COACHING THE AGING ATHLETE

TRAINING GUIDE

CrossFit
EDUCATION

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INTRODUCTION

Like it or not, we all get old and will have to deal with the physiological and psychological changes associated with the aging process. However, to a very large extent we have control over the degree to which those changes impact our quality of life, because we are only as old as we believe we are. We have a very simple choice between sedentary aging that involves a myriad of negative effects resulting from inactivity and active aging that involves maintaining a high quality of life and functionality well into our elderly years. Coach Greg Glassman once stated that his greatest fear was living a long life without the basic functionality to enjoy it, i.e., spending 100 years on the planet and requiring the support of others to perform basic daily tasks for 40 of them. That is a very real prospect for the majority of humans in the western world: a later life that is marred by ill health and spent largely in the nursing home. Our greatest motivation as trainers and coaches should be to not only extend the lives of our clients but also prevent the decline of functionality with age. The goal is a life well-lived.

Attitude plays a huge role in determining the degree to which we remain active as we age. In turn, our level of activity determines the degree to which we remain functional across our lifespan. Contrary to the belief that functional decline and illness are unavoidable and predictable aspects of aging, the emerging research on fit older athletes is clearly showing that they not only live longer than a non-athletic population, they also are healthier later in life and have a lower prevalence of disease (Garatachea et al., 2014). The research is catching up to what we have known in the CrossFit community for some time.

It is the effects of a sedentary lifestyle, not age, that cause functional decline and illness, and quality of life is significantly better for those who remain fit and active throughout the course of their lifespan (Wright, 2012). Becoming an athlete and remaining an athlete creates a "survival advantage" (Bauman et al., 2012).

This should be no surprise to the CrossFit trainer. Our definition of health is fitness across age, or in more technical terms, work capacity across broad time and modal domains throughout life. Our goal is to increase that work capacity. The way we achieve that is by practicing constantly varied functional movements at high intensity. Applying this to an older client should be no problem because we use a principle of relative intensity where the stimulus is modified to match current levels of physical and psychological tolerance. This means that the CrossFit program is universally scalable, i.e., anyone can do it, and everyone should do it, especially your grandma. As CrossFit continues to grow in popularity, the theory of universal scalability is being proven in practice as the average age of participants in the program increases. We have a growing body of empirical data that shows that CrossFit applied with appropriate scaling is a very effective method for training the older athlete and unlocking the benefits of active aging. The CrossFit Games provides us with compelling data that demonstrates that older athletes can get fitter and stronger despite getting older.

When kids started following their parents into CrossFit gyms, it became readily apparent that they benefited most when the training program was adapted to their developmental needs as a special population. This thinking was intuitive and led to the creation of the very successful CrossFit Kids program. It is well understood that kids are not just little adults but rather have physiological and psychological differences that the trainer must accommodate to ensure long-term success in the program.

The program does not need to change, but it does need to be adapted to be fully effective. It is perhaps less intuitive, but equally true, that older adults are a similar special population for similar reasons, i.e., they are physically and psychologically different from younger adults and cannot be treated the same (Langer, 2015). Now that parents and grandparents are following their kids into CrossFit gyms in large numbers, there are great benefits to fully understanding the needs of the older participant for trainer and client alike.

When we talk about the "aging athlete", we are usually talking about anyone older than 40 years of age. This is a general age when changes become more apparent, though in some cases it may be even earlier. For the purpose of this course, we refer to athletes younger than 40 years as younger adults (or athletes). Trainers with limited experience with the aging athlete community will often refer to younger adults as "normal athletes." Inherent in this is an underlying prejudice that we do not support. Aging athletes are normal athletes. We encourage trainers to resist using or accepting any terminology that implies limitations.

NOTE:

Throughout this Training Guide and course, we use the terms aging athlete and masters athlete interchangeably.

In the CrossFit competition space, anyone over 35 is considered a masters athlete; however, when we use the term "masters" athlete, we are not referring to competitors, we are referring to athletes who are 40 years-old and above.

It is important to recognize that masters athletes come in all shapes and sizes, and therein lies the specific challenge for the trainer. Whereas kids follow a universal development path of predictable ages and stages, older adults do not, and there are many situational factors that cause variability among aging athletes. There is also a lot of changeability in the situational factors that define their needs. This means that training aging athletes is a complex endeavour because development is not linear, and without an understanding of the variables involved, success is left to chance.

The goal of this course is to provide a simple toolkit for CrossFit trainers to meet the challenge of coaching aging athletes. CrossFit is a powerful tool to change people's lives for the better, and when applied well to an aging athlete, the effects are profound.

REDEFINING THE AGING ATHLETE

The picture of aging that is painted for us is that we hit the peak of our physical capacity in our 20s, start to decline noticeably in our mid to late 30s, gain weight and become sedentary in our 40s, show signs of illness in our 50s, lose independence in our 60s, and finally, become frail and decrepit in our 70s—if we happen to live that long. It is expected that we will become ill and incapacitated as we get older, and we are told that age is a major risk factor for common diseases like coronary artery disease and diabetes. There is a pervasive theme in the older medical literature that age-based decline is predictable and inevitable. It is a bleak picture that unfortunately does become a reality for a large number of people.

An Alternative View of Aging

An alternate view is emerging in the more recent research, and it is significantly more optimistic. There are biological and physiological changes that occur with aging, but they are not necessarily as limiting or predictable as previously thought. Research into an older athletic population, as opposed to a sedentary population, suggests that lifestyle and exercise are significant factors in successful aging (Langer, 2015). Successful aging can be defined as "a late-life process of change characterized by high physical, psychological, cognitive, and social functioning" (Geard et al., 2017). A high level of fitness as we age attenuates a lot of the negative effects often associated with aging and leads to a significantly better quality of life in later years. In trained individuals, balance is better and fall risk is lower (Rogers et al., 2013), which is a major factor in maintaining independence. Major medical risk factors such as hypertension, diabetes, coronary heart disease, stroke and cancer are reduced (Reimers et al., 2012), and those who achieve a high level of fitness and continue training achieve greater overall life expectancy. An interesting study into the longevity of athletes found that Olympic medalists who maintain fitness live, on average, eight percent longer than an untrained population, which equates to 2.8 years of extra life (Bauman et al., 2012). For the non-elite, regular exercise across the lifespan reduces overall mortality from all causes by 40 to 60 percent (Chugh et al., 2016). The benefits of physical training for the older adult are profound. Age does not have to be synonymous with disease or a decline in function.

The findings in the recent research are consistent with the empirical data provided by the CrossFit community. Regardless of starting age, work capacity across broad time and modal domains can be improved. The CrossFit Games provide compelling evidence that despite getting older, masters athletes get stronger and fitter. The age-fitness paradigm is changing as a result of better data, and as CrossFit trainers, we have every reason to be optimistic when training aging athletes. A life well-lived is built on a foundation of lifelong training. However, training a masters athlete is not easy, and the trainer can face some significant challenges.

Training a masters athlete can be complex and challenging because no two athletes are the same. Grouping everyone over 40 years of age into the same category is not particularly helpful as situational and lifestyle factors create a lot variability. Age by itself is a poor way to define a masters athlete. Rather, we need to define a masters athlete by assessing four key variables that interact, and when understood, allow the trainer to make effective coaching decisions specific to the individual. The complexities of training masters athletes can be made manageable simply by having a better way to classify them.

THE MASTERS QUADRANT

The four key variables that interact are the athlete's goals, age, fitness level and injury state. These four variables form the foundation of the Masters Quadrant, which precisely characterizes specific masters athletes. By assessing the interaction of these four variables, we can define an archetype for the athlete. The archetype provides a simple and consistent way for the trainer to categorize the athlete. Each archetype has specific needs that require the trainer to adapt the training program and coaching style to maximize effectiveness. Goals and age provide us with important information regarding the optimal coaching interaction, whereas fitness level and injury state provide important information on how the program should be scaled. The combination of the four variables identify 16 different archetypes that the trainer may encounter.

Assessing these four variables is consistent with what a good trainer will do with every athlete, regardless of age—i.e., they are not specific to masters athletes. However, making the assessment explicit and thinking in terms of archetypes is particularly useful for a younger trainer who may not know where to start when faced with an aging athlete.

GOALS • Motivated by performance or general wellness? • Focused on competing or social interaction? • Likes to win? • Training for a specific event or competition?	**FITNESS LEVEL** • As prescribed (Rx'd)? • Active or inactive? • History of exercise? • Played sports?
AGE • How old is the athlete? • 40-54 years? • 55+ years? • Do they feel limited by their age?	**INJURY STATE** • Any medical condition that is limiting? • Current injury? • Underlying disease state? • Any history of injury or disease?

Goal Orientation

We identify goal orientation by asking, "What is your reason for training?" Based on the answer, we can separate masters athletes into either a performance group or a wellness group. The performance group is interested in competition and motivated by better results. This group also includes anyone who is training for a specific event or sport. The wellness group is interested in regaining health and fitness or maintaining quality of life. Members of this group are motivated by what they can do in the real world and by their level of health. The two groups have very different goals and therefore require a different training approach. This distinction is more significant in the aging population than the general population. Where there is overlap—i.e., the individual states that both are equally important—one goal will still take precedence over the other and will be the primary driver of training behavior.

Age

We use chronological age to separate masters athletes into either an early masters or late masters group. Fifty-five years of age is used as an arbitrary point to separate the two groups, and it works well in practice. Any athlete younger than 55 is categorized as an early masters athlete. The athletes in this group tend to still have active family and work responsibilities, and their lifestyle factors can be very similar to athletes younger than 40. It is not uncommon for early masters to consider themselves as un-aged, and as such, to still identify as a younger athlete—i.e., be in a state of denial, particularly for those in the 40-44 age bracket.

We categorize any athletes older than 55 as a late masters athlete. Athletes in this group tend to be at a stage of life that is distinct from the early masters group. They may be semi-retired or retired, have grown-up families, and the physiological and psychological effects of aging are more noticeable beyond 55 years. Late masters may also have substantially more time for training and access to greater resources. For competitive masters athletes, separating the groups at 55 years also aligns with typical scaling in the Open and Games, so this categorization also is helpful in terms of programming.

Fitness Level

We can divide the masters into fit and deconditioned groups based on their current level of conditioning. Rather than thinking in terms of CrossFit's definition of fitness, we are more interested in simply determining whether athletes are deconditioned in order to help estimate the degree to which the program needs to be scaled and graduated. For someone presenting to the gym for the first time, the key questions are: (1) "Are they currently exercising?" (2) "Do they have an active lifestyle?" (3) "Have they remained active throughout their life?" and (4) "Do they play sports?" For an existing CrossFit athlete, the key questions also include: (5) "How long have they been training?" (6) "Are they returning from a break in training?" and (7) "Which workouts and movements can they perform as prescribed (Rx'd)?" The answers to these questions help the trainer make a judgment about the current level of conditioning. Having an active lifestyle, currently exercising and regularly playing sports indicates that they are fit. Being sedentary or new to exercise, returning from an extended break in training, or being unable to perform movements indicates that they are likely to be deconditioned.

The starting level of fitness makes a big difference in the degree to which the program needs to be modified. The effects of being deconditioned have an amplified effect for the masters athlete. This means that as a general principle, an older adult who is unfit will need the program to be scaled to a greater degree and will take longer to get fit than a younger adult with the same degree of conditioning. This is an important thing for the coach to understand, and it needs to be made explicit for younger coaches who do not have first-hand experience training older deconditioned adults. The unfit masters athlete has a greater risk of injury if the training is not effectively scaled and is more likely to give up on the program in the early stages, as it can very quickly feel overwhelming.

There is a related dimension to fitness, which is the training history of the athlete. For our purposes, we incorporate training history into our assessment because those who have an extensive athletic or sporting history progress quicker and have fewer problems beginning training. Compliance and progress are best and risk factors are lowest for a fit masters athlete with previous training history. It is worth noting, though, that a deconditioned athlete with previous sporting history or a lot of prior fitness can easily give up on the program because of frustration and unrealistic expectations (based on what they could do previously).

Injury State

The individual's injury state is an important differentiator. We divide masters into uninjured and injured groups. We classify athletes as uninjured if they have no physical limitations. This is significant because uninjured athletes can be exposed to the full variety of the program without compromise or modification. We classify athletes as injured if they have a medical condition that requires them to limit one or more aspects of the program. For an injured athlete, we need to understand the limitations and modify the program to accommodate the injury state. Injury changes the risk profile of a masters athlete (i.e., makes it higher risk) and therefore needs to be carefully managed. We need to ensure that training does not make the injury worse, and if possible, resolving the injury should be our highest priority.

An injured athlete may have an acute injury that will resolve in the short term, a chronic injury that will take time to resolve, or a disease or illness that may not resolve. Even though these three are very different, from a practical perspective, the trainer can treat them all the same provided there is a clear understanding of what the limitations are at any point in time. For the purpose of our assessment, it is the limitation that is significant, not the condition. The trainer should remain objective and optimistic at all times, irrespective of the nature of the injury state, and work relentlessly to restore full function.

An athlete who is diseased is a particular challenge for the trainer because the medical condition may not resolve, or worse, may get more limiting with time due to the progression of the disease. There may be significant psychological and emotional factors as a result of the disease, as well as side effects of medication and contraindications due to drug-related interactions with physical activity (Schetz et al., 2015). A contraindication is something that makes a treatment or activity inadvisable. For the diseased client, the trainer must walk a fine line between motivating the athlete to maintain as much physical capacity as possible and not setting unrealistic expectations.

Injury state is not specific to masters athletes and applies to all athletes. We highlight it as a specific variable to be considered to ensure that the trainer understands that when faced with an injured masters athlete, a much more conservative approach is required than when dealing with a younger athlete.

In general, aging athletes are already at a heightened risk of overuse injuries compared to younger athletes due to changes in tissue quality with age (Langer, 2015). Injured masters have an even greater risk of developing secondary overuse injuries. This is due to the fact that their limitations sometimes result in more frequent programming of movements they can do. The uninjured parts of the body can become overly stressed due to the increased volume, leading to potential secondary injuries. The trainer needs to take this into consideration when modifying the program for an injured athlete.

