POSTACTIVATION POTENTIATION IN HUMAN ANKLE MUSCLES: THE EFFECT OF AGE AND CONTRACTION TYPE

POSTACTIVATION POTENTIATION IN HUMAN ANKLE MUSCLES: THE EFFECT OF AGE AND CONTRACTION TYPE

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SKELETAL MUSCLE FORCE AND POSTACTIVATION POTENTIATION

1.1 CHARACTERISTICS OF HUMAN SKELETAL MUSCLE

1.1.1 Make-up of Skeletal Muscle

Skeletal muscle is composed of bundles of muscles fibres, invested with capillaries and surrounded by an endothelial sheath. On the outside the muscle is covered by a fascia of fibrous connective tissue known as the epimysium (Fox, 1996). Connective tissue from this outer sheath extends into the body of the muscle and subdivides the muscle into fascicles. Dissection of a muscle fascicle reveals that it, in turn, is composed of many muscle fibres.

The contractile element of the cell consists of the myofibrils (Åstrand and Rodahl, 1986). The sarcolemma surrounds each muscle fibre which is typically 1 to 150 µm in diameter and made up of a bundle of several hundred protein filaments in parallel (Pollack, 1990). These bundles repeat along the length of the myofibril, conferring the characteristic banded pattern. Each repeat is called a sarcomere and is bordered by a narrow membrane called the Z line, which divides the myofibril into a functional unit (Fox, 1996).

Two bands of rods or filaments are distributed in the myofibrils in parallel order. The thick myosin filaments are composed of six subunits, including two heavy chains, two regulatory light chains, and two alkali light chains (Sweeney et al., 1993). The carboxy-terminal region of a myosin heavy chain dimer forms a coiled a-helical rod that separates near the amino-terminal to form two globular head regions. Each head region contains: a

MgATP binding and hydrolysis site, an actin binding site, and one of each type of light chain (Sweeney et al., 1993).

In the laboratory the myosin molecule can be cleaved into two fragments through exposure of the enzymes, trypsin and papain (Pollack, 1990). These enzymes cleave myosin into a light meromyosin segment and a heavy meromyosin segment. The light meromyosin segment is composed of polypeptide chains in the form of an α-helical rod (Pollack, 1990). Heavy meromyosin, can be subdivided into two sub-fractions, S-1 (globular head region) and S-2 (tail region). The connection region between the head and the tail of the two meromyosin segments may form a flexible hinge that allows the head or cross-bridge to rotate outward from the myosin filament backbone during excitation contraction coupling (Åstrand and Rodhal, 1986).

The thin actin filament is made up of two chains of roughly globular subunits twisted around each other to form a double helix. The diameter of the actin filament is approximately 8 nm, in contrast to myosin, which is around 12 nm (Huxley, 1963). Actin, however, is not the sole component of the thin filament. Tropomyosin is a long, fibrous protein that lies alongside the length of the actin filament. Each rod-shaped tropomyosin molecule is about 40 nm long, and is in direct contact with seven actin monomers (Åstrand and Rodhal, 1986). Another accessory protein is troponin, and it is basically globular in shape and sits astride the tropomyosin molecule close to one of its ends. Troponin and tropomyosin work together to regulate the attachment of cross-bridges to actin, and thus serve as a switch for muscle contraction and relaxation (Fox, 1996).

1.1.2 Fibre Type

Skeletal muscle fibres can be divided on the basis on their contraction speeds (time to reach maximum tension) into slow twitch (type I), and fast twitch (type II) fibres. In human skeletal muscles, there are studies indicating that the time-to-peak tension in a maximal isometric contraction is 80 to 100 ms for type I fibres and about 40 ms for type II fibres (Saltin and Gollnick, 1983). Further division of muscle fibres can be made by sub-dividing the type II fibres into type IIA and type IIB. The type IIA fibres tend to be intermediate fibres that are fast twitch but also have a high oxidative capacity.

Differences in fibre type can be determined by histochemical staining, whereby the muscle sample is exposed to buffers with different pHs that stain for myofibrillar ATPase activity. It has been demonstrated that myosin ATPase activity is greater in type II muscle fibres than in type I fibres (Brooke and Kaiser, 1970). Pre-incubation of muscle sections at pH 10.3 causes the myosin of the type I fibres to lose its ATP activity, thereby losing its demonstrable stain. In contrast type II fibres will stain intensively, thereby appearing dark.

Muscles like the soleus must be able to sustain a contraction for a long period of time without fatigue. The resistance to fatigue demonstrated by these muscles is aided by other characteristics of slow twitch fibres that endow them with a high oxidative capacity for aerobic respiration. Type I fibres have a rich capillary supply, numerous mitochondria and aerobic respiratory enzymes, and a high concentration of myoglobin pigment. Lastly, type I fibres are innervated by a small motorneuron whereas, the motorneuron which stimulates type II fibres is large (Åstrand and Rodhal, 1986).

Type II fibres have a larger diameter, fewer capillaries and mitochondria than slow twitch fibres and not as much myoglobin. Fast twitch fibres are adapted to perform under anaerobic conditions, by a large store of glycogen and a high concentration of glycolytic enzymes. These fibres have shorter contraction times than their slow twitch counterparts (Saltin and Gollnick, 1983). Type IIA fibres have a high oxidative potential and glycolytic power. They are relatively resistant to fatigue, whereas, type IIB fibres have a low aerobic potential (Fox, 1996).

1.1.3 Force Generation (E-C coupling)

Muscle contraction occurs when the two sets of interdigitating myofilaments, the thin actin filaments and the thick myosin filaments, slide past each other (Huxley and Brown, 1967). A widely accepted theory to explain this process is the cross-bridge theory of muscle contraction (Huxley, 1957). This theory suggests that the sliding process is driven by cross-bridges that extend from the myosin filament and cyclically interact with the actin filament as adenosine triphosphate (ATP) is hydrolyzed.

The excitation of the muscle begins when an action potential is initiated and propagated in the axon of a motor nerve. The action potential is the result of synaptic events on the neuron's cell body and dendrites within the central nervous system. Depolarization of the axon terminal at the neuromuscular junction causes voltage-gated calcium channels to open in the presynaptic membrane permitting Ca^{2+} to enter the nerve terminal (McComas, 1977). Ca^{2+} initiates fusion of acetylcholine vesicles with the neural membrane, resulting in release of acetylcholine (Ach) into the synaptic cleft. The binding of Ach with the nicotinic receptors causes the Na^{+}/K^{+} channels in the post-synaptic membrane to open. Inflow of Na^+ , and outflow of K^+ results in local depolarization of the muscle membrane (McComas, 1977). This evokes an action potential propagating along the muscle fibre at a speed of about 5 m/s (Åstrand and Rodhal, 1986).

The action potential is rapidly propagated from the sarcolemma into the depths of the muscle fibre via the transverse tubules. This results in the release of Ca^{2+} ions from the terminal cisternae of the sarcoplasmic reticulum into the fluid surrounding the myofibrils. Within the muscle fibre Ca^{2+} bind to troponin on the actin filament causing tropomyosin to move away from its blocking position covering the cross-bridge binding sites on actin.

In the resting state, myosin globular heads contain bound ADP and inorganic phosphate (Pi) and have a high binding affinity for the actin binding site (Pollack, 1990). When the tropomyosin molecule uncovers the binding site, myosin cross-bridges on the thick filament rapidly bind to actin. This binding triggers the release of ADP-Pi and energy from myosin, producing an angular movement of the cross-bridge forcing the actin and myosin to slide in opposing directions (Pollack, 1990). When the actin filaments are moved or pulled along the myosin filaments the muscle fibre contracts and this is termed the power stroke of contraction. The binding of ATP to myosin breaks the linkage between actin and myosin, thereby allowing the cross bridge to dissociate from the actin filament (Åstrand and Rodhal, 1986).

The deactivation of the cross-bridges occurs when the concentration of calcium ions around the myofibrils decreases as Ca^{2+} is actively transported into the sarcoplasmic reticulum. This removal of Ca^{2+} from troponin restores the blocking action of tropomyosin, the cross-bridge cycle ceases, and the fibre relaxes (Pollack, 1990).

1.2 MEASUREMENT OF MUSCLE STRENGTH

1.2.1 Effect of Contraction Type on Muscle Strength

Isometric contractions occur when tension is developed, but there is no change in muscle length. Concentric and eccentric contractions, on the other hand, occur when the muscle is either shortening or lengthening, respectively. It is well known that the type of contraction influences the capacity of a muscle for force generation during voluntary contractions. Compared to the isometric condition, the force developed by a skeletal muscle is lower during a concentric and higher during an eccentric contraction (Katz, 1939). In addition, in humans, eccentric muscle action is associated with estimates of whole body energy cost that are lower than for concentric activity at a similar intensity (Abbott et al., 1952).

The classic human study is that of Abbott et al (1952), in which the "positive" working cyclist used much less oxygen than the "resisting" cyclist, despite the fact that both generated the same force on opposing bicycles. The differences in the force-velocity relation of eccentric and concentric muscle action increases the discrepancy in efficiency with increasing contraction velocity (Chance et al., 1981). Lower energy cost for eccentric action could be explained by recruitment of more efficient fibres, fewer fibres, or by an alteration in the efficiency of converting high-energy phosphate bonds into measurable work (Kushmerick, 1983).

1.2.2 Voluntary vs. Evoked Strength

In order to investigate skeletal muscle contractility and force generating capacity, voluntary and electrically induced contractions may be employed. In both cases, maximal muscle activation may be achieved, but during sustained contractions voluntary force may decline due to a decline in central drive. Therefore, evoked muscle contractions are often employed because it is easier to quantify the amount of neural input that reaches the muscle. Evoked contractions may take the form of single twitches, or tetanic stimulation.

1.3 EVOKED MUSCLE TWITCH

1.3.1 Definition

A single, adequately strong, electrical stimulus of the motor nerve gives rise to a synchronous contraction of the innervated muscle called the evoked twitch, whereas a train of closely spaced shocks elicits a sustained contraction called a tetanus. The evoked muscle twitch is an important tool in that it can help us to determine much about the muscle that we are testing.

1.3.2 Twitch Characteristics

Depending on the muscle that is being tested the twitch contraction time may range from 43 ms in the orbicularis oculi muscle (McComas and Thomas, 1968) to 150 ms in the calf muscle (gastrocnemius and soleus) (Lambert, 1974). In the facial muscles the fibres are nearly all fast-twitch (84.6% type II) (Johnson et al., 1973) and this is clearly reflected in the short mean contraction time. In contrast, the relatively long contraction times reported for human calf muscles indicate the presence of a predominantly slow-twitch motor unit population (McComas and Thomas, 1968). In general, the time it takes the twitch to reach peak isometric tension in human skeletal muscle is reported to be 40 ms for type II fibres and 80 to 100 ms for type I fibres (Saltin and Gollnick, 1983).

