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Legal Aspects of Aerobic Capacity: Objective Evidence of the Ability to Work Part I: Age as a Bona Fide Occupational Qualification (BFOQ)

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Legal Aspects of Aerobic Capacity: Objective Evidence of the Ability to Work

Part I: Age as a Bona Fide Occupational Qualification (BFOQ)

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Introduction

This two part series examines the legal issues relevant to aerobic capacity as objective evidence of the ability to work. Law relevant to two issues will be reviewed: (1) age as a bona fide occupational qualification (BFOQ) for certain occupations where public safety is at stake (police and wildlife officers), and (2) chronic fatigue syndrome as a medically diagnosed condition that causes disability for work. In case law for both issues, aerobic capacity is offered as objective evidence of the physical ability (disability) to perform work related duties that may be strenuous as in the case of a police officer, or light/sedentary as in the case of a disabled individual. The role of the expert in determining and interpreting the relevance of aerobic capacity to the physiological demands of a job is central to court decisions for both issues.

Aerobic capacity should be an undisputed core competency of the exercise physiologist. Case law is replete with expert testimony in physiology that influences a court's analysis on this issue. Courts rely upon the expertise of EPs and other medical experts to articulate the link between aerobic capacity and the ability/disability to work in a variety of settings under varied circumstances. This article highlights the role of the expert in law suits where aerobic capacity is objective evidence of the ability to work after age 55.

Age as a Bona Fide Occupational Qualification (BFOQ)

Employment related cases examine the issue of age as a BFOQ often based upon a presumption that physiology declines with aging and that this decline may result in the inability to do a particular job. State law and agency regulations with age

mandated retirements are not always premised on factually based scientific inquiry. Instead, as the cases below illustrate, they are often initially premised upon the opinions of experienced employees who are asked about the ability of "older" employees to perform their duties. At least one court (EEOC v. State of New Jersey, 620 F. Supp. 978 (United States District Court, D., 1985) has questioned the need to prove the loss of ability as a consequence of aging given the "common wisdom" that aging results in physical decline:

> That there exists the exceptional person who can leap tall buildings in a single bound and run marathons that a person half his or her age cannot contemplate as being within the realm of possibility does not call into question the "truism" that the ability to perform strenuous physical tasks declines with age and one wonders why in each case that common wisdom must be proved (Id. at p. 983).

Nonetheless, federal law today prohibits age discrimination in employment in the absence of a factually based exception.

The Age Discrimination in Employment Act of 1967 (ADEA) is federal legislation, applicable to the states, that bans age discrimination against individuals between the ages of 40 and 70. However, there is a BFOQ exception to the ADEA that states: "It shall not be unlawful for an employer…to take any action otherwise prohibited…where age is a bona fide occupational qualification reasonably necessary to the normal operation of the particular business" (81 Stat.603, 29 U.S.C. 621-624, 623(f)(1)). "Reasonably necessary" is the key argument for an exception requiring proof of a factual basis that the age classification is not unreasonable or arbitrary (p. 1178).

The following two cases are examples where state statutes required mandatory retirement at age 55 for police officers and wildlife officers. Both statutes relied upon the ADEA exception, arguing that age is a BFOQ to perform the strenuous duties associated with these jobs. In both cases, the Equal Employment Opportunity Commission (EEOC), the agency charged with enforcement of the ADEA, brought legal proceedings against the states alleging that the use of age as a BFOQ is a violation of the ADEA.

Both states defended their laws mandating retirement at age 55, primarily by arguing that aerobic capacity represents a BFOQ exception to the ADEA. Opposing experts for the state and EEOC gave factually based arguments on whether older workers, as a group, had the minimum aerobic capacity necessary to perform their duties. In both cases, the courts upheld the retirement mandate finding that aerobic capacity declines with age (as an objective basis on which to determine the physiological requirements to do a job), and provides a reasonable basis on which to predict the work capacity of groups over age 55.