It should also be noted that aging athletes are at a heightened risk of re-injury. As Langer (2015) notes, "Fifty-two percent of the injured subjects … reported their current diagnosis as an exacerbation of a previous problem. This raises an interesting consideration: older adults, probably more so than younger adults, not only have to be cautious of new injuries but also of their previous injuries."

USING THE MASTERS QUADRANT TO GUIDE COACHING

ASSESSING THE AGING ATHLETE

Once we have classified the masters athlete according to goals, age, fitness and injury state, we can use the Masters Quadrant as an assessment tool to identify the coaching priorities and risk factors for the archetype that defines the athlete. The four variables in the Masters Quadrant give us 16 permutations— i.e., 16 different archetypes that have different coaching needs. Understanding the archetype allows the trainer to adapt the program to the specific athlete without relying on just age as the guide. Two athletes of the same age are likely to have very different needs and limitations, and the Masters Quadrant allows the trainer to cater to that.

GOALS	AGE	FITNESS LEVEL	INJURY STATE
Performance	Early	Fit	Uninjured
Performance	Early	Fit	Injured
Performance	Early	Deconditioned	Uninjured
Performance	Early	Deconditioned	Injured
Performance	Late	Fit	Uninjured
Performance	Late	Fit	Injured
Performance	Late	Deconditioned	Uninjured
Performance	Late	Deconditioned	Injured
Wellness	Early	Fit	Uninjured
Wellness	Early	Fit	Injured
Wellness	Early	Deconditioned	Uninjured
Wellness	Early	Deconditioned	Injured
Wellness	Late	Fit	Uninjured
Wellness	Late	Fit	Injured
Wellness	Late	Deconditioned	Uninjured
Wellness	Late	Deconditioned	Injured

We can view the 16 archetypes as four main groups: early performance, late performance, early wellness and late wellness. Within each group the specific variations are around fitness and injury state.

Early Performance	Early Wellness
Late Performance	Late Wellness

KEY PRINCIPLES FOR COACHING

The priorities in the Masters Quadrant are based on the following key principles:

- Resolving injury for an injured athlete, or maximizing functionality for a diseased athlete, takes highest priority over anything else. Performance goals should be put on hold until the athlete is uninjured. It should be obvious that competition places an injured athlete at considerable risk.
- Late masters should have loads reduced and in some cases movements modified. The scaling used for 55+ Masters in the CrossFit Open is a good starting point.
- A deconditioned masters athlete should be scaled much more conservatively and introduced to the program more gradually than a younger athlete who is similarly deconditioned.
- Wellness athletes need a broad stimulus in order to achieve a broad fitness adaptation, bearing in mind that the goal is increased work capacity across broad time and modal domains. It is a mistake to train a wellness athlete like a competitive athlete.
- Programming for performance athletes should be biased toward the skills that are most commonly tested in competition—i.e., the stimulus needs to be narrower and targeted. If training for a specific event or sport, the program should be modified to cater to the specific known demands.

It is important to understand that archetypes are not rigid. Over time the athlete may change quadrants, and the trainer needs to adapt accordingly. Athletes will move from early to late age categories, goal orientation may change back and forth, injuries and illness can occur and also be resolved, and the athlete will move from unfit to fit with training. Also, a break in training can result in a fit athlete regressing to a deconditioned state. In this regard, the Masters Quadrant makes use of fuzzy logic—i.e., it is not a rigid model with set rules but rather a guide to point the trainer in the right direction when training a client for the for first time or when progress stalls. Whenever there is a change in situational factors, the Masters Quadrant can be used to reassess where an athlete is and adjust the program accordingly. By making these reassessments and adjustments, the trainer is enabling the athlete to continue training regardless of changes that occur with aging.

MASTERS QUADRANT—CONSIDERATIONS, RISKS AND PRIORITIES

Goal—Key Considerations, Risk Factors And Coaching Considerations

QUADRANT	WELLNESS	PERFORMANCE
Key Considerations	Goal is general health and well-being. Social interaction is important. Key theme is quality of life. May be overly concerned about safety. Focus is personal improvement. Novelty of workouts is a motivator.	Focus is on the scoreboard. Goal is improved competition ranking, increased performance, or acquisition of adequate capacity as preparation for a known event. Being challenged is important. Key theme is winning (or beating personal records), so improved performance on repeated workouts is a motivator. May ignore safety seeking better performance.
Risk Factors	No specific risk factors.	Risk of injury correlated with training volume. Competitive environment can lead to risk-taking.
Coaching Priorities	Programming should be consistent with what is taught in the L1 course regarding general physical preparedness (GPP). CrossFit.com is good guide. Include a lot of benchmarks, named and hero workouts to ensure broad stimulus and measurability of progress. Variety is key to ongoing enjoyment.	Programming should be biased toward competition skills or known demands. Assign goals relative to performance standards set by other competitors. CrossFit Games provides useful data. Target younger age category results when setting future performance goals.

AGE—Key Considerations, Risk Factors and Coaching Priorities

QUADRANT	EARLY (40–54 YEARS)	LATE (55+ YEARS)
Key Considerations	Mostly should be coached in similar way to a younger adult. An early masters athlete is prone to overreaching or overestimating ability—i.e., may have a false positive belief about their capacity. May be impatient or easily frustrated. Look for cherry-picking.	A late masters athlete is prone to under-reaching or underestimating ability—i.e., may have a false negative belief about their capacity. Learning neurological skills may take longer and require more frequent practice. Strength is harder to develop and may be lost quicker with breaks in training. Look for avoidance behaviors.
Risk Factors	No specific risk factors.	Reduced ability to handle Rx'd volume and load. More prone to injuries (particularly overuse). Reduced mobility may make specific movement patterns risky.
Coaching Priorities	Work toward Rx'd level. Find the balance between striving for improvement and not overreaching.	Overall volume and load should be scaled to approximately 70% of Rx'd. Extra rest day per week protects against overuse. Incorporate odd objects to add neurological challenge and real-world applicability. Incorporate more partner WODs to promote social interaction.

FITNESS—Key Considerations, Risk Factors and Coaching Priorities

QUADRANT	FIT	DECONDITIONED
Key Considerations	Introduction to the program will be similar to younger athletes. If they are fit but new to CrossFit, scale heavily and introduce intensity gradually. May be impatient with technique work. May overreach. May resist rest days.	A deconditioned individual must be introduced to the program gradually. Work on initially establishing consistent training habits before increasing the challenge. The older the client, the slower the start.
Risk Factors	Fit athletes are strong enough to hurt themselves. May seek high volume at the expense of intensity.	Extreme soreness. Heightened injury risk, particularly if mechanics are unsound. Very easily demotivated.
Coaching Priorities	Find the appropriate level of intensity and motivate them accordingly. Ensure the athlete is exposed to a broad stimulus. Set goals that are related to intensity. Watch for attempts to bias the athlete's comfort zone.	Follow the charter of mechanics, consistency then intensity, and be very conservative. Err on the side of less work. Reclaiming the ability to perform functional movements is the highest priority. Check in daily.

INJURY STATE—Key Considerations, Risk Factors and Coaching Priorities

QUADRANT	UNINJURED	INJURED (OR DISEASED)
Key Considerations	No special considerations.	The program will need to be modified to account for the injury. If disease or chronic illness are involved, a clear understanding of the symptoms and contraindications is required.
Risk Factors	No specific risk factors.	At risk of developing secondary overuse injuries as a result of limited variety in the program (due to movement substitution leading to higher rep counts). Risk of re-injury is high. For diseased clients, overexertion may result in the disease progressing.
Coaching Priorities	Ensure that the athlete remains uninjured through ongoing technique development and sensible programming.	Resolving the injury is the highest priority. If the athlete is a competitor, place competitive goals on hold until injury is resolved. If chronic, refer to medical professional. Set appropriate expectations regarding timeframes. Be conservative. Do not make the condition worse or inhibit recovery.

THE EFFECTS OF AGING

Our premise is that although we can't stop getting older, we can minimize the degree to which age-based changes limit our lives. Understanding the aging process is the first step in learning what is possible for an older athlete. The trainer needs to be well equipped with accurate information to promote successful aging and challenge any self-imposed limitations older clients may place upon themselves. The trainer also plays a key role in breaking down societal prejudices in relation to aging athletes and physical training, and deep knowledge is essential to be successful in doing so.

If we look to the research on aging, there is general agreement on the types of changes that occur but less certainty about the timing and extent of the changes. Although the changes will happen to all of us, not everyone is affected to the same degree. Some people remain fit, healthy and functional well into old age, whereas others descend into decrepitude during middle age. What is clear is that we share a common goal, which is to defy the aging process and push the changes associated with aging as far as possible into the future. There is concord in the research that maximizing fitness throughout the lifespan is the best defense against the effects of aging. This also makes intuitive sense. The more work capacity we have prior to middle age, the greater the hedge we have against loss of capacity. The less initial work capacity we have, the more obvious age-based changes will be.

The Physiological Effects of Aging

- Hormonal changes
    - Reduced testosterone in men
    - Reduced estrogen and progesterone in women (menopause)
    - Decreased insulin sensitivity (particularly if overweight)

- Immune system changes
    - Inflammation increases
    - Immune function decreases
    - More susceptible to illness

- Musculoskeletal changes
    - Bone mineral density decreases
    - Reduction in joint mobility
    - Onset of osteoarthritic processes
    - Decrease in muscle function
    - Reduction in Type II muscle fibers

- Reduced stamina and cardiovascular respiratory endurance
    - Cardiac, vascular and pulmonary functions decline
    - Reduction in aerobic capacity and VO2 max (O2 uptake)
    - Decrease in maximal heart rate and cardiac stroke volume

- Reduced elasticity of skin and blood vessels
    - Skin becomes dry and susceptible to tearing
    - Reduced peripheral blood flow
    - Reduced ability for skin to repair

- Capacity to recover from injury or illness decreases
    - Increase in tendon stiffness
    - Reduced peripheral blood flow
    - Slower collagen replacement impacts wound healing

The Psychological and Neurological Effects of Aging

- Sensory-perceptual changes
    - Hearing, taste and eyesight decline
    - Decreased ability to thermoregulate
    - Thirst mechanism becomes less sensitive
    - More susceptible to dehydration

- Neurological capacity impaired
    - Reduction in coordination, accuracy, agility and balance
    - Reduction in fine motor skills and proprioception
    - Increased fall risk
    - Loss of nerve tissue and peripheral nerve function

- Neurobiological changes
    - Reduced neuroplasticity
    - Reduced ability to learn neurological skills

- Cognitive changes
    - Increased problem-solving skills with greater life experience
    - More prone to overthinking

- Personality changes
    - Seeking more purposeful life
    - Changes in what is meaningful

- Social changes
    - Changes to the family unit
    - Career changes and transition to retirement

The degree to which these changes result in functional decline is more a result of lifestyle factors than age. It is most likely that the effects of aging are accelerated and amplified by poor lifestyle and/or inactivity. Individuals who have remained active, have good nutrition and avoid known risk factors (like smoking and alcohol) delay and minimize the effects of aging (Ferdows et al., 2018). When we consider masters CrossFit Games athletes, the positive effects of continued training are pronounced. Therefore, there is a strong argument that a healthy and

active lifestyle delays and offsets the effects of aging. It can be argued that masters athletes in all sports are the exemplars of successful aging (Geard et al., 2017). The medical literature will change over time with the inclusion of an ever-growing CrossFit population that is healthier and fitter than their non-training peers.

What does this mean for the trainer? In an untrained or poor lifestyle client, the trainer needs to be sensitive to the above age-related changes and anticipate possible issues created by those changes. However, in the trained client with a good lifestyle, the changes will be less pronounced, and unless there is an obvious limitation, such a person should not have a strong need to modify the program. Age-related changes exist on a continuum, and the degree to which changes have occurred will dictate the degree to which the program will require modification. Once again, it means that age alone is a poor guide for the trainer, and we should not assume functional decline is inevitable at a particular age.

Photo Credit: Wendy Swift

Risks and Health Issues Associated With Aging

Some health issues are statistically more likely for athletes over the age of 40 and significantly increase in likelihood for athletes over 55. For example, the incidence of sudden death from cardiac arrest is significantly higher in people older than 35. The most common cause is underlying coronary artery disease, which is more prevalent in those over 50 (Chugh, 2015). Most sports-related sudden deaths from cardiac issues occur in middle age (Marijon et al., 2015), and the risk is highest in individuals who do not habitually train. A responsible trainer should recognize the heightened risks and take any symptoms seriously. Warning signs should never be ignored. Although the overall risk is relatively small statistically, it becomes increasingly real for those who are older (55+) and deconditioned. These athletes should be more closely monitored, and any individual who is specifically at risk (i.e., has suspected coronary artery disease, chest pain, unexplained shortness of breath, dizziness or heart medication) should immediately be referred to a suitably qualified medical practitioner for assessment. We recommend careful application of relative intensity and graduated introduction for deconditioned clients, because the trainer cannot know whether there is an underlying medical condition. Exercise may act as a trigger for cardiac pathology (Cunningham et al., 2017), although it is worth noting that contrary to popular belief, a significant number of cardiac sudden deaths occur outside the sporting arena and during sleep (Finocchiaro et al., 2016). The general consensus in the medical literature is that the benefits of exercise significantly outweigh the risks.

There is also a greater likelihood of an older client being medicated, and medication can produce unexpected side effects with physical exertion (Schetz et al., 2015). For example, the combination of blood-pressure medication, cholesterol-lowering medication and physical exertion can cause muscle pain, dizziness and confusion in some cases. Additionally, there is an increased fall/trip risk in the elderly, and fear of failing is a major psychological inhibitor to activity.

Some risks and health conditions are specific to the older female athlete. Menopause creates a myriad of issues that vary in impact between individuals. Exercise is crucial to minimize the symptoms of menopause (Mayo Clinic, 2016), but it can be difficult to stay motivated during this transition, and it is likely that there will be a transient decline in performance until symptoms settle. Hot flashes are a common symptom, and the trainer needs to be sensitive to the impact that this has on the athlete's ability to cope with intensity.