1.3.3 Information Gained from the Evoked Twitch

In a specific muscle, the evoked twitch is often used to ascertain the number of motor units as well as the ratio of slow to fast twitch units. Twitch testing allows us to recruit successive motor units singly, and hence to calculate the mean motor unit action potential amplitude. Supramaximal stimulation of the motor nerve evokes the response of the total population of units and therefore, the whole muscle action potential may be determined. An estimation of the number of motor units within a human muscle can then be determined by dividing the amplitudes of the whole muscle action potential by the mean motor unit action potential (McComas et al., 1971).

It is possible to estimate the proportion of type I, type IIA and type IIB muscle fibres based on the evoked twitch. Type IIA and IIB fibres are similar in that they have a fast twitch, and develop moderate to large tensions but only type IIA fibres are susceptible to fatigue. When the electrophysiological data are correlated with the biochemical characteristics of the muscle it is possible to estimate the fibre type of the previously activated muscles.

During maximal voluntary contractions evoked twitch testing is often used to determine whether the contraction is, in fact, maximal. This method assumes that if there are any motor units that had not been fully activated in the course of a strong contraction, then the same units should give a detectable twitch response after maximal stimulation of the appropriate motor nerve. Belanger and McComas (1981) investigated the effect of an evoked twitch during maximal voluntary contractions. They demonstrated that during voluntary contractions when the subject was exerting a maximal effort, the superimposed stimulus could not activate any additional motor units. When the subject did not produce a maximal effort the interpolated stimulus was able to activate more motor units, which produced an increment in force. Belanger and McComas (1981) interpreted the extra torque production as either the triggering of motor units that had not been recruited or, units that were discharging at a submaximal frequency.

The evoked twitch is also utilized to determine fatigue within a muscle. Twitch testing may be used prior to, during and subsequent to a fatigue protocol to determine whether the fatigue is due to a decrease in central drive, an impairment in neuromuscular transmission, and/or failure of the contractile apparatus itself. By utilizing electromyography (EMG) it is possible to record the electrical response of the muscle (M-wave) to nerve stimulation. The M-wave represents the synchronous sum of all of the muscle fiber action potentials that are elicited by electrical stimulation (Enoka and Stuart, 1992). M-waves are always initiated by action potentials that begin in the motor axons at the level of muscle nerves, therefore, changes in the M-wave indicate alterations in neuromuscular propagation between the site of initiation (nerves) and the site of recording (muscle fibres). The literature reveals that there is some controversy over whether the M-wave changes with fatigue; some have reported that the M-wave does not decrease with sustained contractions (Bigland-Ritchie et al., 1983; Kukulka et al., 1986), while others have shown that M-waves decrease with prolonged activation (Bellmare and Garzaniti, 1988; Milner-Brown, 1986).

The decline in M-waves could be due to a reduction in the excitability of muscle fibre membranes. This could be accomplished by fatigue-induced accumulation of K^+ and depletion of Na^+ from the extracellular spaces. In order to mimic the rapid force decline with high frequency imposed stimulation, Jones and colleagues (1979) electrically stimulated isolated mouse muscle in a bathing medium with reduced Na^+ concentration. The result of this perturbation in ion concentration was a decline in the M-wave.

Bigland-Ritchie et al. (1986) have demonstrated that decreases in MVC force production may occur with no reduction in the M-wave. To examine this condition they utilized intermittent (6 s contraction, 4 s rest) submaximal (30% MVC) isometric contractions of the quadriceps femoris. During the first 30 min of the task, MVC force and electrically elicited force declined in parallel to 50% of the initial value, yet there were no significant changes in muscle lactate, ATP, or phosphocreatine and glycogen depletion was minimal and confined to the type I and IIA fibres. The decline in MVC force could not be explained by an inadequate central drive (decreased M waves), acidosis, or lack of metabolic substrates. However, there was a disproportionate decrease in the electrically elicited twitch compared with the tetanic (50 Hz) response, which Bigland-Ritchie et al. (1986) interpreted as evidence of impaired excitation-contraction coupling. On the basis of this rationale, the decline in MVC force was probably caused by a disruption of the link between activation of the muscle fibre membrane and the force exerted by the fibres.

1.4 PTP vs. PAP

1.4.1 Evoked Twitch Enlargement

As early as 1938, it was discovered that tetanic contractions could alter the contractility of cat tibialis anterior muscle (Brown and von Euler, 1938). By employing supramaximal tetanic stimulation, lasting 2 seconds, Brown and von Euler (1938) observed an increase in twitch tension that lasted as long as 10 minutes. This phenomenon has been termed post tetanic potentiation (PTP). PTP is characterized by an increase in peak twitch tension that occurs following tetanic tension development in the muscle, and which rapidly decays following removal of the potentiating stimulus (Green and Jones, 1989). Post tetanic potentiation has also been associated with a speeding-up of the twitch, whereby the potentiated twitch has a shorter rise time and half relaxation time (Belanger et al., 1983; Brown and Von Euler, 1938; O'Leary et al., 1997).

Increases in potentiated twitch force often occur without a substantial increase in muscle excitability (O'Leary et al. 1997). In fact it has been shown that, when PTP was maximal (48% increase), the M-wave amplitude changed very little (-4%) (O'Leary et al. 1997). This may indicate that the mechanism of twitch torque potentiation involves excitation-contraction coupling and/or myosin-actin interaction, rather than enlargement of muscle action potentials.

The enlargement of the twitch following maximum voluntary contractions (MVC) has been termed post-activation potentiation (PAP). Similar to PTP, PAP is associated with an increase in twitch force (Grange et al., 1993; Sweeney et al., 1993), and a decrease in rise time and half relaxation time of the evoked response. The maximum rate of force development also increases when the muscle is in the potentiated state (Belanger et al.1983; Vandervoort et al. 1983). PAP in skeletal muscle is affected by muscle fibre length (Yang et al., 1992), fatigue levels (Houston and Grange, 1990; Vandenboom and Houston, 1996), temperature (Gossen et al., 1998), muscle fibre type (Bagust et al., 1974), and the duration and intensity of the voluntary contraction (Vandervoort et al., 1983).

1.4.2 PAP and Muscle Fibre Length

Joint position has been observed to be an important factor when PAP or PTP are investigated. As the joint angle changes the length of the muscle that is being tested either increases or decreases. The extent of potentiation of the twitch is dependent on the length of the muscle (Vandervoort et al., 1983; Stuart et al., 1988). Measurements of the force developed by an activated muscle show that the isometric force is maximal when the initial length of the muscle at the time of activation is approximately 20 % longer than the equilibrium length (Åstrand and Rodhal, 1986). When stretched beyond this relative length, the active force produced by the stimulated muscle becomes progressively smaller and is zero when the muscle is elongated about twice its resting length. If the muscle is stretched excessively the myosin cross-bridges are unable to engage the actin filaments and tension cannot be developed. In contrast, too much shortening allows actin filaments to overlap each other and the myosin filaments to touch the Z lines, which hinders the muscle's ability to generate tension.

Marsh et al. (1981) determined that the evoked twitch was largest when the muscle is in a lengthened position. Specifically they demonstrated that the optimal position for the tibialis anterior, in humans, was in 10 degrees of plantarflexion. Although the stretched position may be optimal to elicit a single twitch, some disparity exists in the literature as to what is the optimal muscle length for potentiation of the evoked twitch.

It has been demonstrated by Vandervoort et al. (1983) that potentiation of the evoked twitch is largest when the muscle is in the shortened position. Vandervoort and colleagues (1983) propose that the greater capacity of the muscle for potentiation in the shortened position is related to incomplete activation of the contractile elements. This, in turn, is thought to be responsible for the reduced tension developed by muscle fibres at suboptimal lengths. In contrast, Bigland-Ritchie and colleagues (1992) have examined the effect of muscle length on twitch amplitude and found that increased potentiation occurred when the muscle was in a slightly stretched position . A 5 s MVC in the human tibialis anterior muscle, with the ankle positioned at 90° or 75° (tibialis anterior in a slightly shortened position), altered the contractile properties of the evoked twitch. When the ankle was in the 90° position the twitch potentiated 122 ± 55% compared to 70 ± 46% at 75° when the tibialis anterior was in a shortened position. However, the differences between the mean values were not significant.

1.4.3 PAP and Fatigue

Muscle fatigue involves both psychological and physiological factors, and has been defined by Enoka and Stuart (1985) as a general concept intended to denote an acute impairment of performance that includes both an increase in the perceived effort necessary to exert a desired force and an eventual inability to produce this force.

Peak twitch tension and the maximum rate of force development of a twitch have been shown to decrease following fatigue protocols in both animal and human skeletal muscle (Behm and St. Pierre, 1997; Fitts and Holloszy, 1977; Vandenboom and Houston, 1996). Alway et al. (1987) observed a 63.2% decline in twitch torque after voluntary ischemic exercise. A decrease in twitch tension has generally been interpreted as reflecting a decrease in the force-generating capacity of a muscle as a result of either, depletion of phosphocreatine, ATP, extracellular Na^+ , and/or accumulation of muscle lactate and extracellular K^+ (Enoka and Stuart, 1985). A fatigue-induced reduction in the rate of force development provides evidence for a decrease in the rate of activation of actin-myosin interactions.

Peak twitch torque has been shown to decrease during fatigue; however, simultaneous potentiation of the twitch may be one way that twitch torque is better maintained. Garner et al. (1989), investigated twitch potentiation during, and subsequent to muscle fatigue in the tibialis anterior muscle of humans. Fatigue was induced by tetanic (3 s at 30 Hz followed by 5 s rest, for 3 min) stimulation, interspersed with evoked twitches, in the presence or absence of ischemia. Substantial potentiation (99 ± 50 %) of the twitch during the early part of the fatigue protocol was observed. Despite this early potentiation, 3 minutes of tetanic stimulation resulted in the elimination of the twitch and the tetanic response. At the point when the twitch was non-existent, the M-wave had decreased to approximately half of its initial amplitude. During the recovery period, the twitch underwent a second phase of potentiation; by approximately 8 minutes into the recovery period the twitch was potentiated 25 ± 30% above its control value.

A similar increase in twitch torque, during the recovery period, was observed by Grange and Houston (1991) following a 60s maximal voluntary contraction. Muscle biopsy material revealed that phosphate content of the fast and slow myosin light chains, immediately after and 4 min after the MVC was also significantly elevated (Grange and Houston, 1991). It has been suggested that the extent of myosin light chain phosphorylation is temporally related to potentiation of the isometric twitch (Klug et al., 1982). Therefore, twitch torque enhancement and depression appeared to occur concurrently in the fatigued muscle. Myosin light chain phosphorylation could represent a potentiation mechanism activated during sustained efforts to oppose fatigue.