Case #1: EEOC vs. State of New Jersey (1985)

In EEOC vs. New Jersey (1985), a mandated retirement statute for state police officers at age 55 survived a challenge from the EEOC who alleged that the statute violated the ADEA. The New Jersey legislation declared that age was a BFOQ reasonably necessary to the continued health and fitness of the police officers and the protection of the public.

Initially, New Jersey's 30-yr-old mandate had no factual basis. However, following the application of the ADEA to the states, a state study was initiated to determine whether a factual basis existed to establish an age-specific retirement provision for the police officers. Two cardiologists and two physiologists were commissioned as experts to evaluate the actual physiological requirements to perform the duties of police officers. Their Report concluded that there was a compelling factual basis for the mandate because most individuals over 55 are unable to safely and efficiently perform police duties, and it is impossible or impractical to determine continued fitness on an individual basis.

The Report and testimony of New Jersey's experts were pivotal to the court's holding that age is a BFOQ for police work and, therefore, is an exception to the ADEA. It was undisputed by either side to the case that police officers must possess an adequate level of physiological fitness in order to safely and efficiently perform their job duties. Aerobic fitness, body composition, muscular strength, reaction time, and visual and aural acuity were explicitly included as critical physiological attributes. Overall, while all of the above attributes decline with age, the state's experts represented that the greatest decline occurs with aerobic capacity. The impact of the Report and the court's reliance on these experts to interpret and explain the fundamentals of aerobic capacity cannot be overstated. Extensive testimony is in the case regarding VO_2 max, aerobic reserve, the time one can work at $VO_2$80% versus VO_2 max, oxygen debt, and the onset of "total body fatigue" (p. 987-990).

The court, relying upon testimony of state experts and state troopers, concluded that it was "crystal clear" that police are commonly required to perform at high levels of aerobic capacity (p. 988-989). Expert testimony for the state concluded that the recommended minimum aerobic capacity needed to safely and efficiently perform police duties was 41 $ml \cdot kg^{-1} \cdot min^{-1}$ (p. 989). This aerobic minimum was established through a review of responses to the Superintendent's request to all sworn officers for a description of their duties in terms of speed, distance, and duration of effort. Commonly reported duties included routine stops, rescues and investigations that required running more than 100 yards and on occasion more than one mile, pushing disabled vehicles "considerable distances," swimming for sustained periods in rescue, and continuously lifting objects of 75 lbs or more.

EEOC experts opposed the testimony of New Jersey's experts. One EEOC expert testified that aerobic fitness is the least important of the physiological attributes

necessary to perform police duties. This opinion was based upon his knowledge of law enforcement organizations in which "the most aerobically demanding task would commonly be a foot chase of 80-100 feet" (p. 988). The court questioned whether EEOC experts had sufficient knowledge of the New State police and whether they had adequately prepared for the case. It should be noted that EEOC experts made important concessions to state experts; they agreed that there is an "unquestionable" decline in performance with age and they accepted an aerobic minimum of 40 to 41 $ml \cdot kg^{-1} \cdot min^{-1}$ for state police work (p. 988).

The findings in the case relevant to the links between age, aerobic capacity, and the ability to do police work clearly demonstrate the impact of state expert testimony on the court. The court's critical findings include (pp. 987-990):

1. Of the physiological attributes considered, aerobic capacity was most impacted by aging. A peak aerobic capacity is reached by age 20 and a decline of 10% per decade ensues.
2. The decline in aerobic capacity as a function of aging cannot be reversed through training. Regular training can increase aerobic capacity 10-20% but training cannot stop the 10% decline/decade caused by aging.
3. Known aerobic requirements of police tasks provide a factual basis to relate an individual's aerobic capacity to the ability to do police work (pp. 987, 990).
4. Mean aerobic capacities in populations comparable to the New Jersey State Police are well-established in the physiological literature. This information and the establishment of a minimum of 41 $ml \cdot kg^{-1} \cdot min^{-1}$ aerobic requirement necessary for police duties provide a basis to evaluate the ability of age groups to perform their duties (p. 990).