Pelvic floor issues are also common and can affect an athlete's will to train. Older female athletes may encounter pelvic floor issues that result in exertional urinary incontinence (leaking) when jumping. Women who have had children have a heightened risk. In more serious cases, there is also the risk of pelvic organ prolapse when undertaking load-bearing exercises. Avoidance behavior in relation to jumping and running may indicate to the trainer that there is an underlying pelvic floor issue that needs to be addressed. These issues should not be normalized, and the trainer has an important role in educating the client as to the risks and referring her to an appropriately qualified medical practitioner. Although common in female athletes, note that urinary incontinence can also be an issue for older male athletes; some researchers suggest it could be an issue for up to 40 percent of men over 60 years of age (Kozomara-Hocke et al., 2016).

Post-menopausal female clients may also have reduced bone density, which places them at specific risk of stress fractures. This risk can be managed by being conservative with loads and training volume. Where a medical condition is identified, it is imperative that the client seeks appropriate medical care and that the trainer operates within the guidance provided by the practitioner.

None of these issues are necessarily impediments to training, provided that the trainer is sensitive, supportive and willing to adjust the program accordingly. Age-related health issues may present a challenge for a younger trainer who is unlikely to have any relevant firsthand life experience and may be unaware of what the client is experiencing. The affiliate owner needs to understand that an older athlete may be very unwilling to confide in a younger trainer.

In addition to medical issues, the trainer also needs to provide an environment that reduces the risk of injury. There is a heightened injury risk for a deconditioned athlete of any age but significantly more so for an older deconditioned athlete. It takes longer to recover if injured, making the impact of injury greater, and for some injuries, the older athlete is unable to recover at all. For example, partial-tear rotator cuff injuries rarely heal in an older athlete (Tokish, 2014). Regular training and fitness decrease injury risk (Tayrose et al., 2015). The trainer should work to avoid injury at all costs because a single injury may impact the athlete's ability to continue training. Whereas a young adult will readily bounce back from injury, an older athlete will require significant hands-on management from the trainer to recover from an injury. Due to this high cost of injury, the trainer should always err on the side of caution when there is any indication of injury state. Where a younger athlete

may be able to train through pain, tightness or fatigue, it is simply too risky for an older athlete to do so. The masters athlete will often be willing to take risks, but the trainer has an important role in determining when the athlete should rest.

COMMON MYTHS AND MISCONCEPTIONS ABOUT THE AGING ATHLETE

Myths and misconceptions about aging occur because of a sampling bias. Research into the effects of aging, especially prior to 2012, was often based on a sedentary or diseased population. Conclusions were made that do not necessarily apply to a healthy and fit population. The trainer has a responsibility to debunk the myths around aging and remove self-imposed obstacles to fitness. We explore some of the commonly held myths below.

Myth #1: Older Athletes Cannot Get Stronger or Improve Their Physical Capacity

It is a common belief that with age you get weaker and lose capacity. It is implied that older athletes cannot get stronger or improve their capacity. In the CrossFit masters community, we have substantial empirical data that shows that you can not only maintain strength and fitness levels as you age but also get stronger and fitter as you age if training is maintained.

The research into masters athletes is limited, and there are few quality studies that target a trained aging cohort (Mckendry et al., 2018). Most research investigates a sedentary population and draws the incorrect conclusion that strength and muscle mass decline with age. Where masters athletes have been studied, the research is often confounded by a focus on endurance athletes who have not undertaken continued strength training. However, if the research controls for a sedentary or endurance population and investigates an athletic population that undertakes resistance training, the findings support the notion that strength and muscle mass do not decline with age but rather with inactivity (Wroblewski et al., 2011). More recent meta-analysis of the research indicates that aging athletes can continue to adapt to exercise stimuli in a similar manner to younger adults (Mckendry et al., 2018).

Beyond the research, and more usefully, the CrossFit Games provide us with compelling empirical data that is now longitudinal and presents a very different picture from the general research view. We can show improvements in strength and physical capacity in athletes who have competed in multiple age categories as we follow their competitive careers. In 2011, 41-year-old Matt Swift lifted 245 lb. (112 kg) in the thruster event at the Regionals. In 2015, 46-year-old Swift lifted 275 lb. (125 kg) in the thruster event at the Games. That is a 10 percent improvement despite his being five years older and up an age category. As a similar comparison, Amanda Allen lifted 150 lb. at age 40 (68 kg) in the thruster event at the 2011 Regionals. In 2015, at age 45, Allen lifted 165 lb. (75kg) in the thruster event at the Games. That is a 10 percent improvement as well. This is real data that shows categorically that strength and physical capacity can improve with training even as an athlete grows older. These are not isolated data points. Instead, they represent a trend among masters athletes competing in the CrossFit Open, Masters Qualifiers and Games events longitudinally. The empirical data is compelling.

When we look at data that takes into account athletes who train properly and continuously, not only can older athletes improve their capacity, they can improve it significantly.

Myth #2: Older Athletes Should Not Train at Intensity

Older adults are often told that low intensity training is most appropriate and to avoid strenuous activity. A common piece of advice is to take "everything in moderation." The misconception that older adults should not train with intensity seems to be based on a misguided belief that intensity places the athlete at risk, more so than it would a younger athlete.

Intensity is important within our program because it is the independent variable most commonly associated with maximizing the rate of return on favorable adaptation. Another way of saying this is that intensity is the pathway to results. That is true regardless of age. What makes intensity a safe prescription for an older adult is applying it relative to the individual. Relative intensity is defined as working to the boundary of physical and psychological tolerance and not beyond. Adhering to our charter of teaching correct mechanics first, achieving consistency second, and only then applying relative intensity mitigates the risk for an older athlete who is in good health.

Health conditions may alter and increase the risk profile, but the same conditions pose similar risk for a younger athlete in relation to intensity—i.e., it is the condition, not the age, that creates the increased risk. Responsible training requires the training program to be modified to take into account any known contraindications associated with medical conditions or disease states.

Strenuous exercise is associated with a transient elevation of the risk of sudden cardiac death where there is underlying coronary artery disease. Any client with a heart condition or symptoms of a heart condition should be referred to a suitably qualified medical professional before undertaking training, and the trainer should prescribe intensity in accordance with the specific guidance provided. The guidance of prescribing relative intensity is still the best guidance, even with a diseased client.

It should be noted that regular training also substantially reduces the risk of coronary artery disease (Chugh et al., 2015). Regular strenuous exercise is safer than irregular strenuous exercise. Where there is an irregular training pattern, it is sensible to reduce intensity until a regular training pattern is re-established. This is entirely consistent with our charter of mechanics, consistency, then intensity.

Injury rates in the masters population are correlated more with overuse than intensity (Langer, 2015), and injury rates in a trained masters population are actually low and do not increase with age (Ganse et al., 2012). Intensity plays an important role in actually reducing injury risk because of the associated reduction in volume. It is actually extremes of endurance exercise and prolonged (or chronic) training that adversely affect the health of older athletes (Eijsvogels et al., 2016). Provided it is appropriately prescribed, regular training with intensity is most appropriate for older athletes (Fournier, 2012); it supports better bone density and lean muscle mass (Gast et al. 2013) and may minimize a decline in anaerobic work capacity as we age (Reaburn and Dascombe, 2009).

Myth #3: Older Athletes Need a Segmented Program That Is Simpler and Has Reduced Skill Demand (I.e., Avoid Complex Gymnastics and Weightlifting)

Older adults are often told by medical practitioners that the most appropriate form of exercise is walking. Although this may be a good starting point for someone who has lived life on the couch, there is no evidence to support the myth that older adults need a simplified exercise program.

CrossFit is unique in its ability to train the neurological components of fitness: coordination, accuracy, agility and balance. This is achieved by incorporating complex motor patterns in the form of gymnastics and Olympic weightlifting. The benefits of neurological capacity cannot be overstated, and the requirement to train these components does not diminish with age. On the contrary, it becomes more essential. It is the case that older athletes, particularly late masters in the 55+ bracket, find neurological skills more challenging to learn, but that is also precisely the reason that they need to be included in the program. The teaching of complex skills may have to be adapted, but they can and should be learned. Everybody can learn gymnastics with appropriate scaling, and everybody can learn the Olympic lifts with appropriate loads. The CrossFit program does not need to be reduced or segmented for an older athlete. It just needs to be appropriately scaled. Any limitation in teaching an aging athlete complex movements lies in the skill of the trainer, not in the capacity of the client.

Myth #4: Older Athletes Can't Train Hard Because They Have Diminished Ability to Recover

It is a common assumption among coaches and athletes alike that it is harder to recover as you get older and therefore older athletes need less work and more recovery time. By recovery, we mean the ability to return to a pre-exertion state within a training session, as well as the ability to overcome the effects of fatigue between training sessions. In simple terms, this means being ready to go again without performance being impaired.

The literature is inconclusive. Where there has been continuity of training, recovery only diminishes in much later life (70+ years) and is consistent with a decline in VO2 max. But in sedentary masters the diminished recovery is significant and occurs much earlier, which suggests that lifestyle factors are more of a contributor than age alone. Recovery-inhibiting lifestyle factors—factors such as limited training time, work demands, poor sleep, stress, inadequate nutrition, social commitments, alcohol, etc.—are probably more prominent in the aging population, particularly for the early masters. For most masters, it is likely that their physiology can handle much more than their chosen lifestyle allows.

The key point is that it is convenient for aging athletes to blame poor recovery on their age, but before accepting that, ensure that they are doing the things that athletes need to do in order to maximize recovery—e.g., sleeping, getting proper nutrition, de-stressing, practicing active recovery techniques, etc. The trainer needs to address the negative feedback loop that the recovery myth creates. The belief that age inhibits recovery leads to a lack of focus on recovery, which in turn leads to poor recovery. This negative feedback loop is illustrated in Figure 1.

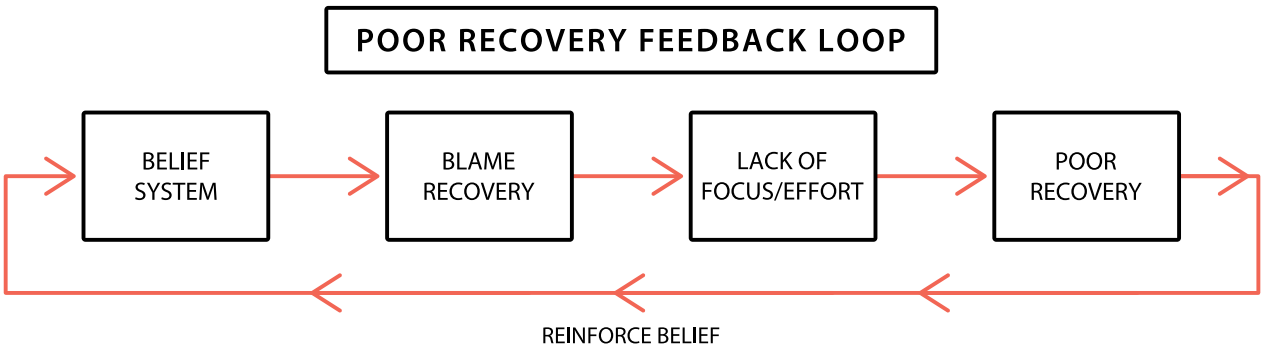

Figure 1. Poor Recovery Feedback Loop.

We accept that there are age-based biological changes that can inhibit recovery at a metabolic level (Doering et al., 2015), but we should not perceive them as a limiter. Aging athletes can work hard, but to do so and recover, they need to do everything right with regard to recovery strategies. Whereas a younger athlete can possibly tolerate a poor lifestyle and still recover, an older athlete cannot.

Acknowledging potentially diminished recovery should only be a factor in making smart decisions when programming and coaching—i.e., use less volume and perform higher quality work. From a coaching perspective, it is very important that you ensure that your athletes are doing everything they need to do to recover before you fall into the trap of blaming age for poor recovery or reduced performance.

Where an athlete is doing everything right but still failing to recover, it would indicate that training volume has not been appropriately scaled. In this situation, scaling should be adjusted and an extra rest day per week added until recovery improves. This has the effect of reducing overall volume. Once the athlete is thriving again, the training day can be added back in. Note that it is excessive volume, not intensity, that is underlying issue.

Training Attenuates the Negative Effects of Sedentary Aging

Though we accept that some changes are inevitable, we can push them as far into the future as possible with effective and continuous training. Our data strongly suggests that the limiting effects of aging can be delayed through CrossFit training. Through constantly varied functional movements executed at high intensity, we create greater health—i.e., greater work capacity across broad time and modal domains measured throughout life. CrossFit is a hedge against the effects of aging. Through training, we elevate health markers to well above average so that with age they also decline at a slower rate and remain above average at each point on the age continuum.

This is a fountain-of-youth effect and masters athletes in general show a youthfulness that does not match their age. This effect of training attenuating the negative effects of aging is also well supported by research. According to the literature, compared to their non-training peers, masters athletes display increased testosterone, lower blood pressure, increased cardiovascular respiratory endurance (Hayes et al., 2013), increased strength, greater muscle mass, greater bone density (Powell, 2005), better mobility and balance, better spinal function (Wright, 2012) and better brain function (Zhao et al., 2016). Lifelong exercise may also be the key to reducing the risk of dementia (Brown et al., 2017). Masters athletes have better bodies and better brains.

Changing the Paradigm

CrossFit is changing the paradigm of what is possible for the older athlete, and there is no downside to being optimistic in our belief about the level of capacity that can be developed by an older athlete. Apart from the data that we have gathered from the CrossFit Games, we also have empirical data from the community. Long-term athletes like Nicole Carroll, Annie Sakamoto, Lisa Ray, Jacinto Bonilla and Andy Hendel are powerful role models who defy age.

