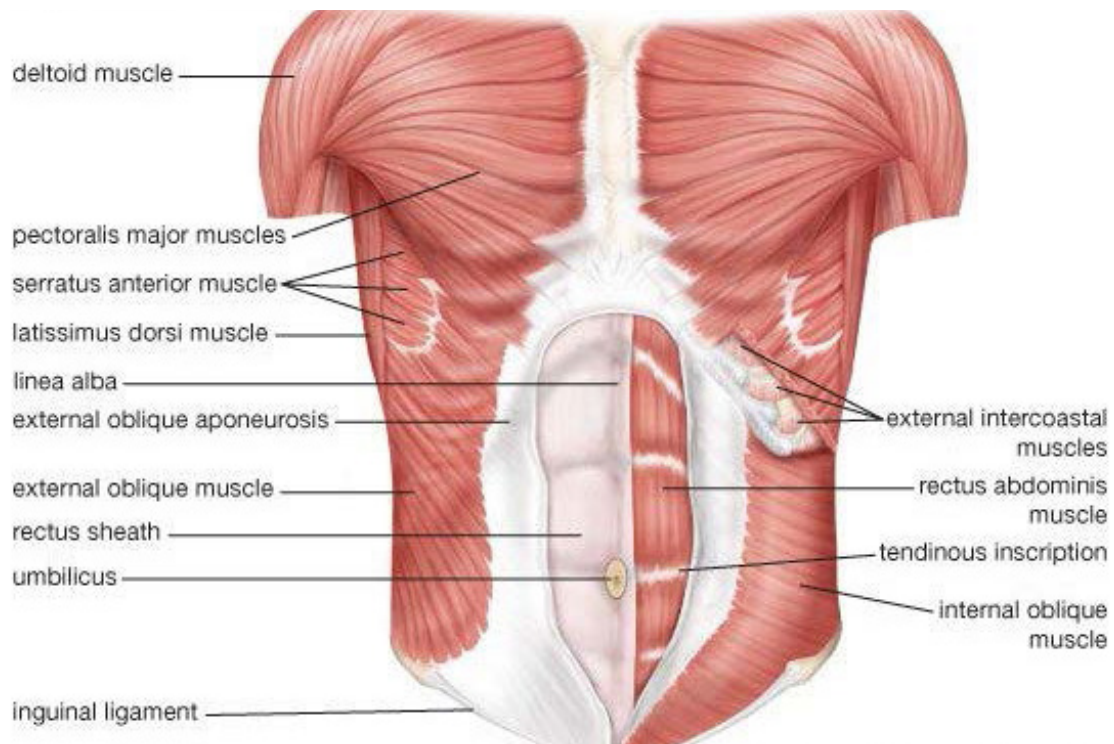
Posterior View of the Leg



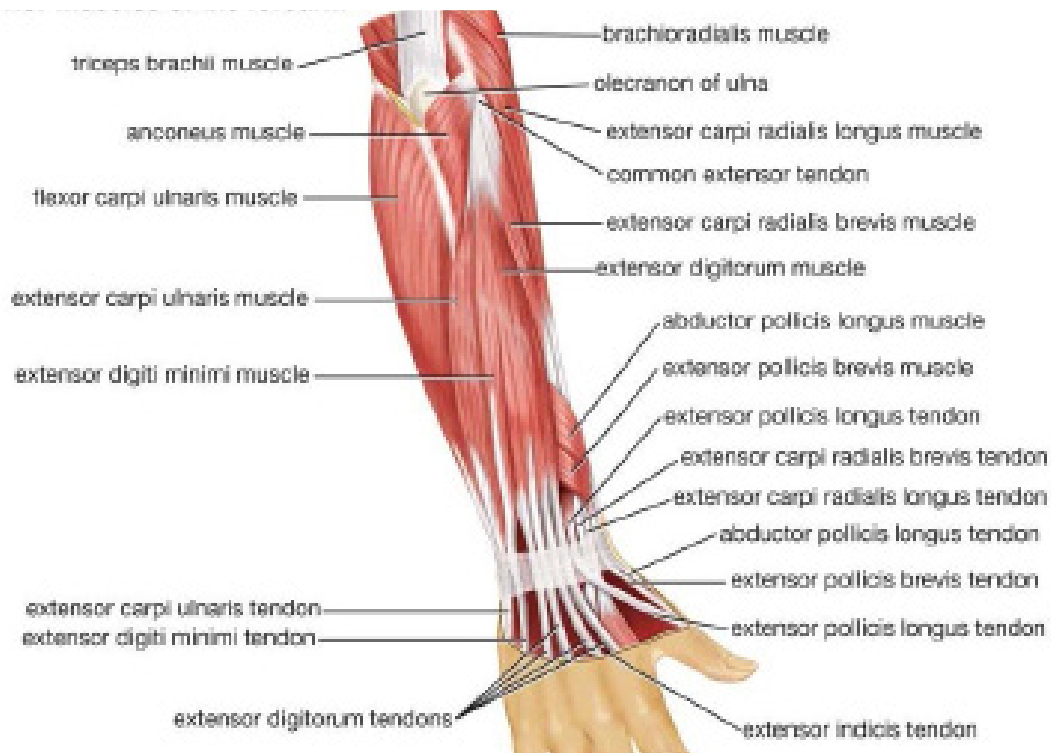
Anterior View of the Leg