1.4.4 PAP and Temperature

Potentiation of twitch force, as it relates to temperature dependency, has been investigated in the mouse extensor digitorum longus. At lower muscle temperatures (30 °C), potentiation is significantly decreased in comparison to higher temperatures (35+ °C). Just a 5 °C decrease in muscle temperature (from 35 °C to 30 °C) served to increase resting isometric twitch force (cold potentiation), decrease relative force potentiation, and increase potentiation duration, all during maximal muscle activation in fast twitch muscle fibres (Moore et al., 1990). Moore et al. (1990) observed that while twitch potentiation varied directly with muscle incubation temperature, the extent of phosphate incorporation into myosin light chains was inversely proportional to incubation temperature. Therefore, as the incubation temperature increased, greater twitch potentiation was observed. The results of Moore et al. (1990) provide further evidence to support the hypothesis that contraction-induced tension potentiation in intact mammalian skeletal muscle is the result of a sensitization of the contractile element to activation by Ca^{2+}.

1.4.5 PAP and Muscle Fibre Type

The degree of PTP or PAP is affected by the fibre type characteristics of the muscle being studied. Grange and colleagues (1995) investigated the effect of a preceding conditioning stimulus on the evoked twitch of mouse soleus. Potentiation of isometric twitch tension occurred only in fast twitch mouse muscles (Grange et al. 1995). This is in contrast to human studies in which twitch potentiation has been shown to occur in a variety of muscles of varying fibre type distribution (Behm and St. Pierre 1997; Belanger et al. 1983; Moussavi et al. 1989; Vandervoort et al. 1983).

By examining post-tetanic potentiation in cats, Bagust and colleagues (1974) determined that the fast motor unit was markedly potentiated, whereas the slow motor unit was unchanged by the tetanic contraction. In the fastest motor units, PTP was also associated with an increase in the maximal rate of tension development of the evoked twitch. Similarly, Brown and von Euler (1938) observed a depression of the twitch response of cat soleus muscle by a short tetanus and an enhancement of the twitch in the tibialis. The tibialis muscle is known to contain proportionally more type II fibres than the soleus muscle, which would explain the increased potentiation.

In human skeletal muscle, however, it has been established that potentiation of the twitch occurs in both type I and type II muscle fibres, although the extent of PAP may depend on the fibre type distribution. Vandervoort and colleagues (1983) demonstrated significant differences in potentiating capacity between the DF and PF muscles. The DF muscle group is composed largely of the tibialis anterior which is 73% type I and 27% type II (Johnson et al., 1973). A larger proportion of fast-twitch motor units in the tibialis anterior (27%) compared to the soleus (13%) contributed to significantly greater PAP in the DF than in the PF muscles.

1.4.6 <u>PAP and MVC Duration and Intensity</u>

PAP has been demonstrated following very brief maximum voluntary contractions lasting only 1 s (Vandervoort et al., 1983), as well as after longer (60 s) contractions (Grange and Houston, 1991). In both of the cited studies, significant potentiation was demonstrated but the time course of PAP differed significantly. A 1 s MVC resulted in immediate (within 2 s) potentiation (143 ± 36% of the resting twitch), whereas PAP following a 60 s MVC was not evident until after 4 minutes of recovery (125%).

When the duration of the voluntary contraction is greater than 15 s, it has been proposed that the full extent of potentiation is obscured by muscle fatigue (Vandervoort et al., 1983). Garner et al. (1989) have demonstrated that while potentiation and muscle fatigue may occur concurrently in the human dorsiflexors, after 30 s of intermittent tetanic stimulation the twitch amplitude decreased. In this experiment, the tibialis anterior was in an ischemic conditon and therefore the decrease in twitch torque may have been due to the accumulation of metabolites which induced fatigue.

Similar results have been observed when long and short duration tetanic stimulation is employed. Vandenboom and Houston (1996) observed a 54.01% decrease in the evoked twitch immediately following 120 s of continuous stimulation at 150 Hz in skinned mouse extensor digitorum longus. However, an evoked twitch measured 15 s into the tetanus, indicated that the peak twitch was potentiated by 18% despite a 22% reduction in peak tetanic force output (Vandenboom and Houston, 1996). Recovery of force and twitch contractile properties following tetanic stimulation was not measured in this study but we might expect PTP to follow a similar pattern as that observed by Grange and Houston (1991), with an initial twitch force decline followed by significant twitch potentiation. O'Leary et al. (1997) observed a 48% increase in the evoked twitch immediately after a 7 s tetanus in the human dorsiflexor muscles of young men and women. The potentiated twitch remained elevated for an average of 10 minutes after the tetanus.

PTP and PAP are highly dependent on the intensity of the preceding tetanus or MVC. Vandervoort et al. (1983) demonstrated that voluntary contractions less than 75% of MVC produced little or no potentiation. As the intensity of the contraction increased, the extent of potentiation also increased. It appears that for full potentiation to be achieved, the preceding contraction must be large enough to activate the highest threshold motor units.

1.5 POSSIBLE MECHANISMS FOR PAP/PTP

When examining the possible mechanisms for PAP/PTP, two main theories have been proposed.

1.5.1 Ca $^{2+}$ Mechanism

Some researchers have attributed PTP to elevated levels of cytosolic calcium resulting from the conditioning stimulus. This would explain the increased activation and consequent increase in twitch torque following a tetanic contraction (Duchateau and Hainaut, 1986; MacIntosh and Gardiner, 1986).

When a motor nerve is stimulated repetitively at subfusion frequencies, there is a classic contractile response that is characterized by a positive inotropy (straircase) followed by a negative inotropy (fatigue) (MacIntosh and Kupsh, 1987). Desmedt and Hainaut (1968) demonstrated that twitch contraction staircase, in human skeletal muscle, was accompanied by an increase in the peak rate of force development and twitch tension without an increase in contraction time. They observed a mean maximum staircase potentiation increase of 24.5%, as well as a 37% increase in the rate of force development, and a 13% reduction in the half relaxation time. These authors interpreted their findings as evidence that such potentiation of the contractile response was effected by an increased intensity of activation. Desmedt and Hainaut (1968) proposed that the intensification of the twitch active state was due to a lowering of the Hodgkin and Horowicz's mechanical threshold, whereby an unchanged muscle action potential elicits a larger calcium release from the sarcoplasmic reticulum and an acceleration of the uptake of myoplasmic calcium which shortens the relaxation of the potentiated twitch.

The staircase response has been investigated in muscles that are atrophied due to disuse. In these muscles it has been shown that the staircase response is virtually absent (Rassier et al., 1999). To investigate disuse atrophy in skeletal muscles of Sprauge-

Dawley rats these authors applied tetrodotoxin to the left sciatic nerve and then analyzed the gastrocnemius muscle after isometric contractions (Rassier et al., 1999). An untreated group and sham-operated group served as controls. Following dantrolene treatment, which has been shown to inhibit Ca^{2+} release in skeletal muscle, and 10 s of 10 Hz stimulation, increased twitch force was observed in all three groups. In light of this, the staircase response may not be a result of increased Ca^{2+} release from the sarcoplasmic reticulum. Instead, it may be proposed that increases in twitch force following evoked or voluntary stimuli may be the result of increased calcium release from extracellular sources.

Increased levels of cytosolic calcium may occur as a result of increased calcium release from the terminal cisternae in response to supramaximal stimulation, or as a result of an inability to return the calcium in cytosol to the pre-contraction concentration (Duchateau and Hainaut, 1986; MacIntosh and Kupsh, 1987). In the latter explanation, calcium released by the sarcoplasmic reticulum per pulse is fixed but is superimposed on a higher cytosolic calcium concentration. Increased cytosolic calcium could result in more complete activation of the force-generating components of muscle. This, in turn, would lead to increased peak twitch tension subsequent to a preceding stimulus. Caffeine potentiation is an example of increased intensity of activation due to the enhancement of calcium release from the terminal cisternae (MacIntosh and Gardiner, 1986).

It is generally accepted that caffeine enhances skeletal muscle twitch response by augmenting calcium release from the sarcoplasmic reticulum (Kovacs and Szucs, 1983). Kovacs and Szucs (1983) reported that calcium transients in response to depolarizing pulses were of a greater amplitude in the presence of caffeine at 0.5 mM. MacIntosh and

Gardiner (1986), while investigating caffeine interactions with PTP, observed an increase in contraction time, and credited it to either increased time required to handle the extra calcium or prolongation of the duration of calcium release from the terminal cisternae. Caffeine potentiation is associated with an increase in twitch tension but also an increase in contraction time, which is not typical of post-tetanic potentiation.

An elevated residual cytosolic Ca^{2+} concentration is similarly inadequate to explain low-frequency potentiation. Decreased aequorin luminescence after a tetanus has been observed in frog skeletal muscle fibres (Blinks et al., 1978). This suggests that the amplitude of the calcium transient is depressed when the isometric twitch is potentiated. An augmented twitch torque which occurs together with a reduced Ca^{2+} transient could result because myosin light chain phosphorlyation makes activation of the contractile elements more sensitive to calcium (Palmer and Moore, 1989).

1.5.2 Myosin Light Chain Phosphorylation

There is convincing evidence in the literature suggesting that the mechanism underlying PAP or PTP is phosphorylation of regulatory myosin light chains (Sweeny and Stull, 1986; Palmer and Moore, 1989; Sweeney et al., 1993; Vandenboom et al., 1993). Myosin light chain phosphorylation in smooth muscle is the principal mechanism that initiates contraction, but in skeletal muscle a definitive role for muscle myosin light chain phosphorylation has not been established.

Myosin light chain phosphorylation is regulated by a series of biochemical stages. At the beginning of a muscular contraction interstitial Ca^{2+} concentrations increase, due to Ca^{2+} release from the sarcoplasmic reticulum, which results in Ca^{2+} binding to calmodulin.

Ca^{2+} /calmodulin then binds to myosin light chain kinase, and the enzyme is converted from an inactive to an active form (Stull et al., 1985). The activated kinase phosphorylates a specific serine residue in the amino-terminal portion of the myosin regulatory light chain, leading to an increase in the rate by which myosin cross-bridges move into the force producing state (Sweeney et al., 1993).

The rate and extent of phosphate incorporation into the skeletal myosin light chain is dependent upon the relative activities of myosin light chain kinase and myosin light chain phosphatase (Sweeney and Stull, 1990). During a muscle contraction there is a rapid incorporation of phosphate by the myosin light chain (Blumenthal and Stull, 1980; Klug et al., 1982; Stull et al., 1990). When the muscle relaxes, the intracellular calcium concentration declines, the activity of the myosin light chain kinase diminishes, and the phosphorylated myosin light chains are gradually dephosphorylated by the activity of myosin light chain phosphatase (Moore and Stull, 1984; Moore et al., 1990).