In 2016, we surveyed 10 athletes in the community who had trained CrossFit continuously for longer than 10 years and are now masters. The ages ranged from 40-58 years, and all but one train four to five sessions a week. Seven of the 10 report that they are still getting strength PRs (the other three said strength varied with frequency of training), and all had dramatically improved Fran times. All said that they expected to do CrossFit for the rest of their life, and only one of the 10 thought he had peaked as an athlete (90 percent thought they hadn't hit their peak!). Six of the 10 had achieved a PR for both a strength and a benchmark workout in the last 12 months, whereas nine out of 10 had achieved either a strength or a benchmark PR in the last 12 months.

That is significant. Sixty percent had recently improved in both strength and conditioning, and 90 percent had recently improved in either strength or conditioning. Five out of 10 said they were confident they could complete a marathon in less than four and a half hours without any extra specific training, and another four said they weren't sure but they would give it a go. Only one wouldn't attempt a marathon for fear of injury. This data is inspiring. It would be an impressive sample even if the average age was 20, but this is a group with an average age of 46. Interestingly, 80 percent said that their primary motivator was wellness. We should be cautious drawing conclusions because the data is anecdotal and the sample size small, but it does highlight the positive outcomes that sustained training can produce for the aging athlete. CrossFit is as effective for the aging athlete as it is for the younger athlete.

Use It or Lose It!

The reality is that it really is a case of use it or lose it, and in most cases, if you start using it again, you get it back. Even for the previously sedentary, high-intensity exercise can substantially improve health markers in a relatively short amount of time (Howden et al., 2018). A key factor in successful aging is being active and maintaining continuity with training across the lifespan. We need to avoid sedentary aging at all costs in order to avoid the negative effects of inactivity. This applies to all ages, but it is especially important for an older adult.

There are substantial benefits to living the life of an athlete. Masters athletes with a history of training live longer and have a higher quality of life in later years. It is clear that the more capacity you develop in earlier life, the larger the hedge you have against lost capacity in later life (Mckendry et al., 2018). This concept is an extension of the sickness-wellness-fitness continuum and is consistent with what we teach at the CrossFit Level 1 Certificate Course. This is CrossFit's model of aging, and it is represented graphically in Figure 2. High capacity through training early in life, combined with continued training throughout life, leads to relatively high capacity in later life, which attenuates the effects of aging.

It is important that the trainer does everything possible to keep a masters athlete training, despite illness or injury. Equally important is motivating sedentary masters to start training. Older adults who return to training in later life can regain significant capacity. As noted by P.R. Langer (2015), "Studies show that even individuals who have previously been sedentary can significantly decrease their risk of serious illness and risk of disability by starting a fitness program later in life."

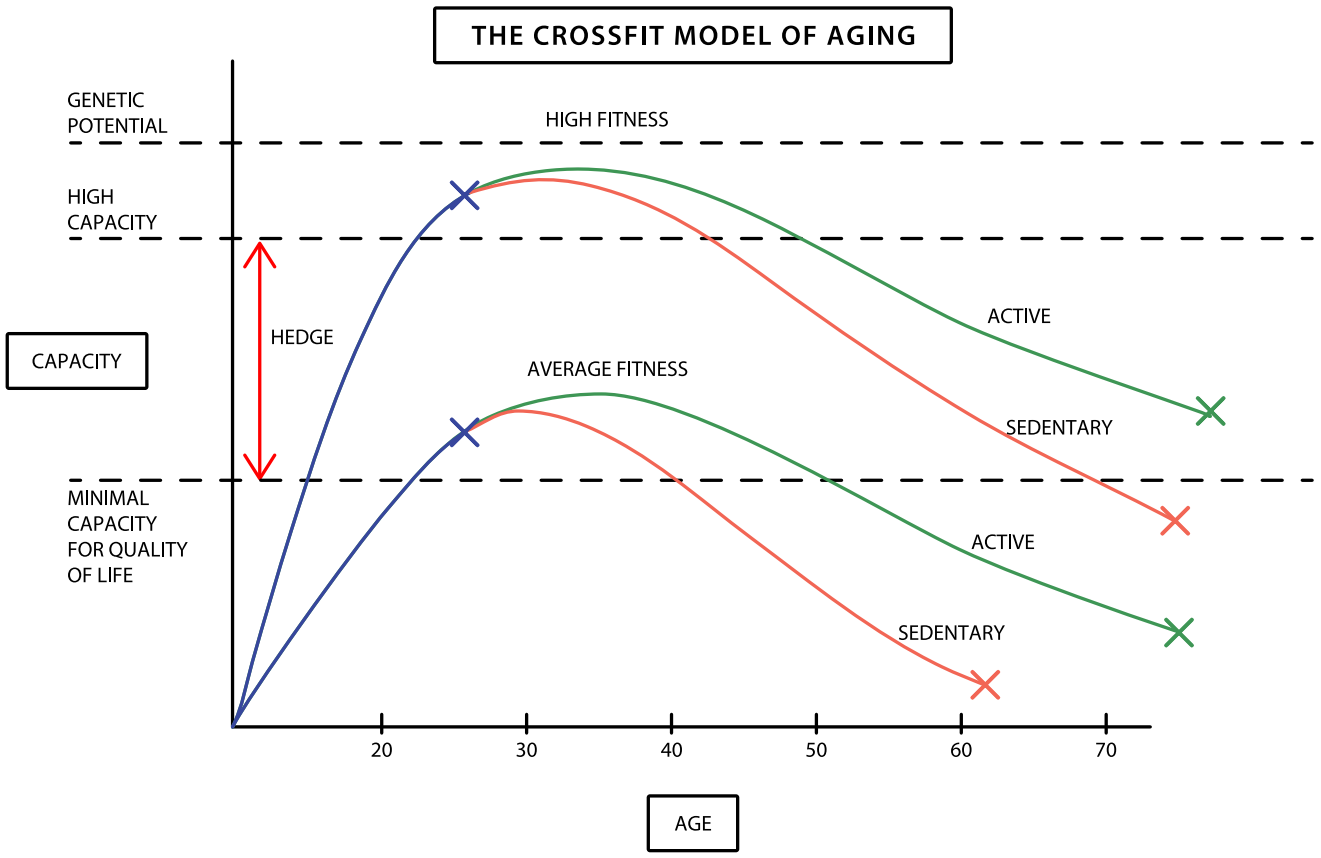

Figure 2. The Crossfit Model of Aging.

It is easy to make false assumptions about the inevitability of decline with an older athlete, but when we look past the effects of being inactive or having a poor lifestyle, we see significantly fewer effects of aging. We will all age, but how we age is a function of the choices we make and the degree to which we continue to develop work capacity. As trainers, we have the power to dramatically improve the quality of life of masters athletes through CrossFit.

The conclusion is obvious: Be as fit as possible at every stage of life.

IMPLEMENTING AN EFFECTIVE MASTERS PROGRAM WITHIN THE AFFILIATE

There are a lot of different ways to implement an effective masters program within an affiliate environment. Just like the affiliate model itself, there is no right or wrong way, and we encourage variety and autonomy. Some affiliates treat aging athletes the same as any other member. For example, at CrossFit Brisbane in Australia, masters athletes train in the general group classes, and the only time they are differentiated is during the Open competition each year when the age categorization makes it obvious. Other affiliates have special classes and programming exclusive to masters. An example of this is the Silvers program at CrossFit Innervate in Singapore. What is important is that the model implemented matches the needs of both the affiliate and the members.

The simplest implementation is integrating the masters athlete into the normal group environment. This requires the gym to have an inclusive culture and the trainers to be skilled and effective at making ad-hoc scaling decisions. Most of the needs of an aging athlete can be accommodated through day-to-day scaling. Integrating into normal classes is probably the most practical approach for a gym with a small number of older athletes. The downside of this approach is that it can be demotivating and make older athletes feel like they are an imposition. If this were there case, it would be evidenced by lower retention rates for masters athletes than for younger athletes.

Photo Credit: Wendy Swift

The most effective implementation from the client's perspective is likely one that caters for the specific needs of masters by adjusting the class structure and programming to suit. This could be through special classes on the timetable, special coaching or opportunities for masters to train together. The more the program and environment are modified to cater to specific needs, the more likely the affiliate is to grow a thriving masters contingent. To some extent, it is a case of "if you build it they will come." Of course, you have to want them to come in the first place.

Programming, class structure, environment and social dynamic may all need to be adjusted to build an environment that successfully supports the aging athlete.

General Class Considerations

There are some general considerations when training masters in a group or class environment:

- Older athletes take longer to warm up and will often require more time to be allocated to body preparation and mobility prior to class. They may also need more gradual and lengthy warm-ups before the workout starts. It takes longer to get to starting weights, and the warm-up sets will need to be more incremental and in smaller steps.

- Allocating more practice time for learning and revising skills is important. This can be achieved through a greater number of repetitions and more frequent programming of complex skills in warm-ups.

- The trainer should allow for hearing and eyesight decline. Don't make assumptions that your instructions are being heard or seen. It is common for aging athletes to have difficulty reading a whiteboard from a distance. Low-light and high-noise environments are particularly challenging with declines in hearing and eyesight.

- For some late masters, the sound of dropping barbells can cause ear drum pain and softer matting may be required.

- Consideration should be given to lowering music volume and using age-relevant content.

- It is not uncommon for late masters to forget the names of exercises and need to be reminded frequently. Workout instructions may need to be more comprehensive.

Be Guided by the Archetypes at Your Gym

Over time the trainer will encounter each of the archetypes in their gym. A key concept is that as a coaching tool, the Masters Quadrant provides a way to adapt to different athletes and different stages for the same athlete over time. However, it is also likely that each gym will have a particular bias toward a certain archetype. Some gyms may tend toward a lot of wellness-focused late masters, whereas others might be very good with performance-focused early masters. A lot of this is a reflection of the culture and demographics at the gym. Use the archetype bias to guide the decisions you make regarding how to implement a masters program. Match the culture of your gym and the bias of your programming to the archetypes in your gym and you will have a recipe for ongoing success with aging athletes.

Athletes with performance goals are probably the only archetypes that need to be accommodated at the programming and/or class level. It is difficult to write programming that caters for the needs of both the performance and wellness athlete without compromising the needs of both groups (this is the case for younger athletes as well). If you have a lot of masters athletes who are competitors, consider offering a separate program (i.e., separate the performance and wellness groups) with specific programming and classes. Serious competition training should be considered as a specialization within CrossFit. The other variables (age, health and fitness) can be readily accommodated on an individual level within the normal class structure and programming through scaling and substitution strategies.

Special Classes and Programming Specific to the Aging Athlete

A key question is whether masters should train in classes separate from younger adults. As stated above, there is a strong argument for a separate program for performance-focused masters and wellness-focused masters. However, is there a valid argument for having separate classes and programming for aging athletes in general? Should we separate wellness-focused masters athletes and wellness-focused younger athletes?

Consider the advantages and disadvantages of separate masters classes and programming for wellness athletes.

Advantages:

- Can promote a better social experience with a more relevant peer group
- Allows the environment to be tailored for an aging athletes group
- Workouts can be programmed as prescribed (Rx'd) for masters.
- The class structure and format can be adjusted to suit an older athlete.
- Can remove a lot of anxiety about fitting in
- Classes can move at a slower pace.
- Can minimize overreaching from trying to match younger athletes

Disadvantages

- Can promote the view that aging athletes are not normal
- Makes it hard to create friendships across different ages
- Can result in under-reaching due to a more relaxed group dynamic
- Setting masters Rx'd standards can be a limiter
- Separating younger athletes eliminates mentoring opportunities.
- Creates a lot more work for the coach

Probably more important than class structure, though, is that trainers have specific skills for coaching aging athletes and understand the challenges faced by them. The right trainer will make any class structure work.

Managing Risk Factors Associated With an Older Athlete

In addition to promoting a high-quality experience for the masters athlete, the implementation method should also be one that allows the trainer to effectively manage and mitigate risks. Deconditioned late masters in particular need to be more closely monitored in order for the trainer to recognize underlying medical conditions that can increase risk for that individual. This has an impact on the client to trainer ratio.

Key Information for the Trainer in Relation to Managing Risks:
Decreased mobility can expose the athlete to greater risk in certain movements (e.g., the snatch), so poor mobility should be a warning sign.

- Rotator cuff injuries are very common and often idiopathic. Err on the side of less overhead volume.
- Achilles injuries are very common and risk of injuries to the feet increase with age.
- Generally, risk increases as health and fitness decrease. Training in itself is the best protection against risk factors, provided that it is implemented appropriately. The importance of ongoing exercise is universally supported in the research.
- The risk factors are best managed by introducing load and volume more gradually than you might with a younger athlete, and by ensuring consistent and regular training (irregular training increases cardiac risk factors) and avoiding any contraindicated movements.
- The mechanics-consistency-intensity charter is effective for managing risks, with the knowledge that intensity is more gradually applied than for a younger athlete.

Effective risk management involves matching the training environment to the risk profile of the athlete based on an assessment of the athlete's injury state and fitness level. As illustrated in Figure 3, for an athlete with injury and/or low levels of fitness, the most risk occurs with fast, loaded, dynamic movements, high mobility demands, unfamiliar patterns and the group environment. The least risk occurs with slow, unloaded and static movements, controlled range of motion, familiar patterns and one-on-one training. An injured and/or deconditioned athlete should be managed in a low-risk environment first, and as fitness improves and injury resolves, be gradually introduced to the higher risk environment.