Anterior View of the Core



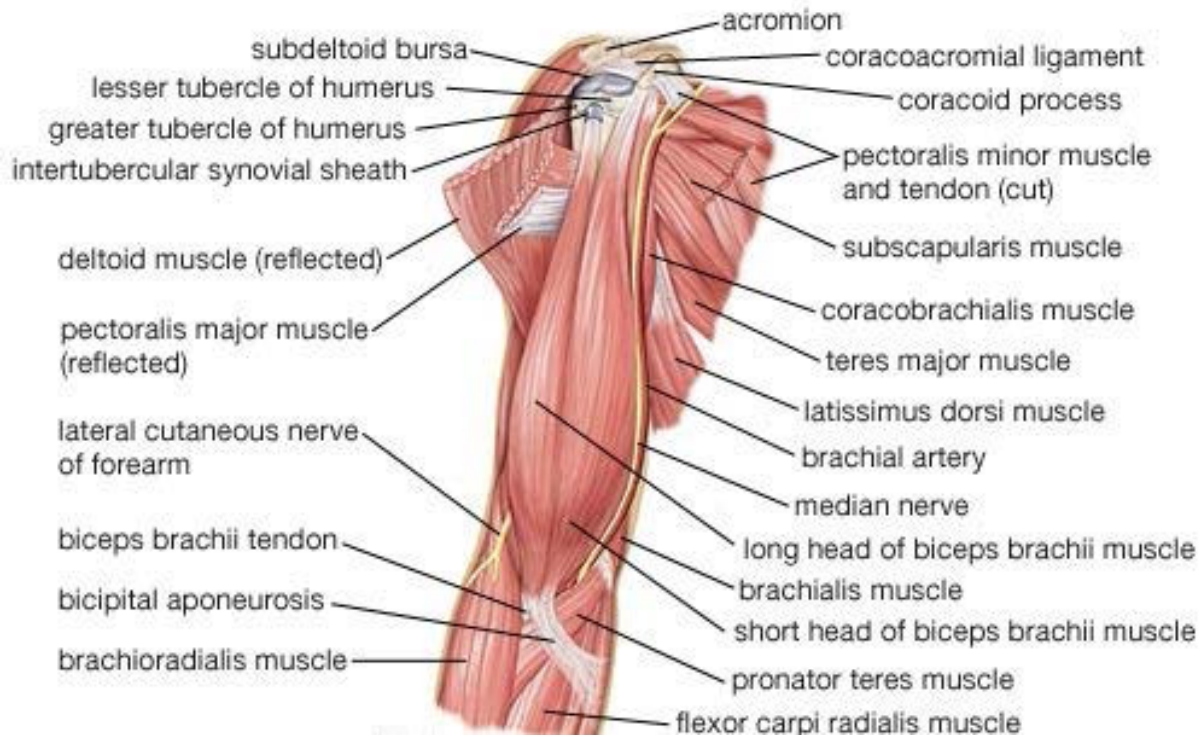
Posterior View of the Forearm