Brenner's model (1988) suggests that myosin light chains regulate force output through Ca^{2+} controlled alterations in transition times of cycling cross-bridges from a non-force generating to a force generating state. Consistent with this model, Sweeney and colleagues (1993) have demonstrated that phosphorylation of myosin light chains does not affect crossbridge stiffness, or the force production per crossbridge. Sweeney and Stull (1986) also established that the effect of myosin light chain phosphorylation was most pronounced at low levels of Ca^{2+} activation. Their findings provide evidence that force potentiation at low concentrations of Ca^{2+} is not due to recruitment of more cross-bridges into cycling but rather to an increase in the transition from the non-force generating to the force-generating state.

Through electron microscopy, myosin light chain phosphorylation has been observed to alter the structure of thick filaments in rabbit muscle through increased filament disorder (Levine et al. 1996). By using polarization microfluorimetry, Craig et al. (1987) have observed that nonphosphorylated myosin heads display an ordered helical arrangement in thick filaments from tarantula muscle. Upon phosphorylation this arrangement is lost, and the heads appeared to be clumped or to project farther from the filament backbone. The cross-bridge disorder leads to increased mobility which means that each head spends more time proximal to the myosin binding sites on the thin actin filament. This conformational change was investigated by Yang and colleagues (1992). They hypothesized that, if moving the myosin head closer to the thin filament is a mechanism by which myosin light chain phosphorylation potentiates force, then changing the distance between the thin and thick filaments should alter the effect of potentiation. Decreasing the distance between the thin and thick filaments in rabbit psoas muscle, either by increasing sarcomere length or by osmotic compression, resulted in a decreased effect of myosin light chain phosphorylation. Thus, phosphorylation may increase myosin head mobility, thereby increasing accessibility to actin, and therefore, result in increased calcium sensitivity of tension development.

1.6 PHYSIOLOGICAL SIGNIFICANCE

It has been proposed by Green and Jones (1989) that PTP can overcome low frequency fatigue (LFF) during the post-contraction period in order to restore torque to pre-exercise levels. LFF causes a decrease in force production due to a reduction in the amount of Ca^{2+} released by the sarcoplasmic reticulum, thereby decreasing the activation of the myofibrillar complex (Green and Jones, 1989). To investigate the effect of post-tetanic contractions on LFF, human subjects performed a fatigue protocol which was immediately followed by 10 s of tetanic stimulation. During the recovery period, the tetanic contraction was repeated at 60, 120 and 240 minutes. Evoked twitch characteristics were determined prior to the fatigue protocol and subsequent to every tetanic contraction. Following the fatigue protocol twitch torque was significantly depressed from the baseline value, therefore tetanic stimulation failed to elicit changes in torque behaviour immediately following the fatiguing exercise. However, at 60, 120 and 240 minutes, an evoked twitch induced significant elevations in torque output. Indeed, the potentiated twitch torque re-established or surpassed the pre-fatigue torque output levels and had the characteristic quicker contraction time associated with PTP.

As fatigue proceeds in humans during both MVCs and imposed contractions there is a progressive decline in the rate of relaxation; a decrease in motor neuron discharge rate and a subsequent reduction in the frequency of activation necessary to elicit the maximum force (Marsden et al., 1983). This phenomenon has been termed “muscle wisdom”, and it is functionally significant because it optimizes the force output and ensures an economical activation of fatiguing muscle by the central nervous system. It has been proposed that PAP may be one way that muscle wisdom is achieved (Binder-Macleod, 1995).

1.7 AGED MUSCLE

1.7.1 Muscle Strength

It has been well established that decreases in voluntary strength start to become apparent after the age of 60 years (Vandervoort, 1995). It has been illustrated by Faulkner et al. (1990), that the maximum isometric strength from age 30 to above 80 is reduced, on the average, by 30-40% with the loss of strength in leg muscles is (40%) being slightly greater than that in the arm muscles (30%) . Reed et al. (1991) have found a significant age-related decrease in muscle strength per unit of lean body mass which could be correlated highly (r=0.79) with cumulative muscle strength in older adults.

Reductions in strength due to age have been measured by investigating maximal voluntary contractions in many different muscle groups. In the knee extensors and flexors, Vandervoort and colleagues (1990) detected a significantly lower peak and average torque in the elderly (66-89 yr.) compared to the young (20-29 yr.)subjects (25 to 54% lower). In order to determine whether the decrease in muscle strength was due to failure of descending drive from the motor cortex or muscle atrophy, the twitch interpolation technique has been utilized during MVCs (Vandervoort and McComas, 1986). Previous results have indicated that healthy elderly people have the ability to maximally activate their ankle muscles (Vandervoort and McComas, 1986).

In both isometric and concentric contractions force produced per unit cross-sectional area was found to decrease with age when young and adult mouse soleus muscle were compared (Brooks and Faulkner, 1988). In contrast, Phillips and colleagues (1991) observed that force exerted during a rapid lengthening contraction was similar in both young and aged mice. Similarly, in human skeletal muscle the force produced during eccentric muscles actions appeared to be less affected by age than during concentric muscle actions (Vandervoort et al., 1990). In elderly women, Vandervoort and colleagues (1990) determined that knee flexor peak torque, at 90°/s, was 64 Nm in the eccentric condition compared to 36 Nm in the concentric condition. The relative strength of the elderly women in the eccentric condition was 75% of that of the young women compared to 55% in the concentric condition. More recently, Poter et al. (1997) have observed the relative preservation of eccentric strength of the plantar and dorsiflexors in elderly compared to young women. The older women had eccentric peak torques that were 97 and 100% relative to the young women, for the plantar and dorsiflexors respectively.

The apparent maintenance of eccentric force production in elderly and young muscle may be due to parallel elasticity from connective tissue, an increased number of attached cross-bridges, and/or greater force per cross-bridge. Brooks and Faulkner (1994) have demonstrated that during lengthening contractions, fibres from old mice developed forces approximately 30% higher than those of adult mice. These authors conclude that the impairments in force of whole muscles with aging are not the result of impairments in intrinsic force-generating capacity of cross-bridges. Lombardi and Piazzesi

(1990) investigated lengthening in frog muscles and have theorized that the increased force per cross-bridge is due to more of the cross-bridges moving into a high force state.

1.7.2 Muscle Atrophy

One explanation for the reduction in muscle strength may be related to age-associated muscle atrophy. With age an associated decline in excitable muscle mass is commonly observed (Vandervoort and McComas, 1986).

Reductions in muscle mass are evident when either radiological imaging techniques or computed tomography scanning is employed (Young et al., 1985; Rice et al., 1990). Ultrasound scanning showed a 25% and 33% decrease in the total leg extensor muscle cross-sectional area when comparing young (21-28) and old (70-79) men and women (Young et al. 1985). The decline in muscle mass is also associated with an increase in non-muscle tissue such as fat and connective tissue (Rice et al., 1990). An increased concentration of connective tissue from adult to old animals has been estimated in the range of 20-40% (Alnaqueeb et al., 1984). Concomitantly, collagen content of muscle fibres is elevated as a result of age, with an increase of 40 % in fast fibres and 30 % in slow fibres (Mohan and Radha, 1980). In the plantarflexor muscles, Rice et al. (1989) reported a 35% reduction in cross-sectional area and a 81% increase in non-muscle tissue in elderly (65-90 yrs) compared to young men (25-38 yrs).

In order to make a direct measurement of muscle mass, Lexell et al. (1988) studied cross-sections of autopsied whole vastus lateralis muscle from 43 previously healthy men between 15 and 83 years of age. These authors have reported a 40% decrease in muscle cross-sectional area, which began as early as 25 years of age. Therefore, one factor which results in decreased muscle strength is a decline in muscle mass and cross-sectional area.

1.7.3 Changes in Muscle Morphology

Another explanation for the reduction in muscle strength in aged muscle may be related to the progressive atrophy of type II fibres which accompanies aging (Doherty and Brown, 1997). It has been shown that with age the fibre-type distribution is not substantially altered; however, due to an increase in type I fibre area and selective atrophy of type II fibres, an increase in slow myosin isoforms in aged muscle is often observed (Klitgaard et al., 1990). Fibre atrophy is most evident for type II glycolytic fibres (Aniansson et al., 1986, Clarkson et al., 1981).

During ageing, the contraction time of the isometric twitch has been observed to increase in various mammals (Gutmann et al., 1971; Belanger et al., 1983). It has been speculated that this reduction in the speed of contraction in old age, which is seen before muscle wasting occurs, may be due to an age-related loss of fast-twitch fibres (Campbell et al., 1973).

1.7.4 PAP and Age

PAP has been observed to decrease with age (Hicks et al., 1991; Petrella et al., 1989). Petrella et al. (1989) investigated PAP in the human gastrocnemius of young and elderly men, and discovered that twitch potentiation in young adults was greater than in elderly subjects. Greater PAP in young subjects was associated with an increase in the rate of tension development, rather than a prolongation of the time to peak twitch. The age-related slowing of contraction times together with the reduced capacity for twitch potentiation, may possibly reflect a greater type II atrophy compared to type I fibres.

Hicks and colleagues (1991) also observed significantly less potentiation in the tibialis anterior muscle in elderly compared to young adults (166% vs. 241% respectively). They speculated that changes in fibre type composition with age may be the reason behind the differences in potentiation capacity, as it is well known that post-tetanic potentiation of the twitch is larger in fast-twitch muscles (Brown and von Euler, 1938). A second hypothesis was that there was an age-associated change in the phosphorylating capacity of the myosin light chains in fast twitch muscle. As the ability to phosphorylate the fast-twitch myosin light chains decreased, so too would the amount of potentiation.

Prolonged contraction and half relaxation times in the elderly may be due to reduced efficiency of the sarcoplasmic reticulum. The duration of the active state is dependent on the concentration of calcium around the contractile filaments (McComas, 1996). Evidence of damage to the sarcoplasmic reticulum with advanced age has been provided both in human vastus lateralis muscles (Klitgaard et al., 1989) and in rat muscle (Larsson and Salviati, 1989). In these muscles, a type II fibre-specific decrease in sarcoplasmic reticulum volume, rate of calcium uptake, and calcium pump activity has been reported. Decreased efficiency of the sarcoplasmic reticulum thus results in an increased contraction time and half relaxation time of the twitch. An increase in these two variables (CT increased 12.7%, ½ RT increased 20.3%) has been observed in elderly compared to young human thenar motor units by Doherty and Brown (1997). Hunter and colleagues (1999) have observed that elderly women (64-79 yr) had significantly slower relaxation rates partially as a result of decreased sarcoplasmic reticulum Ca^{2+} uptake and Ca^{2+} -ATPase activity compared to young women.