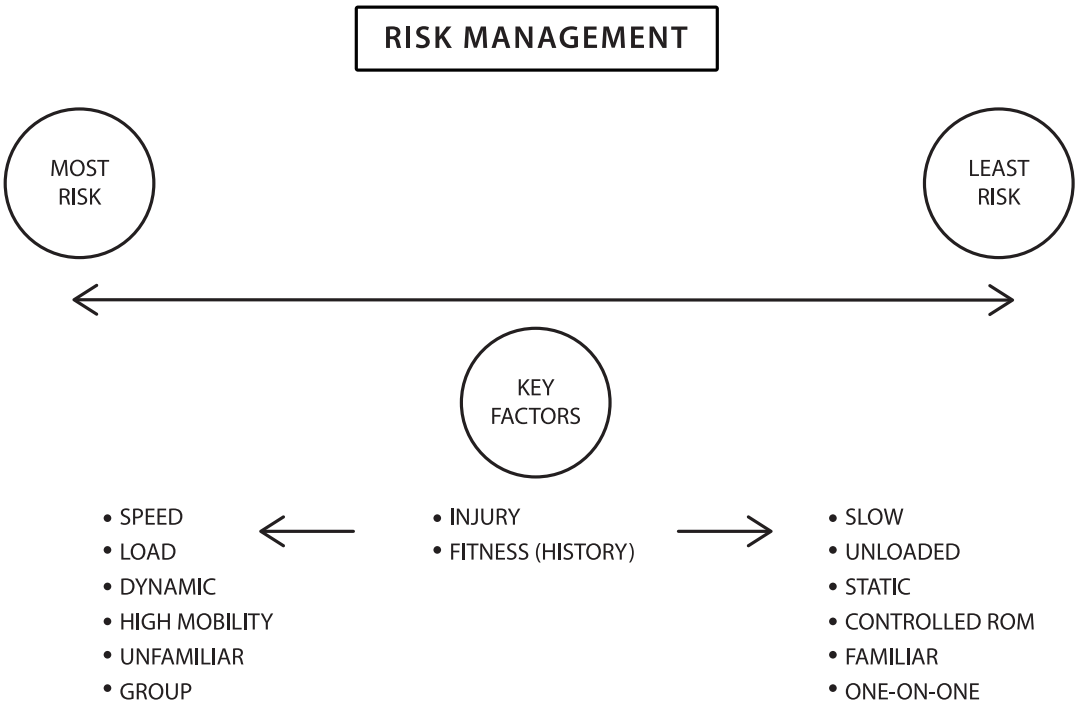

Figure 3. Risk Management.

Creating the Right Social Dynamic

The social dynamic is a key factor in keeping aging athletes motivated and engaged. To the masters athlete, the social experience of training increases in importance with age, and there is a general shift away from an achievement focus to an enjoyment focus. Celebrating the success of the group becomes more important than celebrating individual success. Masters athletes often feel a need to contribute to the affiliate beyond just paying fees, and you should let them. It is important to promote social involvement, but to do that effectively, social events need to be masters-friendly—i.e., the venue and format should be suitable for an older adult.

Bias Practice Time

When faced with challenges and new skills, masters often need to practice in private, and the class schedule needs to allow for that. It is common for neurological skills to take a lot longer to develop, and providing private practice time can alleviate anxiety and stress. Aging athletes may avoid skills that they are not good at, and the trainer may need to schedule practice of skills that are being avoided. Neurological skills can also be more perishable for older athletes, and lack of practice time can lead to loss of skill. This is more pronounced with masters than with younger athletes. Each class should involve a period of dedicated practice, and the trainer should actively encourage athletes to practice in their own time by assigning homework between classes.

Photo Credit: Wendy Swift

Implementation Ideas

- Create a masters group that comes together for weekly workouts and socializes afterwards.
- Host masters-only competitions.
- Have a separate masters record board or scoreboard.
- Create a masters blog and provide training information relevant for an older adult.
- Run masters-only classes.
- Employ coaches who specialize in training aging athletes and make them the go-to person for your masters clients.
- Have a masters competition squad that regularly trains together to practice competition skills.
- Run masters-friendly social events.
- Create masters merchandise for your gym.
- Run skills clinics specifically for masters.
- Write up masters versions of the WOD with specific scaling similar to the Open.

There is no one correct way to train aging athletes in a gym environment. The number of masters athletes and the skill of the trainer will probably be the most significant factors in determining how you implement a program in your affiliate. There are many ways to approach it, but making the program accessible is the primary factor for success. Our recommendation is that if you are new to the masters community, have separate classes and programming and then move toward a fully integrated model over time as experience, skill and the number of masters athletes within your gym increases. A fully integrated model is recommended where trainer and client confidence is highest. A fully separated model is recommended where trainer and client confidence is lowest. The best implementation is one that enables the optimal training environment for the athlete while allowing the trainer to identify and manage risks as they arise.

UNDERSTANDING THE AGING ATHLETE MINDSET

Mindset training is an effective tool used by elite athletes to improve performance. In essence, it is about creating a mindset that supports success or positive outcomes. It involves using mental skills to achieve a positive attitude and outlook, which then correspond to improved training and competition performance. An athlete with an effective mindset thinks, "I can and I will."

Although typically associated with elite competitors, mindset training is applicable and essential for all masters archetypes. Aging athletes benefit greatly from mindset training, and the degree to which the trainer develops mental skills is correlated to the degree of long-term success that they achieve with older clients. We argue that mindset training is even more important for an older athlete than for someone younger because there are more age-associated psychological factors that masters athletes need to deal with. A poor mindset dramatically affects confidence and program adherence.

Photo Credit: Wendy Swift

Trainer Skills

The trainer needs to develop effective coaching skills in four key areas:

1. **Identifying Negative Self-Talk**
   All athletes have an internal dialogue called self-talk. The trainer must be competent in assessing whether or not the athlete's self-talk is progressing them toward their goal or taking them further away from it—i.e., helping (positive) or hindering (negative). Simple checks include, "Do your thoughts make you feel the way you want to feel?" and, "Does what you think lead to you acting in the best way?" If not, the trainer must be skilled at creating and teaching a better mental dialogue.

2. **Thought Stopping**
   Thought stopping is a technique that trainers can teach their athletes to assist them in breaking a negative self-talk cycle. It involves teaching athletes to recognize when their internal dialogue is negative self-talk and then using mental or physical cues as a trigger to change the script. For example, the athlete recognizes that her internal dialogue is, "This is too heavy. I always miss at this weight." The athlete's thought-stopping cue may be to stamp her feet, prompting her to replace the negative thought with a previously practiced positive one such as, "Today I make this lift. Keep the bar close."

3. **Goal Setting**
   Setting relevant goals with appropriate timeframes and clear milestones is an integral part of building a strong mental game. The trainer plays an important and hands-on role in guiding the goal-setting process.

4. **Anxiety Management**
   Managing anxiety in a masters athlete requires the trainer to have experience with the issues with which aging athletes must contend. The trainer must be able to clarify risk and reward and adapt the program and its goals to the athlete's risk profile. Anxiety is discussed further below.

The Anxious Athlete

Aging athletes may have higher anxiety levels than younger athletes, partly due to the fact that there are more things to worry about (such as injury), and partly because they are a minority group in the gym.

Some of the common anxieties derive from a heightened fear of injury, being overly concerned about being a burden on the trainers and/or other clients, and being worried about not fitting in or standing out from the group. Masters athletes also have all the usual anxieties that athletes have in relation to worrying about poor performance and workout discomfort.

The challenging thing for the trainer is that to some extent the underlying fears of an aging athlete are real. There is a higher risk and consequence of injury, they do require more time to be invested by the trainer, and they initially do often stand out when first joining the group. The trainer needs to acknowledge the concerns without being dismissive and then provide the athlete with relaxation techniques to manage the anxiety created by the concerns.

Failure to address anxiety can lead to avoidance behaviors and a self-limiting mindset, particularly if anxiety about injury is not resolved. In some cases, it can lead to recklessness through acting out. For example, if an older athlete is anxious about being a burden, that athlete may not disclose injuries. Or, if the athlete is worried about not fitting in, he or she may overreach on weights to try to be the same as younger athletes. A skillful trainer will look for sources of anxiety and address them before they become limiting.

Self-Limiting Beliefs

An aging athlete may limit themselves due to errant beliefs about their physical capacity. Negative self-talk can be very loud for the masters athlete but also very well disguised—i.e., they may be very skillful at saying what the trainer wants to hear but internally thinking something very different. It is common for late masters to believe that they cannot improve because they are too old. Likewise, you will often hear an early masters athlete say that it is not possible to train hard when you have family, life or work commitments. Both of those things are self-imposed beliefs that inhibit progress.

Photo Credit: Wendy Swift

This links back to the trainer's skill at dealing with negative self-talk. What a masters athlete is saying to himself or herself must be identified and addressed if the athlete is to progress in areas that do not come easily (e.g., neurological skills).

There is often a confirmation bias that causes athletes to be more likely to recognize evidence that supports the negative beliefs that they hold and ignore evidence to the contrary. There is also a feedback loop where athletes don't practice things that they believe they can't do and therefore they remain unable to do them, which in turn then gets used as evidence that they are not good at them. This occurs for athletes of all ages, but it is very common with masters athletes.

Rigid Thinking

Masters athletes are likely to be more set in their ways than younger athletes. We refer to this as rigid thinking, and in the training environment it presents as an unwillingness to try new things. Often the older athlete will draw on significant prior experience to form strong opinions about his or her own ability and potential. This can lead to conservatism and reduced expectations. The trainer needs to understand how current attitude and mindset are supported by previous experience and provide new positive experiences that challenge any self-limiting thinking.

Masters athletes are also more likely to use vicarious experiences from their cohort to support their beliefs. Said more simply, they will use other people of the same stage of life as evidence of what is possible. This can be positive or negative depending on who they use as role models. So, it is important that they are exposed to similarly aged role models with greater physical capacity.

Previous negative experiences (injuries, failures, embarrassment, etc.)—either their own, or those of others at the same stage of life—may limit the degree to which they apply themselves.

Attitude Toward Intensity

We have previously discussed the misconception that, for an aging athlete, intensity should be avoided. Barring specific health issues, all masters athletes need to train with relative intensity to unlock the full benefits of the program. Settling for maintenance training is often an emotionally and socially safe approach for aging athletes but not in their best interests. Avoiding intensity is a trap for both the trainer and the athlete.

Intensity is still the most important variable in the program, but understand that the trainer has a more difficult job in selling it to an aging athlete because of the common response, "I shouldn't be pushing hard at my age." This has to be overcome, because an Rx'd mindset where the athlete strives to complete workouts as prescribed (no matter how long it takes to get there or if they ever achieve it) and with the best possible performance (trying to beat previous scores) is the pathway to continued success, regardless of age. Being explicit with mechanics-consistency-intensity as the charter for applying intensity builds confidence because it guarantees that the athlete is kept safe and within the boundaries of current capacity. It is important to note that a younger trainer may often be prejudiced and not realize it—i.e., may just go through the motions with an older athlete and not demand best effort.

Dealing With Setbacks

Setbacks and injuries can have a more damaging impact on the masters athlete's ability to continue training compared to a younger athlete. Any disruption in training requires immediate attention and a plan delivered by the trainer to regain confidence and capacity as soon as practical. A masters athlete who suffers a setback will likely put on a brave face, but there will be a lot of doubt under the surface, particular if it is a repeat injury.

Injuries are critical times that can dramatically de-motivate the athlete. There is a critical window of opportunity following the setback where if the athlete is given an effective plan, motivation levels will be maintained. Missing the window can lead to self-deselection from the program. It is very easy for older athletes to give up if they feel like they will not resolve their injury. The feeling of having to start all over again can be overwhelming. The trainer's encouragement and support is crucial to helping older athletes overcome setbacks. It is vital that they remain connected to the group as much as possible. The longer they are isolated from the group setting, the more likely they are to give up. Factor this into any management plan and try to keep the training routine as normal as possible. For example, performing their rehabilitation program in the class is significantly better than doing it in their own time. The social connection of the group is a powerful offset to any setback.

Role of the Trainer in Creating a Positive Attitude

The trainer tips the balance in creating a positive attitude, and mindset training should be a natural part of all coaching interactions. The trainer has an important role in resetting expectations regarding what is possible, and the stoicism, optimism and positivity brought to the table by the trainer are critical in keeping a masters athlete striving for improvement and progressing through setbacks.

Mindset training should be part of each training day, and the trainer should check in frequently, ideally at every training session. At every opportunity, an effective trainer will be encouraging, motivating, challenging thinking and resetting expectations. The trainer also needs to be prepared to revisit the same problems over and over again, which is a normal pattern for a masters athlete, and very similar to training kids.

Photo Credit: Wendy Swift

Negative Mental Attitude Is Amplified by Aging

A negative mental attitude interacts with age-related changes in a powerful way to undermine performance. The effect is that age-related physical decline in performance is amplified by mindset decline. It is possible for a masters athlete to continue to maximize performance within the physiology they have maintained. However, if they adjust their mindset to accept age-related decline (i.e., believe they are declining), this can accelerate the decline dramatically. This is why the trainer MUST coach mindset in the aging athlete. A negative, and not uncommon mental attitude of "I believe I can't because I am getting older" places significant limitations on what is possible, and the effect is exponential. Elite sport psychologist and CrossFit trainer Wendy Swift explains the potential impact of this effect using a numerical factor model as follows:

> On a scale of 1-5, with 1 being best possible and 5 being worst possible, if the athlete has a physiological decline factor of 2 (average decline with age), but mindset factor of 1 (positive mental attitude) the net effect is that their performance will decline at a rate of 2x1= 2. If the same athlete has a mindset factor of 5 (negative mental attitude) their performance will decline at a rate of 2x5=10, or 5 times more dramatically. Compare to an athlete that has a physiological decline of 4 (accelerated decline because they are diseased) but a mindset factor of 1 (positive mental attitude) their relative performance will decline at a rate of 4x1=4.

This numerical model is just for illustration. In reality, it is not that simple or predictable. However, the concept is important to understand: For an aging athlete, a negative mental attitude can be an accelerator of negative aging effects if left unchecked.

Self-Awareness and the Aging Athlete

The trainer will encounter aging athletes who have poor self-awareness as a result of being in denial or delusion about their age and level of aging. It is important that athletes have an honest and accurate understanding of their current physical state in order to scale effectively, but that can be hard to achieve, especially for early masters who may be living in the past and unwilling to accept that they are older. This can also be significant for anyone with prior sporting experience or fitness who is returning to training after an extended break. Such athletes may have a false belief about their ability.

Masters athletes who have a false positive belief about themselves and their capacity are more likely to be injured from overreaching. Masters athletes with a false negative belief about themselves and their capacity are less likely to progress from under-reaching. It is the role of the trainer to ensure that athletes have true beliefs about their potential and physical capacity, thereby creating a foundation for success with the program.