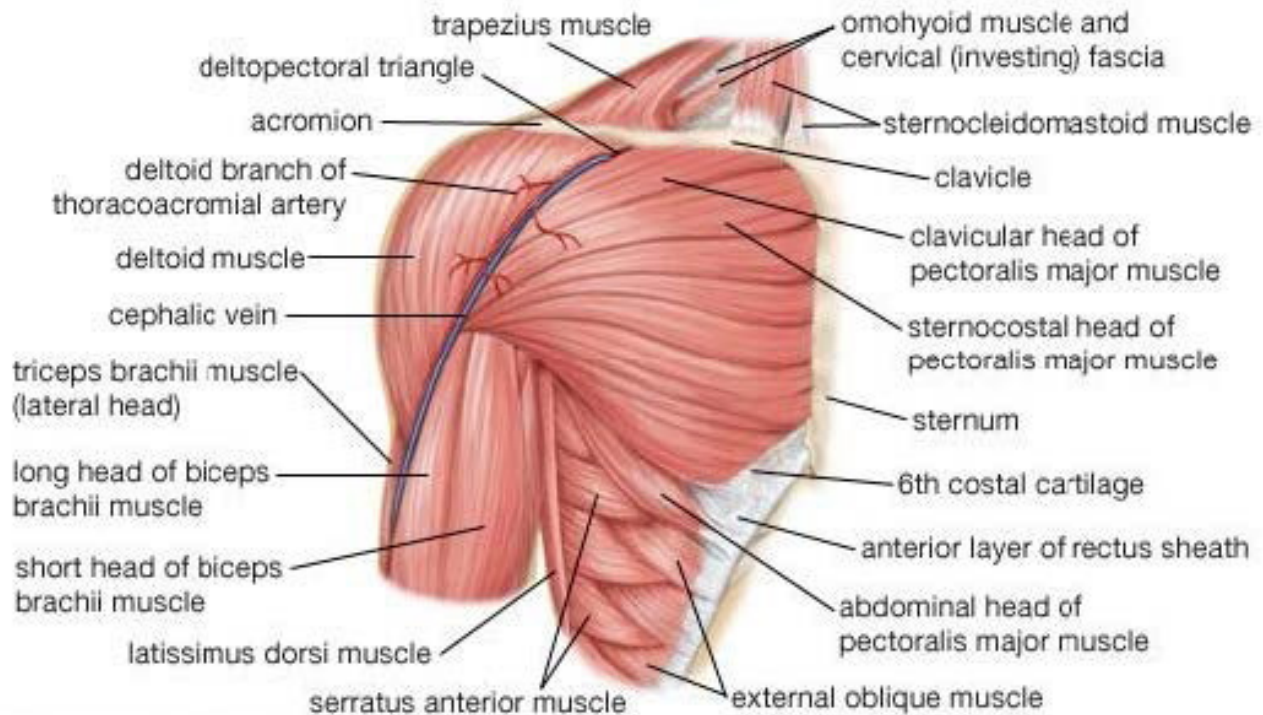
Anterior View of the Forearm



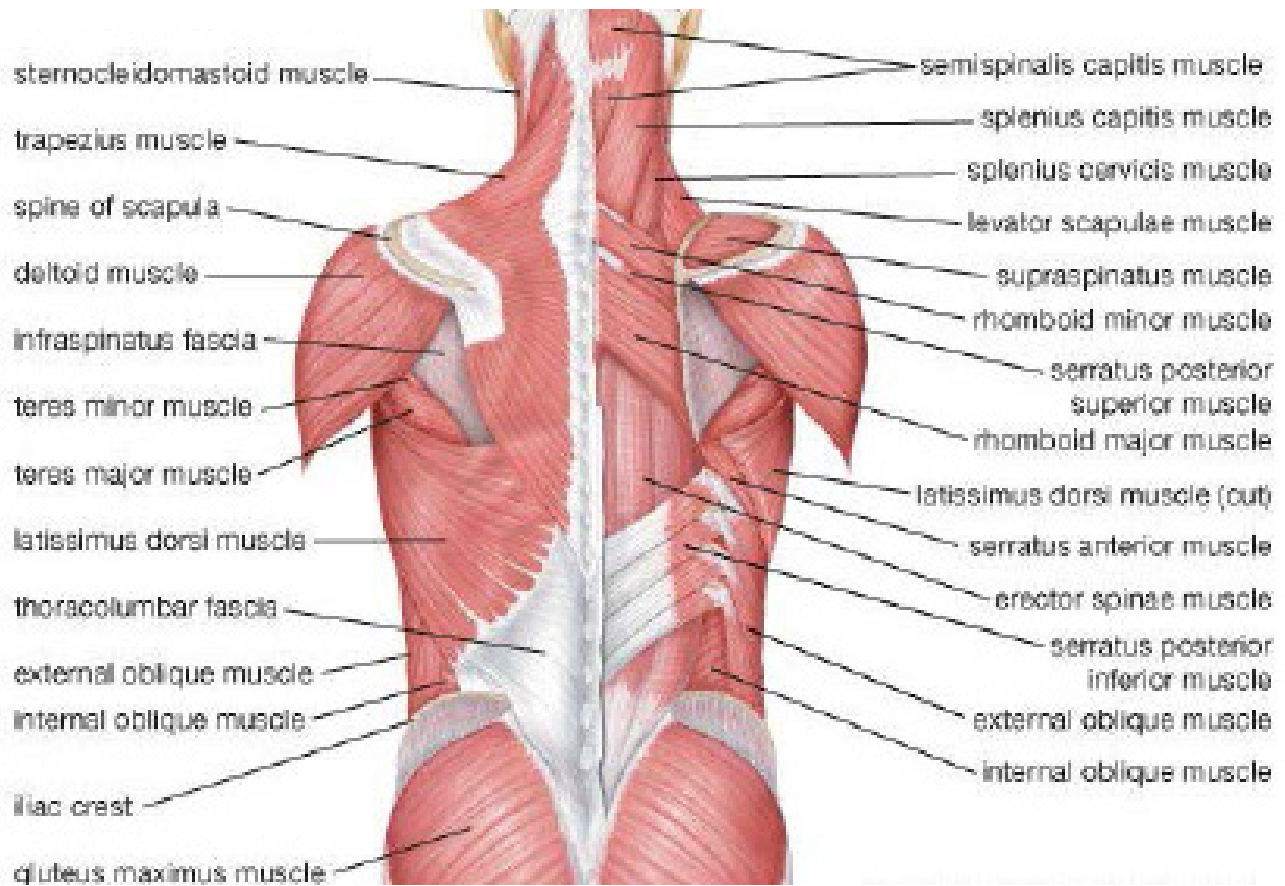
Anterior View of the Upper Arm




Anterior View of the Chest



Posterior View of the Back





APPENDIX D

BMI Calculation

BODY MASS INDEX CALCULATION (BMI)