The court held: (1) that health and fitness of police officers are reasonably necessary to enforce the law and protect the public; and (2) that all or substantially all police officers aged 55 and over cannot safely and efficiently perform their duties because of diminished aerobic capacity. Therefore, the court did not find a violation of the ADEA by state mandated retirement for police officers and upheld the mandatory retirement law.

Case #2: EEOC vs. State of Tennessee Wildlife Resources Agency (STWA) (1986)

In EEOC vs. SWRA (1986), the court held that mandatory retirement at age 55 is a BFOQ for wildlife officers in the field but not for top level administrators. As in the prior case, the EEOC claimed this was a violation of the ADEA, but in the end the court upheld mandatory retirement at age 55.

Tennessee conducted no scientific studies prior to the adoption of the mandatory retirement age of 55. Instead, informal staff meetings established that there was

considerable concern on the part of SWRA employees that older wildlife officers were unable to perform their jobs safely in regards to themselves and the public. There was consensus that this was especially true when more strenuous duties were considered (pp. 1166, 1180). As a consequence of the subsequent EEOC suit, SWRA conducted formal hearings that included a number of agencies, wildlife officers, medical experts, and at least one exercise physiologist to determine if retirement at age 55 was a BFOQ for wildlife officers (p. 1167).

In the lawsuit, aerobic capacity was central to the determination of the link between aging and the performance of wildlife officer duties. Expert testimony on both sides emphasized the importance of the aerobic fitness necessary to perform as a wildlife officer. All experts agreed that there is a significant and progressive decrease in the ability to consume oxygen with exercise as people get older, that aerobic capacity peaks about age 18 to 20, and that a linear decline occurs of approximately 10% per decade after age 20. There were disagreements as to the importance of VO_2 max to predict performance on the job after age 55, the meaningfulness of aerobic capacity as a measure of fitness, and the efficacy of testing individuals (p. 1169, 1182).

TWRA's expert testified on the effects of aging on aerobic, isometric strength, and heat adaptation. He focused primarily on aerobic capacity with extensive testimony about aerobic capacity (e.g., distinguishing aerobic and anaerobic metabolism, explaining VO_2 max, and describing the relative contributions of each metabolic pathway during different points in exercise). He testified that aerobic capacity is an important factor in the ability to perform sustained strenuous work, and that the vigorous job of the wildlife officer would require an aerobic capacity of 43 $ml \cdot kg^{-1} \cdot min^{-1}$.

This aerobic requirement was based on the expert's opinion that an officer without this capacity would not be able to perform successfully in a situation requiring force. Thus, the TWRA expert based his opinion on his theory that the maximum effort to do the most crucial duties established the minimum aerobic requirement. He commented in detail about the need for an aerobic reserve when an officer is confronted with an emergency that exceeds routine metabolic requirements. In his opinion, only 2.5% of men over age 55 would have the necessary aerobic capacity under these circumstances. Finally, the TWRA expert stated that testing for aerobic capacity on an individual basis was not feasible because it would be difficult to develop a test relevant to the particular jobs of the wildlife officer (p. 1169).

There was no dispute from EEOC experts about the vigorous physical nature of the job of wildlife officer. However, one EEOC expert argued that the most arduous tasks of officers occurred infrequently or could be done at an officer's own pace (e.g., lifting and carrying animals and equipment, building fish attractors, chasing violators, participating in overnight stakeouts in extremely cold or hot weather, tracking violators over extended periods of time through difficult

terrain, etc). That officers are confronted with life threatening or stressful situations was not disputed by the EEOC expert, who again contended that such situations occur infrequently (p. 1167).

EEOC's experts further testified that the decline in VO_2 max with age could be slowed by regular exercise. One EEOC expert felt that few of the wildlife officers would possess a VO_2 max of 3.0 $L \cdot min^{-1}$ (43 $ml \cdot kg^{-1} \cdot min^{-1}$) at any age and that age alone is not a valid BFOQ. This expert opined that a valid BFOQ could be established by recognized scientific methods of testing. He believed that it was possible to test to determine who over age 55 could do the job of wildlife officer based on his prior work with law enforcement in which this expert developed entry-level screening tests relevant to a Title VII sex discrimination case (pp. 1171-1172).