FALSE POSITIVE BELIEF • Believe they are better than they are • Make reckless scaling decisions • Set goals that are out of reach • Perceive themselves as un-aged	**TRUE POSITIVE BELIEF** • Believe they have good capacity, and they do • Set big goals, but they are realistic • Know they have aged but are not limited by any self-limiting belief
FALSE NEGATIVE BELIEF • Believe they are worse than they are • Over-scale and under-reach • Do not set goals and are content with maintenance training • Make limited progress and hold the belief they are too old to get better	**TRUE NEGATIVE BELIEF** • Believe they have limitations, and they do • Are realistic about their limitations and scale well • Have come to terms with the fact that they have aged

With regard to the masters mindset, the major takeaway is that the trainer plays an important role in allaying the fears of a masters athlete and creating a mental platform for success based on true beliefs. To effectively coach older adults, the trainer should engage on a more cerebral level and include mindset training to create a positive mental attitude. A greater awareness of the typical thought processes of an aging athlete will set the trainer up for greater long-term success.

COACHING AND PROGRAMMING FOR WELLNESS

Constantly Varied Functional Movements at High Intensity

Programming for a masters wellness athlete is very similar to the programming we use for a younger athlete. Both require constantly varied functional movements at high intensity. Both are training for life's demands, and both require a broad and inclusive fitness. Specific programming is not necessarily any more effective than scaling CrossFit.com-style programming on an ad-hoc basis. If there is a large number of masters athletes, providing masters-friendly programming that is pre-scaled for the group may be more efficient than dealing with scaling on an individual basis.

GENERAL CONSIDERATIONS FOR WELLNESS PROGRAMMING

- Increased variety lends itself to higher enjoyment levels, particularly in the late masters group.
- Skill development requires greater frequency of practice in an older athlete. Add regular skill practice to warm-ups.
- Movement substitution may be required for an injured or diseased athlete—i.e., some movements may never be achievable or in the athlete's best interest. Don't be a slave to the program. Make sensible adjustments.
- More frequent strength training can be effective in offsetting age-related loss of lean body mass.
- Using odd objects and variations in equipment can increase neurological challenge without increasing technical demands.
- Training should be an enjoyable social experience.

Biasing Neurological Skills

Given that neurological skills can be a challenge, biasing the program to include more demands on coordination, accuracy, agility and balance can be of great benefit. Every session should include a challenge to neurological skills. Do not avoid complex movements even though they can be very difficult to teach to an older athlete. Complex skills are an essential part of the program. Just ensure that they are correctly scaled.

Masters athletes may push back on complex movements or get frustrated. The trainer needs to find ways to motivate them. The neurological skill development must be non-negotiable. You wouldn't allow kids to avoid the things that are good for them, and you shouldn't allow older athletes to do so either. The trainer must set the program and not budge. Include everything and scale to ability.

Assign Appropriate Loads and Movement Complexity

As a general guide, early masters should work toward Rx'd weights as posted on CrossFit.com. Late masters should typically be scaled to 70 to 80 percent of standard Rx'd loads. This should be thought of as a continuum and adjusted according to individual capacity. The overarching principle is that scaling should make the workout accessible, not make it easy. The prescription, Rx'd or otherwise, should never be a limiter.

Setting a separate masters Rx'd prescription for the workouts that are programmed for your gym can be very motivating to masters athletes, allowing them to compare scores with their peers. However, a word of caution: It is a slippery slope once you start defining scaled versions of workouts as Rx'd for a particular population. It is easy for the trainer to make the mistake of underestimating what the older adult can achieve physically. Setting an Rx'd standard is also setting an upper boundary—i.e., it becomes a limiter. It is always better to have a harder prescription that can be scaled down than an easy prescription that undermines development.

Manage the Repetition Budget

Aging athletes are more susceptible to overuse injuries. An effective way to prevent this from occurring is to identify high-risk movements (say pull-ups, overhead pressing and box jumps, for example) and assign a weekly budget of repetitions. The programming is then written to never exceed the budget. For example, a weekly budget of 150-200 reps for pull-ups is reasonable to minimize the risk of developing tennis elbow. If Fran is programmed early in the week (45 reps) and Angie later in the week (100 reps), plus 3 sets of 10 are programmed in a warm-up midweek (30), the athlete has completed 175 reps for the week and is in the safe zone. If another pull-up workout was programmed, or if the athlete was doing pull-up practice every day in addition, the budget is exceeded and the client is at greater risk of overuse injuries. Being dramatically under-budget for a movement is also not ideal as it can lead to lack of conditioning and set the client up for excessive soreness and muscle damage when that movement is next programmed. The budget is a very effective way for the trainer to keep track of the overall volume programmed for high-risk movements.

The repetition budget will vary from movement to movement. More experienced trainers will intuitively determine their own safe zones and adjust over time, but as a basic guide for a trainer lacking experience in judging appropriate volumes, the following formula can be used to determine a starting point for upper and lower limits:

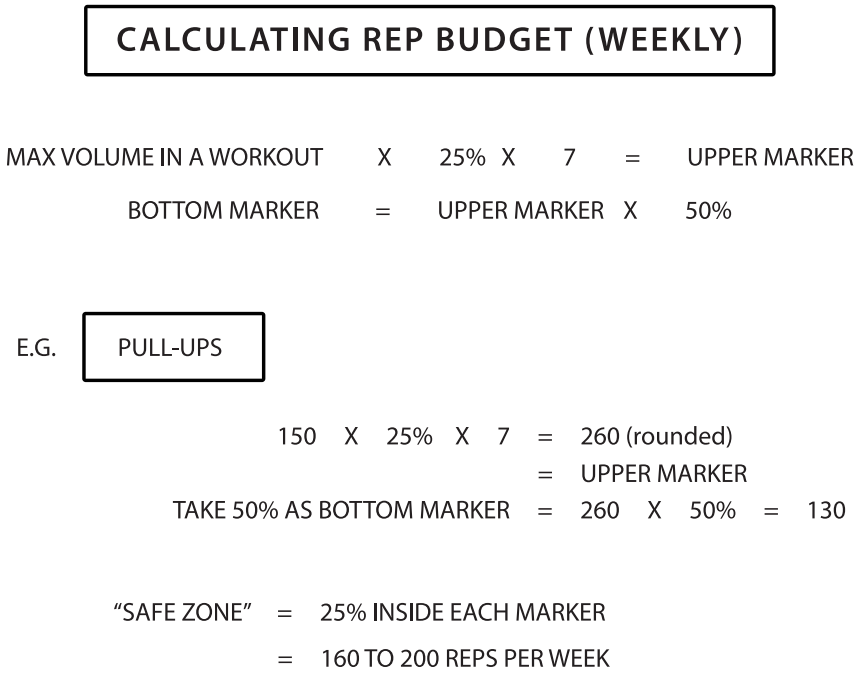

Figure 4. Calculating Rep Budget (Weekly).

The Diseased or Terminal Client

The diseased client is the exception to the rule in that intensity may have to be reduced and even removed from the program in order to avoid exacerbating symptoms. This is generally the case for illnesses that supress the immune system or where drug therapy interacts with exercise in a negative way, but it is a relevant consideration for all diseased clients. The impact of training on well-being needs to be closely monitored and intensity ratcheted down accordingly. It is outside the trainer's scope of practice to make any recommendations in relation to the treatment of disease or drug therapies. Therefore, it is imperative that the trainer seek direct guidance from the medical team in relation to any potential contraindications to exercise. The trainer needs to understand that the highest priority for the diseased client is finding the balance between maintaining functionality and not accelerating the progression of the disease.

Continuity of training can have a hugely positive impact on mental health, particularly if the client is terminal. The trainer should be flexible in the programming approach and recognize that the scaling may change on a daily basis with the ups and downs of the disease. In some situations, just turning up to the gym and socializing may be as much as the client can handle. For the diseased client, any positive effect is valuable so modify the program as much as required. Every case is different and needs to be evaluated on its merits.

Sample Programming Template for Late Wellness Athlete

The following template is an effective way to adapt programming for the late wellness athlete:

- Train three days on and one day off but consider an extra rest day, especially as age increases
- Warm-ups include mobility, balance, skill practice and movement revision
- More frequent strength but less volume
- WOD scaled to approximately 70 to 80 percent of Rx'd standards on CrossFit.com
- Include a lot of benchmarks and scaled hero WODs
- Incorporate partner WODS to increase the social factor and manage volume
- Incorporate odd objects
- Allow a lot of warm-up time
- Every training day needs some form of neurological challenge

Sample On-Ramp Program for the Late Deconditioned Wellness Uninjured Masters Athlete

The on-ramp program for a masters athlete is similar in concept to that of a younger adult client, but it will take considerably longer (i.e., it is more graduated). The major accommodations are:

- Complex skills are broken down even further into simpler steps that have higher repetition before progressing.
- Strength training is undertaken each session.
- There is a greater inclusion of practice time for neurological skills.

For an aging athlete, there needs to be a much slower introduction of dynamic skills. Note that the more dynamic the movement, the greater the risk of injury (and probably the weaker the enjoyment factor), particularly if the client has a history of injury or is deconditioned.

We present below general principles of responsible coaching and stress what should be the foundation for the on-ramp program design:

- Slow before fast (e.g., overhead squat before snatch)
- Body weight before load (e.g., air squat before loaded front squat)
- Static before dynamic (e.g., push-up hold before push-up)
- Simple before complex (e.g., deadlift before kettlebell swing)
- Strength before speed (e.g., ring rows before jumping pull-ups)
- Balance before movement (e.g., balance on one leg before step-up)
- Positional control before increasing range of motion (ROM) (e.g., correct hip hinge in hang position before working from the floor)

These principles should apply to everyone anyway, but with a masters athlete, there is a strong argument for being more systematic and conservative in their application. If you violate these principles with a younger athlete, probably nothing is going to happen, but break the rules regularly with a masters athlete and you are likely to break them as well.

EXAMPLE 12-WEEK ON-RAMP PROGRAM

The following 12-week, three-day on-ramp program is an example of how to responsibly prepare a late masters deconditioned wellness client for the group environment:

	DAY 1	DAY 2	DAY 3
WEEK 1 **Squat** **Push-up**	Teaching Point Tour of the gym, where things are. Warm-up Fast pace walk/jog 300 m Dynamic warm-up: wrist circles, shoulder circles, hip circles, bow and bend, torso rotations, etc. Skills Squat AbMat sit-up Workout AirBike 1 min. on/1 min. off for 3 rounds	Teaching Point Whiteboard/Brief—what happens at the start of a class? Warm-up Star jumps (practice landing position first), mountain climbers (step leg in rather than jump), inchworms Skills Rowing technique, stages of stroke (catch, drive, recover) Push-up, including how to build strength using slow lower and how to scale a workout with an incline Strength/Workout 5x3 quality push-ups	Teaching Point How to record scores. Warm-up Row 3 min. Balancing on 1 leg—spotted practice for 3 min. Skills Squat and push-up revision/ practice Strength Plank hold (incline if needed) 3x30 sec. Workout 7-min. AMRAP Row 200 m 7 squats 7 AbMat sit-ups
WEEK 2 **Press** **Pull-up** **Hip extension**	Teaching Point How to pack up after a class Jumping mechanics—what we are looking for. Warm-up In place: Bunny hops Lunges—hold onto wall if needed. Knee to AbMat Broad jumps Focus on jumping mechanics, landing in good position Skills Press Workout Row 3x250 m Rest as needed between efforts	Teaching Point Stretches you can do at home; Samson stretch, hamstring stretch. Warm-up Bike 3 min. Arm circles; coordinate arms going different directions (one forward/ one back) Leg swings (holding onto wall), keep hips straight Skills Pull-up: scaling options and how to build strength Workout 5 rounds for time: 5 push-ups 5 squats 5 AbMat sit-ups (increase to 10 reps if able)	Teaching Point What are benchmark workouts? Warm-up Single skips with a rope, 2-3 min. Skills Hip extension—start with a superman, progress if showing capacity Workout Prowler push or sled drag 3x100 ft.