- ✓ **Purpose:** Estimate body composition by calculating a height-normalized index against body weight.
 - The validity of this index has been challenged for senior populations or athletic populations. Athletic populations tend to have more body mass and lean tissue.
 - Additionally, BMI tables do not apply to children and adolescents under age 18.
 - Use standard height-to-weight tables:
 1. A child's weight that is in the 85th – 95th percentile classifies him or her as overweight.
 2. A child's weight that is \geq 95th percentile classifies him or her as obese.
- ✓ **Equipment:**
 - BMI tables.
 - Calculator.
 - Tape measure and scale (if needed).
- ✓ **Procedure:** Trainers can utilize any of the three methods provided:
 1. **BMI Table** (table 7)
 2. **Metric Formula:** $\text{BMI} = \text{Weight (kg)} \div \text{Height}^2 \text{ (m}^2\text{)}$
 - Metric Formula: $\text{BMI} = \text{Weight (kg)} \div \text{Height}^2 \text{ (m)}$
 1. Obtain your client's body weight and convert it from pounds to kilograms.
 - **1 kg = 2.2 lbs**
 2. Obtain your client's height and convert it from feet and inches to meters.
 - **1 inch = 2.54 cm**
 - **1 meter = 100 cm**
 3. Example: Mary stands 5'7" at 160 lbs
 - $160 \text{ lbs} \div 2.2 = 72.7 \text{ kg}$
 - $5 \text{ foot } 7 \text{ inches} = 67 \text{ inches} \times 2.54 = 170.18 \text{ cm}$
 - $170.18 \text{ cm} \div 100 = 1.70 \text{ m}$
 - $72.7 \text{ kg} \div 1.70^2 \text{ m} = 72.7 \text{ kg} \div (1.70 \text{ m} \times 1.70 \text{ m}) = 72.7 \text{ kg} \div 2.90 \text{ m} = \mathbf{25.07}$

3. Standard Formula: $BMI = Wt \text{ (lbs)} \times 703 \div Ht \text{ (inches)} \div Ht \text{ (inches)}$

- **Procedure: Standard Conversion: $BMI = Wt \text{ (lbs)} \times 703 \div Ht \text{ (inches)} \div Ht \text{ (inches)}$**

1. 1. Example: Mary stands 5'7" at 160 lbs

- $160 \text{ lbs} \times 703 = 112,480$
- $112,480 \div 67 = 1,678.81$
- $1,678.81 \div 67 = \mathbf{25.06}$

Table 7: BMI Computation Table

BMI (kg/m ²)	19	20	21	22	23	24	25	26	27	28	29	30	35	40
Height (in.)	Weight (lb.)													
58	91	96	100	105	110	115	119	124	129	134	138	143	167	191
59	94	99	104	109	114	119	124	128	133	138	143	148	173	198
60	97	102	107	112	118	123	128	133	138	143	148	153	179	204
61	100	106	111	116	122	127	132	137	143	148	153	158	185	211
62	104	109	115	120	126	131	136	142	147	153	158	164	191	218
63	107	113	118	124	130	135	141	146	152	158	163	169	197	225
64	110	116	122	128	134	140	145	151	157	163	169	174	204	232
65	114	120	126	132	138	144	150	156	162	168	174	180	210	240
66	118	124	130	136	142	148	155	161	167	173	179	186	216	247
67	121	127	134	140	146	153	159	166	172	178	185	191	223	255
68	125	131	138	144	151	158	164	171	177	184	190	197	230	262
69	128	135	142	149	155	162	169	176	182	189	196	203	236	270
70	132	139	146	153	160	167	174	181	188	195	202	207	243	278
71	136	143	150	157	165	172	179	186	193	200	208	215	250	286
72	140	147	154	162	169	177	184	191	199	206	213	221	258	294
73	144	151	159	166	174	182	189	197	204	212	219	227	265	302
74	148	155	163	171	179	186	194	202	210	218	225	233	272	311
75	152	160	168	176	184	192	200	208	216	224	232	240	279	319
76	156	164	172	180	189	197	205	213	221	230	238	246	287	328

Reference: Adapted from Bray, G.A. and Gray, D.S. (1988). Obesity, Part I, Pathogenesis, Western Journal of Medicine: 149: 429-41.

Test Interpretation:

- Using the reference table presented below, categorize your client's score.

Table 8: BMI Score Classifications

Body Mass Index	
Classification	BMI Score (kg/m ²)
Underweight	< 18.5
Normal	18.5 – 24.9
Overweight	25.0 – 29.9
Obese	30.0 – 40.0
Extremely Obese	> 40.0

Reference: ACSM Guidelines for Exercise Prescription (2006).