The court was ultimately persuaded by the testimony of the TWRA experts: The Court believes, after hearing the accounts of the wildlife officers of their strenuous activities, that aerobic capacity is an important measure of capability to do this job, that [New Jersey's expert] estimate of 3.0 liters of oxygen per minute [43 ml/kg/min] is reasonable and that few persons over age 55 possess that level. This opinion was largely unrebutted by [EEOC's experts].

Thus, the court held that age 55 is a BFOQ for the mandatory retirement of wildlife officers. The court based this holding on evidence that substantially all wildlife officers over age 55 would be unable to perform safely and efficiently their duties (p. 1180).

Issues for the Exercise Physiologist

In these cases, experts disagreed on a number of issues. There were disagreements as to the importance of VO_2 max to predict the ability to work after age 55, the meaningfulness of aerobic capacity as a measure of fitness, and the efficacy of testing individuals. The basis upon which experts based their opinions of the metabolic requirements to do certain duties was not always entirely clear. There was reference to established and scientifically based aerobic means for certain populations. Reference to metabolic testing of officers did not appear to occur by experts on either side of the issues.

The issues relevant to the exercise physiologist are numerous. There isn't any question that the fitness of police offers and other employees can be measured by the exercise physiologist as a correlate to VO_2 max. Those who have high aerobic capacities have high VO_2 max values. However, there are several important concerns and questions. For example, are the estimates of aerobic capacity based upon operationally defined duties and self-reports accurate? If they are, then, why aren't police officers and others utilizing exercise physiologists in their fitness

assessments since it relates to their ability to perform essential functions and duties?

Because of the leadership role exercise physiologists are expected to have in public safety fitness in years to come, shouldn't the profession of exercise physiology be recognized for its involvement in establishing a valid and defensible position if challenged in court? The short answer to this question is "yes" since current legislation requires that fitness tests and standards must be job related and scientifically valid. Exercise physiologists, particularly the ASEP board certified exercise physiologist, must understand that the VO_2 information provided by way of an estimate or a direct measurement of VO_2 max must predict with a high degree of accuracy who can and who cannot perform the necessary functions and duties of a job.

Are the accepted physiological data on VO_2 appropriate for defining work and duties in these cases? Yes. Studies consistently show specific tasks necessary to perform the functions of a job, and physical fitness is at the core of these tasks. Whether it is a police officer engaged in a "sustained pursuit" that requires aerobic power or sprinting that requires anaerobic power, having knowledge of the officer's VO_2 max and anaerobic power are essential to determining who can and cannot do the job. However, it is possible that the experts in these cases did not adequately assess the physiological requirements to do police work and wildlife officer duties? If so, this means that the 55-year-old police officer who doesn't meet the 43 $mL \cdot kg^{-1} \cdot min^{-1}$ but nonetheless can sprint, lift and carry, drag and pull, crawl, jump and vault, and use force for less than 2 minutes may be forced into retirement. Yet, the officer demonstrates anaerobic power, muscular strength, leg power, flexibility, and muscular endurance! Shouldn't these cases make a reference to these physical fitness components, and shouldn't these cases make reference to an actual graded exercise test (GXT) in determining VO_2 max?

What is the significance of the assumptions about groups versus individuals and age versus ability? Although VO_2 max declines with age at the rate of about 10% per decade in sedentary subjects, it isn't correct to conclude that all police officers and wildlife officers are 100% sedentary subjects. Individuals who are more active than others will not experience the same rate of decline in VO_2 max with age. Is it fair to make blanket assumptions about workers over age 55? No. Women are physiologically at a disadvantage, particularly in regards to stroke volume (SV) and cardiac output (Q) even after normalization to weight. It is also likely that the sex hormones of women may influence the training-induced adaptations relative to arteriovenous oxygen content difference (a-vO_2 diff).