1.8 CONTRACTION TYPE AND PAP

1.8.1 PAP and Dynamic Contractions

Until recently, the majority of postactivation potentiation studies have characterized PAP under isometric conditions. This is interesting in light of the fact that the type of preceding activation has been shown to alter the torque production of a muscle (Svantesson et al., 1994). These authors evaluated the differences in concentric force output of the human gastrocnemius muscle when preceded by an eccentric or isometric muscle action. Static isometric or dynamic eccentric maximal contractions at either 120° or 240°/s (within the ROM of 78-125°) were immediately followed by a maximal concentric action. Velocity, angle, torque and EMG production during the concentric muscle action was measured. They demonstrated that the concentric muscle action was significantly larger following an eccentric action than with an isometric preceding action, regardless of velocity. Svantesson et al. (1994) did not examine twitch characteristics but it might be speculated that differences in the degree of twitch potentiation existed following the eccentric and isometric contractions.

Evidence in support of increased twitch tension following eccentric contractions may come from data that suggest a larger proportion of high threshold, fast-twitch motor units are preferentially recruited during lengthening contractions (Nardone et al. 1989). Based on animal studies, fast twitch muscle fibres are known to demonstrate a greater degree of twitch potentiation than slow twitch fibres (Manning and Stull, 1982). If a higher proportion of fast twitch muscle fibres are activated during an eccentric contraction then the resulting twitch tension may also be augmented.

1.9 SUMMARY

The phenomenon of postactivation potentiation has been investigated under a variety of conditions. Specifically, twitch potentiation following isometric maximum voluntary contractions has been studied in considerable detail (Vandervoort et al., 1983; Grange and Houston, 1991; Hicks et al., 1991). Stuart et al. (1988) have investigated the effect of concentric contractions on PAP in human knee extensors. However, the effect of a preceding eccentric contraction on the evoked twitch is one area that has not been explored. In light of this, and the research that suggests that lengthening contractions in the elderly are better preserved than either isometric or concentric contraction (Phillips et al. 1991), the objectives of this thesis were to examine differences in PAP:

1) after eccentric, concentric, and isometric contractions
2) between young and old adults.

Collection of PAP data from twenty young subjects (10 male, 10 female) was completed and analyzed in a pilot study before the elderly subjects were recruited, but the data will be presented collectively in order that age comparisons in PAP can be made.

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CHAPTER II

POSTACTIVATION POTENTIATION IN HUMAN ANKLE MUSCLES: THE EFFECT OF AGE AND CONTRACTION TYPE

2.1 ABSTRACT

The effect of contraction type on postactivation potentiation (PAP) in the dorsiflexor (DF) and plantarflexor (PF) muscles was determined following maximal voluntary contractions (MVC) in 20 young (24.3 ± 2.8 yr.) and 20 elderly (70.5 ± 5.7 yr.) subjects. On each day (3 testing days total), subjects performed one maximal dorsiflexion and one maximal plantarflexion contraction, in either an isometric (ISO), concentric (CON) or eccentric (ECC) mode. Maximal twitches were evoked prior to the MVCs, immediately following the MVCs and at 30 s intervals thereafter, for a total of 5 minutes. ECC MVCs produced the largest peak torque followed by ISO and CON MVCs in both age and muscle groups; however, significant age-associated decrements in MVC torque were only evident in ISO and CON MVCs. A significant increase in twitch torque was demonstrated following all three contraction types in both age and muscle groups. In the DF muscles contraction type differences were observed in potentiated twitch torque (ECC: 196% > CON: 174% > ISO:160%; $p<0.05$), in the young subjects only. There were no differences in PAP in the PF muscles between contraction types in either age group. In the DF muscle group the maximum rate of torque development (MRTD), in the potentiated twitch was greatest following ECC MVCs compared to CON and ISO MVCs in young subjects ($p<0.05$). MRTD in the potentiated twitch was greatest subsequent to ECC and CON MVCs compared to ISO MVCs, in both age groups for the PF muscle group. The potentiated twitch was associated with a significantly shorter rise time (TPT) and half-relaxation time (½ RT) in both age and muscle groups. These results suggest that the extent of PAP may be affected by contraction type in a number of twitch contractile characteristics.

2.2 INTRODUCTION

The ability of human skeletal muscle to increase twitch tension following either voluntary contractions or tetanic stimulation has been well documented in the literature (Behm and St. Pierre, 1997; O'Leary et al., 1997; Vandervoort and McComas, 1983; Vandervoort et al., 1983) in several different muscles (Belanger et al., 1981; Stuart et al., 1988). This enlargement of the twitch following maximum voluntary contractions has been termed postactivation potentiation (PAP). While research using animal models suggests that potentiation of isometric twitch tension occurs only in fast twitch muscles (Sweeney et al., 1993), human studies have demonstrated twitch potentiation in a variety of muscles of varying fibre type distributions (Behm and St. Pierre, 1997; Belanger et al., 1983; Vandervoort et al., 1983).

The mechanism that most likely accounts for PAP appears to be the phosphorylation of fast myosin light chains (Houston et al., 1985; Sweeney and Stull, 1986; Palmer and Moore, 1989). A number of researchers have determined that myosin light chain phosphorylation is correlated with increases in force generating capacity and the rate of force development. Phosphorylation of myosin light chains is thought to render the contractile element more sensitive to activation by Ca^{2+} (Palmer and Moore, 1989; Stuart et al., 1988; Vandenboom and Houston, 1996). Myosin light chain phosphorylation exerts its effect on skeletal muscle by increasing the rate that cross-bridges enter force-producing states from non-force-producing states (Sweeney and Stull, 1990). This conversion allows for an increased rate of cross-bridge attachment, therefore, phosphorylation results in a higher proportion of active cross-bridge attachment at any given time during the twitch.

Myosin light chain phosphorylation is a necessary step in the activation of contractile force in smooth muscle (Dillion et al., 1981); however, no unified functional significance can be attributed to this modification in skeletal muscle myosin. One functional implication may be that phosphorylation decreases the energy cost for isometric force maintenance during prolonged or submaximal contractions (Crow and Kushmerick, 1981). Myosin light chain phosphorylation may enhance performance and efficiency by allowing the frequency at which motor units fire to decrease from an initially high level, in order to maintain a given level of force (Sweeney et al., 1993). Because phosphorylation allows a specific level of force to be maintained at a lower Ca^{+2} concentration, less energy will be spent pumping Ca^{+2} out of the myoplasm during the contraction cycle.

PAP is affected by a number of variables including duration and intensity of the MVC and muscle fibre type (Vandervoort et al., 1983; Moussavi et al., 1989; Belanger et al., 1981). The twitch potentiation process has been studied in considerable detail following isometric maximal contractions (Grange and Houston, 1991; Hicks et al., 1991; Petrella et al., 1989; Vandervoort et al., 1983). In contrast, the effect of dynamic contractions on PAP has not been adequately explored to date.

Twitch potentiation has been shown to be decreased in elderly muscle (Hicks et al., 1991; Petrella et al., 1989). One explanation for this reduction in twitch potentiation may be related to age associated muscle atrophy (Lexell et al., 1983). Tubman and colleagues have determined that myosin light chain phosphorylation is virtually absent in atrophied skeletal muscle (Tubman et al., 1996a; Tubman et al., 1996b). In these experiments they observed an absence of twitch potentiation in the rat gastrocnemius muscle, which was accompanied by little or no myosin regulatory light chain phosphorylation.

Studies using quantitative electromyography have reported a reduction in the number of functioning motor units in aging human muscles (Campbell et al., 1973) with an increase in the size of the remaining low-threshold motor units (Doherty and Brown, 1997). Therefore, the reduction in PAP in aged muscle may be related to the progressive decrease in type II fibre area which accompanies aging (Doherty and Brown, 1997), since myosin light chain phosphorylation has been shown to be more a characteristic of type II vs. type I muscle fibres (Sweeney et al., 1993). The number of functioning motor units has also been shown to decline with age (Campbell et al, 1973). However, the elderly retain the ability to fully recruit their motor unit populations and excite motorneurons at optimal frequencies for force development (Vandervoort and McComas, 1986).

The functional importance of a decrease in twitch potentiation in the elderly may become apparent in situations where sudden brief efforts are required (jumping, regaining balance etc.). In the elderly, falls may result when the ability to generate muscular force quickly is diminished. Therefore, it is especially important to quantify twitch potentiation in this population.

Contraction type differences in postactivation potentiation (PAP) need to be investigated. Decreased twitch potentiation may occur because subjects have more difficulty activating their muscles during eccentric contractions (Westing et al., 1990).

Conversely, it has been proposed that biased activation of type II fibres results during lengthening contractions (Nardone et al., 1989), which would tend to increase potentiation. Based on the results of a earlier study, we have hypothesized that PAP will be greatest following eccentric contractions compared with either isometric or concentric contractions. In addition, eccentric strength in the elderly is better preserved than concentric or isometric strength (Vandervoort et al., 1990; Porter et al., 1997). Therefore, we expected the age differences in PAP to be smaller in the eccentric condition.

Thus the purpose of this study was to compare PAP induced by three different contraction types (isometric, concentric and eccentric) in two muscles that cross the ankle joint (dorsiflexors and plantarflexors) in young and elderly subjects.

2.3 METHODS

2.3.1 Subjects

Twenty young (10 men and 10 women) subjects (24.3 ± 2.8 yr) and twenty elderly (10 men and 10 women) subjects (70.5 ± 5.7 yr) volunteered for this study (Table 1). The elderly subjects were recruited from a seniors exercise program and had been training for 2.2 ± 2.1 years. The young subjects were primarily graduate students and were all physically active. The study carried the approval of the University Ethics Committee at McMaster University, and each subject gave their written informed consent to participate (Appendix A).

2.3.2 Apparatus

The subjects sat on a specialized Biodex chair (Model 830-110, Shirley, New York) with their left leg extended (Feiring et al., 1990). Their foot was secured to a foot plate by two Velcro straps, and one strap was placed over the knee to minimize quadriceps involvement. A strain gauge mounted on the footplate enabled dorsiflexor (DF) and plantarflexor (PF) torque to be measured during the evoked twitches and the maximum voluntary contractions (MVC). The Biodex dynamometer measured the ankle angle during all MVCs. For measurement of DF twitches, the ankle joint was secured at 20° of plantarflexion, and for measurement of PF twitches at 10° of dorsiflexion (Marsh et al., 1981). van Schaik et al. (1994) have determined that 20° of plantarflexion is the optimal angle for MVC torque generation in the dorsiflexors for both elderly and young subjects. In the plantarflexor muscles, Winegard and colleagues (1997) have demonstrated that 10° of dorsiflexion is the optimal angle for torque production.