	DAY 1	DAY 2	DAY 3
WEEK 3 **Deadlift** **Step-up (Box jump)**	Teaching Point How to load a barbell: plate order, clips, removing plates, etc. Warm-up Leg swing x 20 each side Inchworm x 5 Glute bridge x 10 Broomstick good mornings x 10 Skills Deadlift Strength/Workout Press 5x5	Teaching Point What is midline stability? What does it look like? Warm-up Fast-paced walk/jog 400 m Dynamic warm-up: wrist circles, shoulder circles, hip circles, bow and bend, torso rotations, lunges Skills Balance drills Single-leg balance Strength Hip extension 3x10 (add load if competent) Workout Tabata mash-up (4 each): Squat AbMat sit-up	Teaching Point Nutrition intro—explain the prescription. Emphasize eating real food. Warm-up Single skips with a rope, 2-3 min. Active hang on bar or in ring row position, 20 sec. Kipping swing x 20 (with feet on box—open/close shoulder) Skills Step-up (Box jump) Strength Pull-up 5x3 (use a slow lower or banded pull-up or ring row—scale appropriately) Workout 500-m row TT
WEEK 4 **Front squat** **Push press**	Teaching Point How to safely bail on a front squat—practice doing this. Warm-up Samson stretch, 30 sec. each side Squat therapy Front-rack mobility 2 rounds: Jumping pull-ups x 10 Push-ups x 10 Squat x 10 Skills Front squat Strength/Workout Deadlift 5x5	Teaching Point Lifting etiquette; where not to stand when someone is lifting weight. Warm-up Junkyard dog (scale height of jump) Over-unders (can be done with a broomstick rather than a partner if needed) Skills Push press Workout 4 rounds: 5 DB presses 7 AbMat sit-ups 10 box jumps	Teaching Point Post-workout nutrition; why it's important to refuel after a workout. Warm-up 3 rounds: Active hang on bar or in ring row position, 20 sec. Push-up plus x 10 Hip extension x 10 Skills Thruster Strength Plank hold 3xME (incline if needed) Workout Mini-Nicole 10-min. AMRAP Run 200 m Max-effort jumping pull-up* *emphasize stop before failure

	DAY 1	DAY 2	DAY 3
WEEK 5 **SDHP** **OH squat** **Skipping**	Teaching Point How to safely lose a bar from overhead. Warm-up Dynamic warm-up: wrist circles, shoulder circles, hip circles, bow and bend, torso rotations, lunge and twist Push press progression Skills SDHP Workout Push press 5x2	Teaching Point What is CrossFit.com and what kind of information can you find there? Warm-up Balance beam—walking along a straight line (chalk), bend and pick up objects as you go Bear crawl length of gym Star jumps x 30 Skills OH squat Strength Front squat 3x3 Workout Diane 21-15-9 Deadlift Push-up	Teaching Point Open gym and practice time; what are the best things to practice outside of class? Warm-up Ankle mobility 2 min. each side 3 rounds: Hollow hold 10–20 sec. Squat hold 10–20 sec. Active hang (bar or rings) 10–20 sec. Mountain climbers x 10 Skills Skipping—double-unders Strength Thruster 4x4 Workout Half-Annie 25-20-15-10-5 Double-unders (or singles) Sit-ups
WEEK 6 **Back squat** **Push jerk**	Teaching Point How to spot other lifters. Warm-up Hip mobility—banded Samson stretch, pigeon stretch Squat therapy Skills Back squat Workout Fran 21-15-9 Thruster Pull-up	Teaching Point Shoes—Why do people wear different shoes for different workouts? Warm-up Banded shoulder distraction x 1 min. per side 2 rounds: Push-up x 10 Pull-up x 10 Single-leg squat to a box x 10 Skills Push jerk progression Strength OH squat 5x3 Workout 500-m row TT (retest)	Teaching Point Different priority workouts, time vs task. Warm-up Junkyard dog (scale height of jump) Over-unders (can be done with a broomstick rather than a partner if needed) Skills Push jerk progression Workout/Strength SDHP 5x3

	DAY 1	DAY 2	DAY 3
WEEK 7 **MB clean** **KB swing**	Teaching Point How to keep track of reps in a workout. Warm-up Length of gym floor: Bunny hops Lunges—deep as possible Broad jumps (rest as needed throughout) Skills MB clean progression Strength Back squat 5x5 Workout Tabata mash-up (4 each) SDHP Box jumps (step-ups)	Teaching Point Rest days. Why are they important? Warm-up Dynamic warm-up: wrist circles, shoulder circles, hip circles, bow and bend, torso rotations Broomstick warm-up: Press x 5 Push press x 5 Jerk lands x 5 Push jerk x 5 Skills KB swing Strength/Workout Push jerk 7x2	Teaching Point How to clean up if you bleed accidentally (i.e., shins on a deadlift) Warm-up/Skills Med-ball clean progression Strength Warm up to a heavy set of 2 OH squat Workout Mini-Nancy 3 rounds for time: Run 400 m 15 OH squats* *taken from the rack
WEEK 8 **Clean** **Rope pull (climb)** **GHD sit-up**	Teaching Point What is the difference between Olympic weightlifting and power-lifting movements? Warm-up/Skills Med-ball clean review Strength/Strength Rope pull-to-stand (climb) Workout 5 rounds for time of: 10 med-ball cleans 5 push jerks	Teaching Point Intensity—What is it, and why is it important? Warm-up Jog 400m course Skills Clean progression with a broomstick: Dip drive x 5 Dip drive shrug x 5 Dip drive shrug + high elbows x 5 High elbows + drop under x 5 Hang clean x 5 Clean x 5 Workout Helen 3RFT Run 400m* 12 Pull-ups 21 KB swings *scale to 200m if needed	Teaching Point Variance—It's important not to cherry-pick. How to work on weaknesses. Warm-up Partner med-ball throw/catch Partner med-ball sit-ups Review broomstick clean progression Skills GHD sit-up (static hold on GHD)* *scale to v-sits/h-sits if needed Strength/Workout Hang power clean 7x2

	DAY 1	DAY 2	DAY 3
WEEK 9 **Snatch** **Farmers carry** **Wall ball**	Teaching Point Key positions in Olympic weightlifting, the 3 pulls—what are they? Warm-up Junkyard dog (scale height of jump) Over-unders (can be done with a broomstick rather than a partner if needed) Skills Snatch—Burgener warm-up Strength/Workout Back squat 5x5	Teaching Point Mental state during workouts—Things to think about. How to stay positive. Warm-up Running drills: High knees Butt kicks Karaoke Side steps Take-off drills Skills Farmers carry Wall ball Strength Rope pull (climb) 5 climbs halfway up OR 10 rope pull-to-stands Workout 800-m run TT	Teaching Point Scaling—How we scale workouts. How we maintain the stimulus. Warm-up/Skills Broomstick clean progression Strength Hang clean 5x3 Workout Karen 150 wall balls for time* *scale number as needed—talk through the process
WEEK 10 **Handstand (Progression)** **Burpee**	Teaching Point Breathing/bracing during a "gassy" workout. Warm-up Dynamic warm-up: wrist circles, shoulder circles, hip circles, bow and bend, torso rotations Broomstick clean & jerk warm-up Skills Burpee Strength Clean & jerk 2RM Workout Grace 30 reps for time Clean & jerk	Teaching Point How to spot a bench press. Warm-up Burgener warm-up Skills Bench press Strength Power snatch 5x3 Workout 4 rounds for time: 10 pull-ups 10 burpees	Teaching Point CrossFit as a sport—What is the Open? Warm-up Hollow body/Superman Dead bugs Skills Handstand (Progression—feet on box, etc.) Strength/Workout 3 x 100-m farmers carry Rest as needed between efforts

	DAY 1	DAY 2	DAY 3
WEEK 11 **Split jerk** **Toes-to-bar (Hanging knee-raise)**	Teaching Point How to look after your hands. Warm-up Handstand hold (or progression with feet on a box) Shoulder taps in push-up plank x 20 Push-up plus x 10 Push-up with t-rotation x 10 Skills Split jerk progression Strength/Workout Bench press 5x5	Teaching Point Barbell cycling in a workout—How to regather hook grip. Warm-up Burgener warm-up Skills Toes-to-bar (hanging knee-raise) Strength Snatch—build up to a heavy set of 2 Workout Isabel 30 reps of power snatches for time	Teaching Point Trust your coaches. Always ask for help if you're unsure. Things you should tell your coach—injury/illness, etc. Warm-up Broomstick front squat x 10 Broomstick push press x 10 Broomstick thruster x 10 Pull-ups x 10 Skills Ring support/Ring dip and Scaling Strength Split jerk 5x2 Workout Elizabeth 21-15-9 Clean Ring dip (dip scaling)
WEEK 12	Teaching Point Mobility—Why it's important. What you can do at home/in open gym. Warm-up Balance beam retest—walking along a straight line (chalk), bend and pick up objects as you go Bear crawl length of gym Star jumps x 30 Skills Thruster—efficient cycling Strength Deadlift 5x3 Workout Jackie For time: Row 1,000 m 50 thrusters 30 pull-ups	Teaching Point What a typical class will be like. What to expect. Warm-up Clean and jerk broomstick progression Skills Muscle-up progression Strength/Workout Clean & split jerk 5x2	Teaching Point Fast transitions during a workout. Warm-up Row 3 min. Dynamic warm-up: wrist circles, shoulder circles, hip circles, bow and bend, torso rotations Skills Movement review/setting up for the workout Workout Fight Gone Bad ** Graduate to groups

Note that extra strength work has been programmed in addition to the workout, particularly on days where the workout is technical or likely to be heavily scaled. This is consistent with our recommendation of more frequent strength work for deconditioned late masters, which can be particularly beneficial while intensity is low in the beginning stages of training. It is implied that as athletes graduate into group classes, they will transition to more traditional CrossFit programming—i.e., a single workout a day.

EXAMPLE CLASS PLAN FOR A LATE MASTERS ATHLETE

Once they have achieved an appropriate level of fitness and graduated into the class environment, late masters athletes can and should be exposed to challenging workouts. Heavy and complex skill workouts are an important stimulus that should not be avoided.

Complex gymnastics and heavy lifting can be accommodated with effective scaling, but the trainer needs to be prepared and skillful. A class plan should be prepared ahead of time that allows for:
Increased warm-up time

- Adjustment of workout weights
- Creative scaling strategies such as forced rest, partner work, and AMRAP components
- Effective progressions and substitutions
- Neurological skills to be incorporated and reinforced throughout the entire session

A well-prepared class where the specific needs of aging athletes have been addressed ahead of time will reduce the demand on the trainer during the class and increase coaching effectiveness. Providing explicit masters scaling will also go a long way toward creating an inclusive environment.

Below is an example of a class plan for the challenging Barraza Hero WOD, rewritten as Rx'd for a late masters group.

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LESSON PLAN: BARRAZA

WORKOUT

"Barraza"—55+ Rx'd version
14-min. AMRAP:
200-m run
9 deadlifts, 225 lb./155 lb.
6 burpee chest-to-bar pull-ups/burpee pull-ups

INTENDED STIMULUS

- This is a longer time domain triplet combining monostructural, weightlifting and gymnastics modalities.
- The rep scheme allows for each set to be completed unbroken, at least for the early rounds.
- The deadlift is on the heavy side of moderate and is intended to be challenging to complete with a high heart rate following the run.
- The gymnastics movement is complex and involves a large range of motion, increasing the cardiovascular demands of the workout.
- There is some redundancy in the pulling movements, which suggests that grip endurance will become a factor in later rounds.

BREAKDOWN

- This hero workout is in honour of U.S. Army Staff Sergeant Ricardo Barraza, 24, of Shafter, California. Barraza was assigned to the 2nd Battalion, 75th Ranger Regiment, based in Fort Lewis, Washington, and died on March 18, 2006, in Ar Ramadi Iraq.
- The original workout is an 18-minute AMRAP of 200-m runs, 9 deadlifts at 275 lb. and 6 burpee bar muscle-ups.
- This version is the suggested Rx'd prescription for 55+ (late masters).
- The deadlift weight has been reduced to approximately 80 percent of the original prescription.
- The time for the workout is reduced from 18 to 14 minutes to prevent the potential increase in volume (i.e., increased rounds) that can occur when loading is reduced. The goal is to complete the same volume as the original workout, which on average is 5–7 rounds.
- The gymnastics movement has had complexity reduced, but that is not intended to be a limiter. Athletes who can do burpee bar muscle-ups should use them in the workout instead of burpee chest-to-bar pull-ups.

:00–:05

WHITEBOARD (5 MINUTES)

- Explain the workout, intended stimulus and breakdown (above).

:05–:17

GENERAL WARM-UP (12 MINUTES)

Dynamic movements (trainer-led)

- wrist circles
- elbow circles
- arm circles
- hip circles
- bow and bend
- glute bridge
- single-leg RDL (or single-leg balance)

Warm-Up Game—broomstick shuffle in a circle

- Go right, go left. Add a clap to make it harder.
- Make the circle bigger one step at a time.
- Move opposite to the instruction to make even harder.
- This is social, plus a neurological warm-up.

Stretch calves.

Easy 400-m jog

:17–:23

BURPEE CHEST-TO-BAR PULL-UP—SPECIFIC WARM-UP (6 MINUTES)

- 20 kipping swings
- Jump to bar in hollow body, open and then kipping pull-up
- Burpee, then jump to bar and do pull-up
- Practice burpee pull-up cycling

:23–:33

DEADLIFT SPECIFIC WARM-UP (10 MINUTES)

- Broomstick deadlift review with a trainer
- Warm up your deadlift to workout load.
- Start with 50% for 5 reps, 75% for 5 reps, 100% for 3 reps and then (optional) 125% for 3 reps

:33–:36

BREAK & LOGISTICS (3 MINUTES)

- Bathroom break
- Set-up and final adjustments—check scaling
- Remind athletes that additional scaling may occur during the workout.
- Safety check—ensure safe distance between barbell and burpee spot, and ensure safe run track.
- Re-brief workout, flow and safety considerations.

:36–:50

WORKOUT: START AT :36 (14 MINUTES)

- Run—encourage athletes to run faster than is comfortable.
- Deadlift—watch for loss of midline stability in deadlifts. Coach this and if no change can be made do not hesitate to reduce load.
- Burpee chest-to-bar pull-up—look for full range of motion at bottom and top. Ensure athletes are not slow lowering or jumping to a flexed arm position.

:50–:60

COOL-DOWN (10 MINUTES)

- Clean up equipment.
- Stretch glutes.
- Stretch lats and upper back.
- Collect scores, celebrate new personal records and exchange high fives!

SCALING THIS WOD

- The run can be scaled to a row or bike if there is an injury or limitation.
- To scale the deadlift, reduce load. Choose a load that is on the heavy side of moderate and that you could do 15-20 reps unbroken when fresh.
- The burpee chest-to-bar pull-up can be scaled to a burpee jumping pull-up. The athlete performs the burpee, then steps up onto the box to perform the jumping pull-up.
- Competent athletes may scale up to burpee bar muscle-ups.

EFFECTIVE SCALING

The importance of the trainer's ability to effectively scale the program for an aging athlete cannot be overstated. The Masters Quadrant provides a general guide for the trainer in relation to big picture coaching priorities, but it is the day-to-day decision making in relation to scaling that creates success for the client. CrossFit Training provides an excellent online scaling course (oc.crossfit.com/scaling), which offers a foundation for developing an understanding of what is required for effective scaling.

The principles of scaling are universal and unchanged in relation to an aging athlete. However, as we have stated, a masters athlete requires a more conservative approach to scaling. If the trainer gets it wrong, it can have a significantly greater negative impact on an older athlete, particularly if that athlete is in the injured or unfit quadrant, than it might on a younger athlete. As with training a kids population, effective scaling for masters athletes requires great care and preparation.

It is important to recognize that masters athletes may require scaling indefinitely, and the ability to provide a variety of scaling options can be a critical factor in maintaining motivation. The availability of multiple scaling strategies can offset the frustration that is often associated with slow progress in an aging population.