Are the experts correct that it was not feasible to test individuals? No. To investigate the mechanism of the age-related decline in functional capacity is worthy of increased consideration, given the legal concerns. Since it has been demonstrated that the decline in VO_2 max of ~10% per decade after 30 years of age is proportional to a decreased cardiac output reserve, peak heart rate, and peak

SV in older subjects, then, it is well-known that with aging there is reason to be more concerned. Since VO_2 max is determined by the capacity of the cardiovascular system to provide oxygenated blood to the working muscles, it is important to fully understand the age-related decline in VO_2 max as a consequence of a reduction in Q max, a-vO_2 diff, or both. Also, it seems reasonable that the exercise physiologist should know whether these age-associated changes in maximal aerobic capacity and cardiovascular function occur more rapidly in older men than they do in older women.

It is therefore reasonable to speculate that the assumptions about a group over 55 could not be reasonably made with the information in the Report? Isn't it logical that a board certified exercise physiologist using gas analysis is legally in the right position to provide valuable fitness information when predicting performance in spite of field specific limitations that a GXT may not assess? In fact, without such tests, how could anyone know if the age-related decline in Q max is due to decreases in maximum heart rate (HR max) with no significant effect of age on maximal SV.

Can we analogize to sex discrimination and "opinions" that men are more capable as a group; therefore, do not hire women? What about the worker's ability versus sex? Since the VO_2 max of an average male 20 to 29 yrs of age is 38 to 43 $mL \cdot kg^{-1} \cdot min^{-1}$, the minimum VO_2 of 43 $mL \cdot kg^{-1} \cdot min^{-1}$ appears to discriminate against both age and sex. The typical 55 year old police offer is not likely to have the aerobic capacity in "relative units" as the experts have indicated he should have. Similarly, given that the average maximum VO_2 of women is in the range of 28 to 30 $mL \cdot kg^{-1} \cdot min^{-1}$, the gender difference bears directly on aerobic capacity and job related duties.

A 55 yr-old woman police officer with a VO_2 max of 32 $mL \cdot kg^{-1} \cdot min^{-1}$ would have the maximal aerobic capacity that is generally consistent with a moderate intensity category. This means that at 60% of the 32 $mL \cdot kg^{-1} \cdot min^{-1}$ (i.e., 19.2 $mL \cdot kg^{-1} \cdot min^{-1}$) the officer would be expected to engage in activities at an intensity that could last as long as 60 minutes. Given that individuals (men and women) vary widely in their functional capacity, the relative intensity of an activity is likely to differ considerably across the population and may be above the maximal capability of some individuals.

Did the experts in these cases adequately represent the ability to individually test aerobic capacity and the economic feasibility of so doing? In short, the answer is "no." On one hand, they failed to point out the obvious. That is, the decrease in VO_2 max in relative units with age is not just an age-related decline. In fact, it is clear that the decline might be simply a strong reflection of an increase in body weight with no change in absolute values for ventilation of oxygen or utilization at the cell level. Recall that VO_2 max is usually expressed relative to body weight. Since it is more than obvious that body weight tends to increase with age while the aerobic fitness of "active" individuals remains essentially unchanged,

the calculation of VO_2 max in $mL \cdot kg^{-1} \cdot min^{-1}$ concludes that aerobic capacity has decreased.

If the experts are held accountable for their statements in regards to VO_2 max in relative units and job related capabilities, then, they should have provided accountability in the areas of physiological calculations, interpretations, and direct measurements of aerobic power. Also, given the legal concerns along with the job related issues, employees should be evaluated by board certified exercise physiologists using a standard 12-lead ECG recording along with hemodynamic and metabolic assessment during a GXT. A progressive incremental protocol 5 to 12 minutes in duration with an end point of exhaustion should be the gold standard to determine job related fitness (specially, VO_2 max and related cardiovascular responses).