2.3.3 Electrode Placement

Electromyographic (EMG) data were recorded for the DF muscles with the recording electrode placed over the proximal third of the tibialis anterior (TA), the reference electrode on the TA tendon and the ground electrode placed on the tibia. For the PF muscle group the recording and reference electrode were positioned 3 cm apart over the distal belly of the gastrocnemius. EMG activity was measured during all evoked twitches and during the MVCs.

2.3.4 Stimulation

DF evoked twitches were initiated by stimulation of the common peroneal nerve. Lead plate electrodes (3 x 3 cm), coated with conducting cream, were placed on the skin overlying the head of the fibula (cathode) and approximately 5 cm distal to that, on the anterior aspect of the knee (anode). To stimulate the PF muscle group the stimulating electrode was positioned over the tibial nerve in the popliteal fossa. This nerve innervates the gastrocnemius and soleus muscles. The stimuli were rectangular voltage pulses of 150 μs duration delivered from a high-voltage stimulator. Prior to applying the stimulating electrode the skin was shaved, sanded and isopropyl alcohol applied. Voluntary and evoked muscle torque , as well as ankle angle, was displayed and analyzed by a Dataq waveform scrolling board in an IBM-compatible computer (WFS-200PC; Dataq Instruments, Akron Ohio).

2.3.5 Protocol

At the start of each trial the Biodex dynamometer was adjusted to fit the leg and foot dimension of each subject, then a series of single twitches of increasing intensity were delivered until a plateau of twitch torque and muscle compound action potential (M-wave) amplitude was obtained. This was the voltage that was subsequently used to evoke the maximum twitch. During each of the 3 testing days, subjects were instructed to perform two MVCs (one DF MVC and one PF MVC, in either an ISO, CON or ECC mode). The contraction type was randomized between the 3 trial days. Each MVC was followed by five minutes of twitch testing to determine the decay time of the potentiation. Post-activation twitches were elicited 3-5s after the MVC, and then at 30 s intervals for a total of 5 min. The ISO MVCs were maintained for 5 s and the ECC and CON MVCs were performed at 10 degrees/s such that the total contraction time was also 5 s.

2.3.6 Data Analysis

Custom-designed Advanced CODAS software (Dataq Instruments) was used for the collection of all twitch and MVC data. To determine twitch peak torque (PT), maximum rate of torque development (MRTD), half relaxation time (½ RT),and time to peak twitch (TPT) a custom designed computer program was used. WINDAQ software was used to determine M-wave amplitude and area, MVC peak torque and average EMG (AEMG) during the MVCs.

2.3.7 Statistics

Statistical analysis were performed using the Statistica software program (© StatSoft Inc., Tulsa, OK). All of the twitch data were computer-analyzed using a four-way mixed design. The between variables were age (elderly, young) and gender (male, female), and the within variables were contraction type (ISO, CON, and ECC) and time (12 separate times). The dependent variables were PT, MRTD, ½ RT, TPT, M-wave area, and M-wave amplitude. The dependent variables were all examined as absolute data and also normalized to the baseline value. The maximum voluntary contractions (MVC) were analyzed using a three way mixed design (age x gender x contraction type). MVC peak torque, and average EMG for the entire 5 s MVC and for the 1 s period around the peak torque were the dependent measures. Significant differences between means were determined using a Tukey HSD post hoc test. A level of $p \leq 0.05$ was considered to be statistically significant. Throughout the text, data are presented as means ± SD.

2.4 RESULTS

2.4.1 Baseline Characteristics

Table 1 contains the baseline characteristics of the study subjects. Males were significantly heavier and taller than females ($p \leq 0.05$) . Elderly subjects were significantly heavier than young subjects. Women were able to move their ankle through a wider range of motion (ROM) than men ($p \leq 0.05$). The young subjects had a significantly larger ROM than the elderly subjects.

Baseline twitch measures revealed that in both muscle groups there were gender and age main effects for peak torque (PT) and the maximum rate of torque development (MRTD) (Tables 2 and 3). PT and MRTD was significantly larger in men than women and in the young compared to the elderly group ($p \leq 0.05$). In both muscle groups, the baseline twitch was significantly slower in the elderly than young subjects, in terms of half relaxation time (½ RT) and time to peak torque (TPT) ($p \leq 0.05$). In the DF muscle group the men had a significantly longer ½RT than the women and in the PF muscle group the men had a significantly longer TPT than the women.

M-wave differences were also apparent in the baseline data. In the DF muscle group, the M-wave area and amplitude were significantly greater in the young than the elderly subjects (Table 2). In the PF muscle group, M-wave area and amplitude were significantly greater in the male compared with the female subjects but no age differences were detected (Table 3).

2.4.2. PAP in the Dorsiflexors

2.4.2.1 Dorsiflexor MVCs and AEMG

A 5 s conditioning MVC was performed in an isometric, concentric and eccentric mode to induce PAP in the DF muscle group. The dynamic MVCs (CON and ECC) were performed at 10°/s such that the total contraction time was approximately 5 s. Significant main effects for age, gender and contraction type were evident after statistical analysis (Table 4). Peak MVC torque was higher in the young than elderly subjects, collapsed across contraction type, and men were significantly stronger than women. Contraction type differences also existed in MVC peak torque values in both age groups; eccentric MVCs were largest followed by isometric and concentric MVCs (Figure 1). The ECC/CON ratio was significantly larger in the elderly compared with the young subjects (4.1 ± 1.6 vs. 2.5 ± 0.8). There was an age by contraction type interaction, in which the young subjects were significantly stronger in the CON and ISO conditions but not in the ECC condition.

Average electromyographic (AEMG) data recorded during the MVCs indicated significant age and contraction type main effects and an age by contraction type interaction. Increased levels of AEMG were observed during the eccentric and concentric MVCs compared to the isometric MVC ($p<0.05$) in the young subjects only; there were no significant differences in AEMG between contraction types in the elderly group (Table 5).

2.4.2.2 Effect of Age and Contraction Type on PAP in the Dorsiflexors

Absolute peak twitch torque was significantly larger in the young subjects compared to the elderly subjects following all three MVCs. In the absolute PAP data there was also a contraction type main effect. Peak torque was larger following ECC and CON MVCs than after ISO MVCs. No significant gender effects were found in either the absolute or relative data.

When the peak twitch torque data were collapsed across gender and contraction type it was observed that the post MVC twitch in young and elderly subjects was 4.7 ± 2.0 Nm and 2.6 ± 1.2 Nm respectively ($p \leq 0.05$). However, when the data were normalized to the baseline twitch, it became apparent that both young and elderly subjects potentiated to a similar degree (young 176.8 ± 53.5% and old 162.4 ± 44.8%) (Figure 2).

When normalized peak potentiation was analyzed a contraction type main effect was detected (Table 6). Peak twitch potentiation was largest in the ECC condition (185.3 ± 48.9%) compared to CON (162.9 ± 43.5%) and ISO (160.4 ± 49.5%). The potentiated twitch in the elderly subjects was not significantly affected by the preceding contraction type (ISO 160.9 ± 63.5%; CON 151.8± 42.0%; ECC 174.2 ± 44.6%). However, when the peak twitch torque of the young subjects was analyzed on its own, a significant contraction type by time interaction was found. The ECC potentiated twitch was the largest (196.4 ± 44.5%) followed by CON (174.2 ± 44.2%) and ISO (159.9 ± 23.3%) twitches (Figure 3).

Maximum rate of torque development (MRTD) increased sharply in both age groups after the conditioning MVC and then decayed rapidly for the first minute then more slowly thereafter. MRTD was significantly affected by both age and contraction type in the DF muscle group. A consistent observation in both the absolute and normalized data was a gender by age by time interaction ($p \leq 0.05$). The MRTD of young men was significantly greater than young women and all elderly subjects immediately post MVC (Table 7). A significant age by contraction type by time interaction was also found in the normalized MRTD data. Following ISO and CON MVCs there were no significant age differences in MRTD, but the ECC MVCs resulted in a significantly greater MRTD in the young compared with the elderly subjects (Figures 4,5 and 6).

The potentiation of the twitch was accompanied by a shortening of the time to peak twitch (TPT) and the half relaxation time (½ RT) in both age groups. A significant age main effect was detected in the absolute TPT and ½ RT data; however, no significant differences between age groups were found in the normalized data (Table 8).

Absolute M-wave data indicated that there were significant age and time main effects. M-wave area and amplitude in young subjects was significantly larger than in elderly subjects (Table 9). No significant contraction type differences were apparent in the M-wave data. In both age groups peak M-wave area became potentiated after 2 minutes of recovery; young and elderly M-wave area increased 12.3% and 10.9% respectively (Table 9).

2.4.3 <u>PAP in the Plantarflexors</u>

2.4.3.1 Plantarflexor MVCs and AEMG

Significant main effects for gender, age and contraction type were evident in MVC peak torque data. Men were consistently stronger than women and the young subjects achieved a larger peak torque than the elderly subjects (Table 10). Similar to the DF muscle group, eccentric MVCs were significantly larger than isometric and concentric MVCs in both age groups (Figure 7). The ECC/CON ratio was significantly larger in the elderly subjects compared to the young subjects (2.1 ± 1.1 vs. 1.6 ± 0.5).

No contraction type differences were detected in the AEMG recorded during the MVCs in either age group. However, gender and age main effects were significant; men and the young subjects produced more AEMG than women and the elderly subjects, respectively (Table 11).

2.4.3.2 Effect of Age and Contraction type on PAP in the Plantaflexors

The absolute PAP data revealed significant gender, age and time main effects. Peak PAP was larger in men than women (19.6 ± 5.1 Nm vs. 13.7 ± 4.2 Nm) , and in young subjects compared to elderly subjects (19.2 ± 10.7 vs. 14.1 ± 10.3 Nm).

There were no significant contraction type main effects in the normalized peak potentiated twitch torque; however, there were significant age and gender main effects (Table 12). The young subjects potentiated significantly more than the elderly subjects

(117.6% vs. 108.3%) and potentiation was larger in males than females (118.9% vs. 107.0%) (Figure 8).

There was an age by time interaction in the normalized PAP data. The young subjects potentiated significantly more immediately post-MVC compared with the elderly subjects but the time course of recovery was different in the two age groups. In the elderly subjects peak torque was significantly larger compared with the young subjects after the second minute of recovery (Figure 9).