Scaling Recommendations:

- If in doubt, err on the side of caution with less volume and lighter weights.
- For shoulder impingement in hanging movements, use rings instead of the bar to allow for a more neutral grip.
- For shoulder impingement in overhead pressing movements, use dumbbells instead of a barbell to allow for a more neutral grip.
- If reducing range of motion, use targets and depth markers for movement consistency.
- Loaded lunging can be an effective substitution if squatting is not possible.
- Sled drag, sled push and farmers carries are effective ways to maintain hip strength if squatting or deadlifting is not possible.
- The trainer should periodically reassess the athlete to ensure that habitual over-scaling does not occur. Unless injured, the general strategy should be to move the athlete toward the full program but on a more gradual timeline than a younger athlete.

Make the Athlete Self-Sufficient

It is critical to athletes' ongoing motivation to have a method for managing their own scaling on a daily basis in order to be self-sufficient and not feel like a burden on the trainer. Providing a scaling and substitution table can be a very effective way to achieve this. The table acts as a cheat sheet that allows the athlete to look at the daily workout and then modify it accordingly based on the guidance in the table. Periodically, the trainer would review the athlete's progress and update the table. This process can continue ad infinitum or until the athlete is performing workouts Rx'd and no longer requires scaling.

An excerpt from a scaling and substitution table is presented below as an example:

Name: Joe Smith				**Trainer:** Matt Swift	
Date: 16/5/2016				**Next Review:** 16/6/2016	
Movement / Element	**R X D**	**Max Reps in Workout**	**Weekly Rep Budget**	**Scaling (movement, reps)**	**Substitution(s) Comments**
Air Squat	✔	50	100		
Strict Pull-Up	✔	10	20		Must be pain-free
Kipping Pull-Up	✘	—	—	No kipping until shoulder injury resolves	Substitute strict pull-ups
Double-Unders	✘	—	—	No jumping until Achilles heals fully	Small box step-ups
Knees-to-Elbows	✘	30	60	Attempt to get knees as high as you can—Hanging knee-raise OR try for smaller numbers	
Toes-to-Bar	✘	30	60	Attempts Reduce volume	
Handstands	✘	5	20	Feet on a box and walk to a pike position	ONLY try handstands with a coach present. Do not attempt if shoulder pain.
Handstand Walk	✘	—	—		As above
Handstand Push-Ups	✘	50	100	DB press—12-kg to 15-kg range	Must be pain-free
Russian KB Swing	✔	75	150	Start at 16 kg. As you get better, progress to the prescribed weight of 24 kg. There are 2 x 20kg KBs—grey.	
Overhead KB Swing	✘			Do not go overhead until shoulder injury resolves	Substitute with Russian swing
GHD Sit-Up	✔	30	60		
AbMat Sit-Up	✔	100	200		
Hip (Back) Extension	✔	50	100		
Rope Climb	✘	—	—	Work on partial climbs (2 bites), and follow coach's guidelines. If your lockout and descent are solid, you may go higher once a coach checks you.	
Pistol	✘	40	80	Use a 20-in. box. Remember to reach forward and sit back.	
Deadlift	✔	60	120	Between 1 to 1 ½ times body weight for strength day. Start at the lower end of the range as your max for the day. 40 to 60 kg for WODs	
Front Squat	✔	40	80	Strength days—80 kg WODs—40 kg	
Back Squat	✔	40	80	80 kg to 100 kg. Go up if the coach says OK. Keep a record of your numbers and don't exceed a PB by more than 5 kg.	
Overhead Squat	✘	—	—	Broomstick only until shoulder injury resolves.	Back squat
Clean	✔	45	90	Land in a power squat, then add a full squat, 40 kg limit for first 4 weeks. 25 kg for WODs	
Etc.		Etc.	Etc.	Etc.	Etc.

Masters Progressions

It is not uncommon for trainers to hit the wall trying to teach complex skills to masters. The standard progressions that are effective with a younger adult may not be as effective with a masters athlete and often require additional steps and strategies. Standard progressions for CrossFit skills are usually based on reducing the effort component of the skill, e.g., using a smaller box for box jumps or reducing the range of motion for a handstand push-up. However, with a masters athlete, particularly a late masters athlete, it may be necessary to reduce the thinking component or even practice the neurological component separately from the skill itself. For example, even on a tiny box, a masters athlete may freeze while attempting a box jump, and the progression may have to start with basic jumping drills in horizontal patterns such as hopping and skipping until the neurological pattern is established. We have seen clients who cannot correctly jump onto a 10-lb. plate. Confusion can reign inside a masters athlete's head when trying a new skill. In some cases, underlying physical limitations may have to be addressed in isolation before the neurological component can be effectively practiced. For example, if the athlete does not have the requisite strength and mobility to perform a calf raise, he or she will not have a foundation to practice jumping.

We Can Take These Things for Granted

For the younger athlete, the progression practice itself can resolve any underlying body limitation. For the late masters athlete, it may be the other way around, and the underlying limitation may need to be identified and rectified before the progression will work.

Guidelines for Masters Progressions

- Need to understand that masters (especially late masters) may have reduced ability to learn neurological skills, so take it slowly and be patient
- Progressions need more steps and smaller increments.
- May have to zero in on the neurological components
- There may be body limitations that will factor in, so look for a lack of basic strength.
- Fear and anxiety can be limiters and need to be addressed separately.

When developing progressions for a deconditioned late masters athlete, a key teaching point is that we need to check and develop strength first, develop the mechanics second, and then progressively increase the effort third. It can take considerable time to reverse the effects of being significantly deconditioned.

Box Jump Example

A typical box jump progression for a younger athlete may occur over two to five sessions and consist of the following steps:

1. Step-up
2. Box jump to a small box
3. Box jump to a higher box

The box jump progression for a deconditioned late masters athlete may take six months or longer and require 15 or more steps:

1. Double-leg calf raise (build to 30 reps)
2. Single-leg calf raise (build to 15 reps per side)
3. Walk on toes
4. Lunge
5. Lunge with knee lift when stepping up
6. Step-up on small box (increasing height)
7. Step-up with knee lift (add calf raise for neurological challenge)
8. Vertical jump with correct ankle extension
9. Vertical jump with landing practice (mimic box-jump landing)
10. Broad jump and stick the landing
11. Progressive jumping to plate
12. Step-up with jump down (stick landing)
13. Hand hold box jump (with a spotter)
14. Wall hold box jump
15. Progressive height box jump

Pull-Up Example

A typical pull-up progression for a younger athlete may occur over six to 12 weeks and consist of the following steps:

1. Band-assisted strict pull-up
2. Strict pull-up
3. Kipping drills
4. Kipping pull-up

The pull-up progression for a deconditioned late masters athlete may take two to three years and require 15 or more steps:

1. Hang with feet on the ground (some weight bearing)
2. Hang with feet on the ground, lifting one knee at a time
3. Hang with active shoulders, holding own weight
4. Band pull-down seated on box
5. Seated bar pull to standing and squat back down with slow lower (bar at eye height)
6. Feet assisted low bar pull-up and slow lower (kneeling under the bar as with a muscle-up transition)
7. Bar row
8. Ring row
9. Seated or feet-assisted ring pull-up (build biceps strength)
10. Pull-up with feet on box (feet stay connected to box)
11. Pull-up with foot on box (one leg only)
12. Jumping pull-up using plates (reducing plates as strength builds)
13. Jumping pull-up with hold and then slow lower
14. Partner-assisted pull-up (lifting from behind on upper back)
15. Band-assisted pull-up (reducing band tension)

Masters Modifications—Beyond Scaling and Progressions

It is a reality, particularly for the late or injured masters athlete, that some movements need to be avoided entirely and should be excluded from the program. In these cases, movement substitution can be an effective way to preserve the intended stimulus.

LIMITATION	SUBSTITUTION STRATEGY
Seriously limited range of motion in overhead positions prevents achieving safe snatch position.	Replace snatch with split snatch.
Rotator cuff tear that won't resolve causing pain hanging in pronated grip.	Replace kipping pull-ups with strict ring pull-ups.
Knee and lower back pathology limiting ability to safely back squat.	Replace back squat with box squat using dumbbells.
Kyphosis and hip issues make safe deadlift setup unachievable.	Replace barbell deadlift with kettlebell deadlift off blocks with the load at the side (suitcase deadlift).
Lower leg and Achilles issues make jumping contraindicated.	Replace box jumps with step-ups and avoid skipping.

This is not intended to be an exhaustive list but rather an example of how even the most deconditioned or physically limited athlete can continue to participate in the program using clever substitutions.

The trainer should periodically reassess whether substituted movements can be reintroduced to the program. The goal remains having the client undertake the full program if possible with appropriate scaling, but both parties need to accept that in the case of unresolvable pathology or injury, reintroduction of some movements may never be possible, and even attempting them could set the athlete back. Each case should be assessed on an individual basis. The trainer should be optimistic and pragmatic in equal doses.

TRAINING FOR QUALITY OF LIFE—THE STORY OF MICHAEL

This is the story of Michael, a client at CrossFit Brisbane from 2009 until the end of 2015 when he passed away at 72 years of age due to complications from a degenerative lung disease. Michael was physically fit his entire life, with long-distance running serving as his primary exercise method prior to CrossFit. When he joined CrossFit Brisbane at 66 years of age, he was in significantly better condition than most 40-year-olds largely due to a very healthy lifestyle and continued physical activity. He completed over 1,000 CrossFit workouts at CrossFit Brisbane.

Due to his high level of capacity when he first started, Michael was able to join the general classes without any issues, and apart from limited range of motion overhead, there was little to indicate that his age was a factor. For three years, he continued to train in the groups with great success and was one of the boys. Around the three-year mark, he had a break to correct a cardiac issue that had to do with the electrical signalling in his heart and was a result of a congenital issue. He successfully returned to training without any noticeable issues. At around the four-year mark, Michael elected to have back surgery to fuse slipped discs in his lower spine. This was a long-standing injury from well before his CrossFit days, and it had become progressively more limiting with age, to the point where he was in constant pain. At 69 years of age, the back surgery was a major operation requiring significant recovery. It took 12 months to rehabilitate Michael from barely being able to stand post-op to being able to deadlift 130 kg from blocks using a trap bar. His medical specialist noted that his recovery was exceptional and exceeded all expectations. This was attributed to Michael's high level of fitness for his age prior to the operation. Following the operation, Michael elected to not return to groups as he required modifications to a lot of movements and felt that training in a one-on-one setting would be more productive. From that time on, all his training was either done as personal training sessions or in open gym under indirect supervision. He was constantly concerned that he was a burden and required regular reassurance.

Around the same time as the back operation, Michael was diagnosed with idiopathic pulmonary fibrosis, a degenerative lung disease with a poor prognosis but slow progression. Initially this did not affect his training apart from a noticeable increase in the amount that he was puffing. It was painfully unfortunate that at the time that Michael started to be fully recovered from his back injury and ready to train again, his lung symptoms started to worsen. It became clear that lung function was going to be a major factor that needed to be managed. By 2014, Michael's lung disease developed to the point that he had difficulty catching his breath, and his program had to be modified so that he was working at a lower intensity with much bigger rest periods between efforts. At around this time, his medical team had concerns that his blood oxygen saturation was dropping too low while he was exercising, and in order to monitor it, he started wearing a finger pulse oximeter on his finger during rest periods. The guideline that was provided was that his SpO2 (blood oxygen saturation) was not allowed to drop below 90 and needed to return to 95 before Michael would be allowed to continue training. This guideline was proving hard to meet as he was regularly dipping as low as 80, which put him at risk of ectopic heart beats and arrhythmia. Managing the Sp02 levels became the highest priority, and for the next 12 months, the program was continually modified and scaled back to keep his levels above 90.

Work-to-rest ratios were adjusted, and various exercises and workout styles had to be dropped all together because of the oxygen cost. It was determined that he needed a work-rest ratio of no higher than 1:5 to stay above 90. He was also unable to cope with any exercises in combination—i.e., he could do push-ups, rest and then do pull-ups, but he could not cope with push-ups and pull-ups mixed together. The majority of his program became strength-based. He remained strong and during this period actually increased his capacity at body-weight movements. It was not unusual for him to complete 100 strict pull-ups and 200 push-ups unassisted during a session. However, the sessions took him a long time because he would constantly have to stop for extended periods of time to bring his heart rate down and Sp02 back up before continuing. Nonetheless, he remained determined and looked for novel ways to keep working hard. He became the master of isometric holds and could plank for well over three minutes without any difficulty. He also became very good at farmers carries and his grip strength was impressive.

In 2015 the decision was made to bring his oxygen machine into the gym so he could wear it when resting. The machine would help maintain his Sp02 while he trained. His medical team was supportive of his exercise regimen because his level of strength and functionality, and therefore quality of life, was well beyond what should have been the case for someone at his stage of disease. But they were also clear that training could only continue if Sp02 was maintained above 90 or else it would become counterproductive. As managing Sp02 became more and more difficult, Michael started wearing his oxygen mask while he trained and lying down and semi-sleeping between efforts to recover. This presented a number of problems, the primary one being that trainers would often trip over the cord, and to the amusement of many, new people to the gym would often think he was dead when he was resting.

Toward the end of 2015, Michael's lungs deteriorated to the point that he was physically unable to come to the gym without being exhausted by the car trip. At this point, he started training at home on a very modified and basic program using stretch bands. It was clear that the end was near, but nonetheless, he refused to stop training, and a couple of days before his death he was still squatting and watching reruns of the CrossFit Games, which he loved with a passion. Despite being unable to breathe and in considerable discomfort, Michael retained strength and capacity right up to his death, avoiding palliative care. He remained adamant that CrossFit was instrumental in extending his life and maximizing his ability to enjoy his remaining time. Prior to his death, Michael became a proud grandparent, something that in the early days he feared he would not live to do. Following his death, his medical team attributed an extra four years of his life to his lifelong fitness and continued CrossFit training. Michael's story is the epitome of what CrossFit has to offer the aging athlete community and is a testament to our key principle of continuing training no matter what.

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