In addition, given the work duties of police officers and wildlife officers, there is sufficient justification (i.e., legal and otherwise, as in forced retirement) to require a battery of test to accurately assess to full range of vital physical functions. Such a test has been put forth for some years by The Cooper Institute. For example, the following fitness battery measures and the range of standards recommended for each test to perform the physically demanding tasks regardless of age or gender:

1. The 1.5 Mile Run (14:40 to 15:54 min) or the 12 Minute Run Test measures aerobic power. The officers must put forth a maximal effort during the entire test.
2. The 300 Meter Run (64.3 to 66.0 sec) test measures sprinting ability
3. The Vertical Jump (15.5 to 16 in) test measures explosive leg strength.
4. The 1 RM Bench Press (151 to 165 lbs or .78 to .84 of body weight for the 1 RM bench press ratio) or the 1 Minute Push Up (25 to 34) measures of upper body muscular strength while the push up test is a measure of upper body muscular endurance.
5. The 1 Minute Sit Up (30 to 38) test measures core body muscular endurance. It is important the officers interlock their fingers and place them behind the head during the sit up test.

What about the experts' claim of the excessive risk in GXTs for older officers in both cases? The prognostic value of peak oxygen uptake has been well documented in patients with ischemic heart disease. Of importance to these cases is a recent study that identified VO_2 peak as the only variable, besides age and comorbidity to be predictive of future dependence (Paterson). Directly measured VO_2 has been shown to be a reproducible marker of exercise tolerance. Therefore, it provides objective information regarding the officers' clinical status and factors that may limit job related duties and performance.

What about submaximal predictive tests versus using gas analysis? First, it is important to point out that aerobic power, aerobic capacity, maximal oxygen

uptake, and VO_2 max are all terms used interchangeably. To measure VO_2 max directly, a subject must be connected to a computer and breathe into an apparatus that analyzes exhaled air while walking and/or running on a treadmill. The equipment is expensive and the test may not be practical for all job-related conditions. In addition, it should be pointed out that since the actual maximum effort is often too painful except for the highly motivated, it is VO_2 peak that is measured.

A bicycle ergometer is less expensive, takes up less space, and is less noisy than a treadmill. The decrease in upper body motion allows for an easier measurement of blood pressure. There is also the advantage of knowing the exact external work performed, thus allowing exercise physiologists to evaluate the officer's VO_2 work rate relationship. The negative is that the peak cardiovascular responses, including VO_2 peak, are usually 10% to 20% lower than when measured on the treadmill. With that in mind, however, the following formula can be used to estimate aerobic capacity: VO_2 ($mL \cdot min^{-1}$) = kpm x 2 + 300, where kpm = kiloponds meters per minute. Therefore, an officer working at 600 kpm would need a VO_2 of 1500 $mL \cdot min^{-1}$ or 1.5 $L \cdot min^{-1}$. If the 175 lb officer reached his peak work capacity at 1200 kpm, his VO_2 max would be 2.7 $L \cdot min^{-1}$ or 34 $ml \cdot kg^{-1} \cdot min^{-1}$.

Knowing the officer's VO_2 max at 1200 kpm allows for determining (i.e., estimating) his exercise cardiac output (Q). For example, using the regression equation [Q ($L \cdot min^{-1}$) = 6.12 x VO_2 ($L \cdot min^{-1}$) + 3.4], the exercise physiologist knows that the officer Q was 19.9 $L \cdot min^{-1}$ with a SV of 105 mL per beat at a maximum heart rate (HR max) of 189 $beats \cdot min^{-1}$. Here again, it is simple enough for the exercise physiologist to calculate the officer's tissue extraction (i.e., the amount of oxygen used by the working skeletal muscles): a-vO_2 diff = VO_2 max ($mL \cdot min^{-1}$) ÷ Q ($L \cdot min^{-1}$), thus 2700 $mL \cdot min^{-1}$ ÷ 19.9 $L \cdot min^{-1}$ = 135.7 $mL \cdot L^{-1}$ or 13.5 mL of O_2 per 100 mL of blood.