Significant age and gender main effects were detected in the absolute MRTD data. The young and male subjects had a greater MRTD than the elderly and female subjects respectively. A contraction type by time interaction was detected in both the absolute and normalized data. The MRTD following CON (468.8 ± 220.2 Nm) and ECC (469.7 ± 193.3 Nm) MVCs was significantly greater than after ISO MVCs (420.8 ± 197.7 Nm) (Figure 10). A consistent observation in both the absolute and normalized data was a significant age by time interaction. Similar to the peak twitch torque data, the MRTD of young subjects potentiated significantly more than the elderly subjects immediately post-MVC (142.3% vs. 128.7%), but quickly returned to baseline values. On the other hand, the MRTD in the elderly subjects tended to remain elevated above baseline values during the recovery period (Figure11).

The potentiated twitch in the PF muscle group was of shorter duration than the baseline twitch due to a decrease in the TPT and ½ RT. Significant age main effects were observed for both TPT and ½ RT in the absolute and normalized data. The young subjects demonstrated a significantly shorter TPT and ½ RT compared with the elderly subjects (Table 13). No contraction type differences were observed in either of these two variables.

M-wave area and amplitude also demonstrated significant age and time main effects. M-wave area was greater in the elderly subjects compared with young subjects (Table 14). A small but significant increase in peak M-wave occurred after 2 minutes of recovery in both elderly and young subjects (Table 14).

2.5 DISCUSSION

Potentiation of twitch tension following voluntary isometric contractions has been demonstrated in a variety of human limb muscles (Belanger et al., 1981; Belanger and McComas, 1983; Stuart et al., 1988; Vandervoort et al., 1983). The leading mechanism to explain an increase in twitch force appears to be phosphorylation of myosin light chains (Palmer and Moore, 1989; Sweeney and Stull, 1990). Increased sensitivity of the contractile element to activation by Ca^{2+} has been correlated with myosin light chain phosphorylation in rabbit skeletal muscle (Persechini and Stull, 1984). It has also been demonstrated that increased myosin light chain phosphate content is associated with an increase in twitch force and maximum rate of force development (Grange et al., 1995).

It is thought that when the myosin light chains are phosphorylated, the cross-bridges move away from the myosin backbone and towards the actin filament. This conformational change would mean that each myosin head spends more time proximal to the myosin binding sites on actin. This enhanced proximity promotes more myosin-actin interaction at low levels of calcium activation resulting in enhanced force production.

Yang and colleagues (1992, 1998) attempted to mimic the movement of the myosin heads closer to the thin filament, by increasing osmotic pressure and/or sarcomere length of the rabbit psoas muscle. Both these processes enhanced the proximity of myosin to actin to elicit force potentiation.

The present study was designed to test the effect of different contraction types on postactivation potentiation in young and elderly subjects. Eccentric and concentric isokinetic MVCs, as well as isometric MVCs were employed to induce potentiation in the ankle dorsiflexors and plantarflexors. Our results indicate that there are substantial age and contraction type differences in a number of twitch and MVC contractile characteristics.

As was expected, significant differences in MVC peak torque were observed in both age groups between contraction types. It is known that the greatest amount of force production can be achieved during rapid lengthening contractions. This is most likely due to 1) the series elastic component already being taken up when the muscle is stretched, 2) an increased number of attached cross-bridges, and/or 3) greater force generated per cross-bridge (Åstrand and Rodhal, 1986). Our results support the literature which indicates that MVC peak torque will be largest during ECC MVCs followed by ISO and CON MVCs.

Peak MVC torque was larger in young compared with elderly subjects in both muscle groups. This was an expected result due to the vast amount of literature on decreases in muscle strength with age. However, our results suggest that eccentric muscle strength was better maintained in the elderly subjects than either ISO or CON strength. In both the DF and PF muscle groups the ECC/CON ratio was significantly larger in the elderly compared to young subjects. This agrees with the findings of Vandervoort et al. (1990) in human quadriceps muscle and Porter et al. (1997) in human plantar and dorsiflexor muscles. In each of these two studies the apparent weakness of elderly muscle was removed when muscle strength was measured during rapid stretching.

No significant differences were demonstrated in AEMG recorded during the three MVCs in elderly subjects in either the DF or PF group. In contrast, in the DF muscles of young subjects AEMG was significantly greater during concentric and eccentric MVCs compared to isometric MVCs. This is not in agreement with the literature, which maintains the degree of muscle excitation when the active muscle is forcibly stretched is smaller than it is when the muscle shortens at the same velocity (Bigland and Lippold, 1954). Tesch et al., (1990) observed that the IEMG data was greater during CON compared to ECC contractions in the human vastus lateralis and rectus femoris muscles. Consistent with Tesch and colleagues (1990) observations, Westing et al. (1990) have demonstrated that electrical stimulation superimposed on maximal voluntary ECC contractions results in increased torque production. Therefore, maximal voluntary ECC torque does not appear to be truly maximal. It has been proposed that the failure to reach maximal torque during voluntary ECC efforts could be due to a decline in neural output to the muscles (Wesitng et al., 1990). This inhibitory mechanism may help to protect against injury induced by forceful ECC contractions. In this study, movement artifact may account for the increased AEMG that was observed during dynamic contractions. This may explain the elevated AEMG in ECC and CON MVCs compared to ISO MVCs.

As expected, PAP (expressed as a percentage of baseline twitch) was significantly lower in the elderly compared with the young subjects in the PF muscle group. However, in the DF muscles the age main effect was only evident in the absolute data; there were no significant differences in the relative PAP in young and elderly subjects. The baseline twitch torque was significantly smaller in the elderly subjects but they were able to potentiate to a similar relative degree as their young counterparts (PAP elderly 160.9% vs. young 169.8%). In contrast, Hicks and colleagues (1991) demonstrated that twitch potentiation was decreased in elderly compared with young individuals. DF MVCs (↓ 9.56%) were better maintained in the elderly subjects than PF MVCs (↓ 34%). It might be speculated that in the DF muscle group the elderly subjects were able to fully activate all of their motor units and therefore, fully potentiate.

In the DF muscle group, in young subjects, it was demonstrated that the potentiated twitch following the ECC MVC was significantly larger, shorter in duration, and had an increased rate of maximal torque development. These contraction specific alterations in force and time course of the potentiated twitch cannot be explained by an increase in activation level, as the M-wave amplitude did not increase until after peak potentiation was achieved. AEMG during the ECC MVC was elevated above that recorded during the ISO MVC, but it was no different than the AEMG during the CON MVC. If increased activation was responsible for the significantly larger twitch following the ECC MVC, then we would expect the twitch following the CON MVC to have potentiated to the same degree.

Nardone et al. (1989) demonstrated that fast-twitch, and therefore fast-relaxing motor units, may be selectively recruited during voluntary tasks involving controlled lengthening of active muscle. Preferential activation of type II fibres during the eccentric MVCs may have resulted in increased phosphate content in the myosin light chains and consequently increased potentiation. It has been demonstrated that fast twitch glycolytic fibres demonstrate a greater ability to potentiate following either tetanic or voluntary activation (Moore and Stull, 1984). Therefore, the increased potentiation that we observed in young subjects following eccentric contractions may have been due to elevated phosphate content in the type II fibres. However, without the information gained from muscle biopsy material we can only speculate on the mechanism behind the increased potentiation.

The maximum rate of torque development was significantly increased in both age groups after the conditioning stimulus. It has been proposed that myosin light chain phosphorylation exerts its effect on skeletal muscle by increasing the rate that cross-bridges enter force producing states (Sweeney and Stull, 1990). Our MRTD results may help support the hypothesis that twitch potentiation is the result of myosin light chain phosphorylation. MRTD of the potentiated twitch was significantly greater in the young compared to the elderly subjects. Contraction type differences were also detected in the DF muscle group of young subjects. Our results suggest that the eccentric contractions produced a greater increase in the maximum rate of torque development than the static contractions. This may be further evidence that type II muscle fibres are preferentially recruited during eccentric contractions.

The baseline time to peak twitch (TPT) and half relaxation time (½ RT) were significantly longer in the elderly compared to the young subjects. This may reflect age-associated atrophy of type II fibres or impaired functioning of the sarcoplasmic reticulum, both of which would result in a slower twitch. The potentiated twitch demonstrated a decreased TPT and ½ RT, in both age groups, which is in agreement with previous studies in this area (Belanger et al., 1983; Vandervoort et al., 1983). This may indicate that the potentiation process is associated with a decreased Ca^{2+} release and reuptake time by the sarcoplasmic reticulum.

A consistent observation in our study was a small but significant increase in M-wave area after 2 minutes of recovery in both age groups. Our findings support O'Leary et al. (1997) in which a 26% increase in M-wave amplitude occurred at 2 minutes post-tetanus. However, the increase in M-wave area in our study did not coincide with an increase in twitch torque. M-wave potentiation may be due to the stimulation of the fibre membrane's Na^{+}- K^{+} active transport mechanism (Hicks and McComas, 1989).

In conclusion, the present study has demonstrated clear age differences in PAP following dynamic and static contractions in the DF muscle group. Peak MVC torque, PAP and the half relaxation of the twitch were all significantly depressed in elderly muscle. These results may stem from differences in the motor unit composition of elderly muscle and/or changes in muscle morphology with age. It was also determined that PAP may be affected by the nature of the preceding contraction type, at least in young subjects. A possible explanation for the increase in PAP after lengthening contractions may be an alteration in the recruitment pattern of motor units (Nardone et al., 1989). Following maximal eccentric contractions PAP was elevated and MRTD was increased, in the DF muscle group of young subjects. The evidence leads us to believe that type II fibres may have been preferentially recruited during the eccentric MVCs leading to an increase in PAP.

Further research in this area could include an exploration of the relationship between activation patterns during different contraction types and subsequent PAP, and investigation of the effect of aging on PAP. Determination of the possible functional significance of PAP in human muscle should continue to be explored.

TABLE 1. Subject Characteristics
(n=40)

Variable	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
Age (yrs.)	70.6 ± 6.39	70.3 ± 4.99	26.2 ± 4.10	22.3 ± 1.49
Height (cm)	*177.2 ± 6.87	164.7 ± 4.96	*175.18 ± 7.84	167.5 ± 6.60
Weight (kg)	*◆85.46 ± 12.6	◆70.81 ±11.81	*74.86 ± 8.49	62.05 ± 3.65
ROM (°)	47.75 ± 8.16	●58.4 ± 10.09	59.09 ± 8.49	●67.55 ± 6.78

Values are means ± SD.