What about the use of METs to evaluate the ability of an individual to do certain duties, given that 43 $mL \cdot kg^{-1} \cdot min^{-1}$ = 12.3 METs)? Is it reasonable to expect that men over the age of 55 have the aerobic capacity to function at 12.3 METs? According Wilmore and Costill, men 50 to 59 years of age have a functional capacity in the range of 34 to 41 $mL \cdot kg^{-1} \cdot min^{-1}$ (or 9.7 to 11.7 METs). In other words, men of this age range would not generally be expected to meet the minimum aerobic capacity as defined by the experts. And yet, in support of the experts' opinion, Heyward concluded that a VO_2 in the range of 41.0 to 45.3 $mL \cdot kg^{-1} \cdot min^{-1}$ (or 11.7 to 12.9 METs) would place men 50 to 59 years of age in the "excellent" category. However, this would mean that all officers would have an excellent cardiorespiratory system. This isn't likely to be the case since the majority of 50 year old men have significantly less aerobic capacity in relative units (given their general increase in body mass).

The VO_2 max of average young untrained males with a body weight of 171 lbs (77.7 kg) is about 3.5 $L \cdot min^{-1}$ or 45 $mL \cdot kg^{-1} \cdot min^{-1}$ (i.e., 3500 $mL \cdot min^{-1} \div 77.7$ kg = 45 $mL \cdot kg^{-1} \cdot min^{-1}$). The VO_2 max of the average young untrained female is about 2.0 $L \cdot min^{-1}$ or 38 $mL \cdot kg^{-1} \cdot min^{-1}$. The aerobic capacity of each sex can be improved with training, but it will decrease with age. The problem is that VO_2 max varies widely from one individual to the next. While endurance training and a reduction in body weight may double VO_2 max in some individuals, it may not change much at all in others. Factors such as genetics, training volume and intensity, and fitness status influence the determination of VO_2 max.

There is also the contention that a high VO_2 max value alone does not make a super athlete or worker. Whether it is on competition day or a job-related police initiative, psychological factors are important. If it is a race or chasing a suspect, then pacing and tactics must be taken into consideration. Depending on the exact physical involvement with a suspect, mechanical efficiency and technique play a large role. If police office's lactate tolerance is low, a super VO_2 max may not be all that helpful in apprehending the suspect. As a result, in all likelihood, given the volume of factors that can influence VO_2, it is important that a qualified (meaning, ASEP board certified) exercise physiologist is available to render expert testimony in regards to VO_2 max and factors that it, METs, and GXTs? Board certification is not only helpful in understanding the physiology of the cardiovascular response it should be a legal mandate in cardiovascular assessments that define work related duties.

This is why the ASEP leadership is willing to provide a list of qualified expert witnesses for cases like this. The leadership understands the seriousness of performing as an expert witness. They believe that the most urgent recommendation by the ASEP leadership is that the physiology that undergirds the VO_2 concept and assessment needs significant clarification. As just one example, Pollock pointed out years ago that in previously sedentary men and women, aerobic training at 75% of VO_2 max for 30 minutes 3 times a week for 6 months should produce approximately a 20% increase in VO_2 max.

However, what is important to remember is that there are large individual variations with increases ranging from 4% to 93% reported. Using VO_2 max without taking this point into consideration that there will be "responders" (those who make large gains) and "non-responders" (those who make little or no gains) is entirely inappropriate. In addition, since VO_2 max is not a good predictor of performance in elite athletes, why should it be designated as the sole predictor of work related duties? Clearly, for example, the winner of a marathon race cannot be predicted from VO_2 max.

It is incumbent upon the exercise physiologist to have the scientific expertise to accurately review and interpret aerobic capacity in a variety of circumstances. Inaccurate expert testimony can contribute to a mistaken understanding of the underlying factors and/or a bad court decision. Recall, for example, the expert

who testified that the most "aerobically" demanding task in law enforcement "would commonly be a foot chase of 80-100 feet" (EEOC vs. New Jersey, p. 988). Mistaken expertise on fundamental concepts regarding the difference between aerobic and anaerobic metabolism begs continued consideration of the importance of the ASEP organization and academia's role in the preparation of board certified exercise physiologists. Also, the importance of these cases is, in part, the pivotal role played by the exercise physiology expert in legal proceedings, the outcome of which so many can depend.

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