* Men significantly different from women ($p \leq 0.05$)
◆ Elderly significantly different from young ($p \leq 0.05$)
● Women significantly different from men ($p \leq 0.05$)

TABLE 2. Baseline DF Twitch and M-wave Characteristics

Variable	Elderly M (n=10)	Elderly F (n=10)	Young M (n=10)	Young F (n=10)
Twitch Characteristics				
PT (Nm)	*1 56 ± 0.55	1 69 ± 0.66	*◆3.37 ± 1.31	◆2.19 ± 0 76
MRTD (Nm/s)	*90.69 ± 33.20	57 06 ± 22.79	*◆97 71 ± 50 5	◆76.28 ± 18.32
½ RT (ms)	*Ŧ100.2 ± 33 7	Ŧ77.44 ± 32.71	*74.63 ± 16.12	66.18 ± 19.29
TPT (ms)	Ŧ99 9 ± 43 94	Ŧ92.67 ± 36.11	77.36 ± 19.27	66.93 ± 17 63
M-wave Characteristics				
AREA (mV·s)	0 019 ± 0.014	0 013 ± 0.004	◆0.092 ± 0 025	◆0 095 ± 0 014
AMP (mV)	1 81 ± 0.37	1 52 ± 0 52	◆10.46 ± 2.49	◆10.61 ± 1.33

Values are means ± SD.

* Men significantly different from women ($p \leq 0.05$)
◆ Young significantly greater than elderly ($p \leq 0.05$)
Ŧ Elderly significantly longer than young ($p \leq 0.05$)

TABLE 3. Baseline PF Twitch and M-wave Characteristics

Variable	Elderly M (n=10)	Elderly F (n=10)	Young M (n=10)	Young F (n=10)
Twitch Characteristics				
PT (Nm)	*14.318 ± 4.35	11.41 ± 3 80	*◆18.45 ± 4.65	◆13.88 ± 3 04
MRTD (Nm/s)	*302.8 ± 98.1	248.61 ± 107 84	*◆444.1 ± 125 0	◆338.2 ± 103.37
½ RT (ms)	Ŧ110.7 ± 21 6	Ŧ112.90 ± 19 07	90.73 ± 14 05	90.85 ± 11.30
TPT (ms)	*Ŧ119 8 ± 23	Ŧ135.33 ± 28.29	*93 03 ± 14.31	103 72 ± 19 18
M-wave Characteristics				
AREA (mV·s)	*0 05 ± 0 02	0 041 ± 0 013	*0 046 ± 0.023	0.033 ± 0.016
AMP (mV)	*8.54 ± 3.40	5 80 ± 1 89	*8.25 ± 4.09	5 78 ± 2.69

Values are means ± SD.

* Men significantly different from women ($p \leq 0.05$)
◆ Young significantly greater than elderly ($p \leq 0.05$)
Ŧ Elderly significantly longer than young ($p \leq 0.05$)

TABLE 4. DF MVC PEAK TORQUE (Nm)

	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
ISO	26.25 ± 9.39	19.69 ± 5.19	◆36.91 ± 7.63	◆26.79 ± 3.66
CON	17.17 ± 6.87	15.19 ± 5.83	◆26.62 ± 5.47	◆17.88 ± 4.64
ECC	60.67 ± 9.24	53.56 ± 5.44	52.97 ± 7.81	51.66 ± 8.36

Values are means ± SD.

Age main effect (Young > Elderly) ($p \leq 0.05$)
Gender main effect (Males > Females) ($p \leq 0.05$)
Contraction type main effect (ECC > ISO >CON) ($p \leq 0.05$)
◆ Young significantly different from elderly ($p \leq 0.05$)

TABLE 5. DF AEMG (mV)

	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
ISO	0.352 ± 0.09	0.348 ± 0.09	0.917 ± 0.24	0.751 ± 0.16
CON	0.358 ± 0.12	0.404 ± 0.18	◆1.04 ± 0.82	◆1.07 ± 0.24
ECC	0.377 ± 0.13	0.411 ± 0.13	◆1.19 ± 0.54	◆1.11 ± 0.47

Values are means ± SD.

Age main effect (Young > Elderly) ($p \leq 0.05$)
Contraction type main effect (ECC and CON >ISO) ($p \leq 0.05$)
◆ ECC and CON significantly different than ISO ($p \leq 0.05$)

TABLE 6. DF PEAK POTENTIATION (%)

	Elderly		Young	
	M (n=10)	**F (n=10)**	**M (n=10)**	**F (n=10)**
ISO	175.42± 91.14	146.53 ± 35.59	160.32 ± 22.82	159.38 ± 49.43
CON	143.17 ± 24.46	160.40 ± 59.21	176.17 ± 50.10	172.14 ± 40.12
ECC	●178.5 ± 54.24	●169.7 ± 34.69	●194.67 ± 58.01	●198.08 ± 48.52

Values are means ± SD.

Age main effect (Young > Elderly) ($p \leq 0.05$)
Gender main effect (Males > Females) ($p \leq 0.05$)
● Contraction type main effect (ECC > ISO and CON) ($p \leq 0.05$)

TABLE 7. DF MRTD (Nm/s)

	Elderly		Young	
	M (n=10)	**F (n=10)**	**M (n=10)**	**F (n=10)**
Pre-MVC Twitch	90.69 ± 33.20	57.06 ± 22.79	97.71 ± 50.55	76.28 ± 18.32
Post-MVC Twitch	148.46 ± 54.85	93.12 ± 30.03	*185.64 ± 83.99	111.52 ± 24.86
% Change	↑63.7%	↑63.2%	Ŧ↑90.0%	↑46.2%

Values are means ± SD.

Gender main effect (Males > Females) ($p \leq 0.05$)
*** Young males significantly different Post-MVC than all other groups ($p \leq 0.05$)**
Ŧ Young males significantly different than all other groups ($p \leq 0.05$)

TABLE 8. DF TPT and ½ RT

	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
½ RT (ms)				
Pre-MVC Twitch	100.2 ± 33 70	77.44 ± 32.71	74.63 ± 16.12	66.18 ± 19.29
Post-MVC Twitch	80.23 ± 26.20	72.26 ± 27.29	58.41 ± 14.27	58.07 ± 14.3
% Change	↓19 9%	↓6.7%	↓21 7%	↓13 1%
TPT (ms)				
Pre-MVC Twitch	99 9 ± 43 94	92.67 ± 36.11	77.36 ± 19.27	66.93 ± 17 63
Post-MVC Twitch	85.23 ± 34.94	82.67 ± 30 41	65.53 ± 12.55	58.67 ± 12.98
% Change	↓14 7%	↓10 8%	↓15.3%	↓11.3%

Values are means ± SD.

Age main effect in both ½ RT and TPT (elderly slower than young) ($p \leq 0.05$)
Time main effect in both ½ RT and TPT (Post-MVC twitch significantly shorter than Pre-MVC twitch) ($p \leq 0.05$)

TABLE 9. DF M-WAVE AREA AND AMPLITUDE

	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
AREA (mV·s)				
Pre-MVC Twitch	0 019 ± 0 014	0.0129 ± 0 004	0.092 ± 0.025	0.0956 ± 0.014
Post M-wave Area	0 020 ± 0.013	0.014 ± 0.005	0 105 ± 0.029	0.104 ± 0.013
% Change	↑6.8%	↑8.5%	↑14%	↑8.8%
AMPLITUDE (mV)				
Pre-MVC Twitch	1 814 ± 0.37	1 524 ± 0.52	10.46 ± 2.49	10.613 ± 1.33
Post M-wave Amplitude	1 82 ± 0.35	1 63 ± 0 59	10 87 ± 2.45	10 77 ± 0.39
% Change	↑0.3%	↑6.9%	↑3 9%	↑1 5%

Values are means ± SD.

TABLE 10. PF MVC PEAK TORQUE (Nm)

	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
ISO	86.84 ± 34.99	58.49 ± 18.21	139.54 ± 45.38	101.88 ± 17.34
CON	73.13 ± 35.61	51.62 ± 20.34	106.16 ± 36.52	96.60 ± 31.72
ECC	121.48 ± 30.51	98.89 ± 24.19	171.74 ± 51.31	128.99 ± 37.76

Values are means ± SD.

Age main effect (Young > Elderly) ($p \leq 0.05$)
Gender main effect (Males > Females) ($p \leq 0.05$)
Contraction type main effect (ECC > ISO >CON) ($p \leq 0.05$)

TABLE 11. PF AEMG (mV)

	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
ISO	0.195 ± 0.08	0.124 ± 0.05	0.432 ± 0.31	0.189 ± 0.07
CON	0.233 ± 0.10	0.167 ± 0.07	0.355 ± 0.24	0.329 ± 0.25
ECC	0.201 ± 0.06	0.144 ± 0.04	0.459 ± 0.24	0.388 ± 0.32

Values are means ± SD.

Age main effect (Young > Elderly) ($p \leq 0.05$)
Gender main effect (Males > Females) ($p \leq 0.05$)

TABLE 12. PF PEAK POTENTIATION (%)

	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
ISO	108.87 ± 14.93	102.29 ± 12.68	124.51 ± 19.51	111.76 ± 14.50
CON	118.75 ± 23.61	101.23 ± 14.34	121.98 ± 15.31	109.36 ± 11.73
ECC	116.93 ± 15.32	101.94 ± 15.70	122.29 ± 12.55	115.67 ± 17.51

Values are means ± SD.

Age main effect (Young > Elderly) ($p \leq 0.05$)
Gender main effect (Males > Females) ($p \leq 0.05$)

TABLE 13. PF TPT and ½ RT

	Elderly M (n=10)	Elderly F (n=10)	Young M (n=10)	Young F (n=10)
½ RT (ms)				
Pre-MVC Twitch	110.65 ± 21 60	112.90 ± 19 07	90 73 ± 14 05	90.85 ± 11.30
Post-MVC Twitch	110 79 ± 20.28	116.65 ± 22.12	78.41 ± 17 61	88.03 ± 11.60
% Change	↑0.1%	↑3.3%	↓13 6%	↓3 1%
TPT (ms)				
Pre-MVC Twitch	119 77 ± 22.66	135.33 ± 28.29	93 03 ± 14.31	103 72 ± 19 18
Post-MVC Twitch	100 8 ± 18.8	116.07 ± 24.78	81.48 ± 15 88	83 85 ± 16.64
% Change	↓15 8%	↓14.2%	↓12.4%	↓19.2

Values are means ± SD.

Age main effect in both ½ RT and TPT (elderly slower than young) ($p \leq 0.05$)
Time main effect in both ½ RT and TPT (Post-MVC twitch significantly shorter than Pre-MVC twitch) ($p \leq 0.05$)

TABLE 14. PF M-WAVE AREA AND AMPLITUDE

	Elderly		Young	
	M (n=10)	F (n=10)	M (n=10)	F (n=10)
AREA (mV·s)				
Pre-MVC Twitch	0 049 ± 0 019	0.041 ± 0 013	0.046 ± 0.023	0.033 ± 0.016
Post M-wave Area	0.054 ± 0 023	0 042 ± 0.013	0.049 ± 0.026	0.034 ± 0.016
% Change	↑10.2%	↑2.4%	↑6.5%	↑3 0%
AMPLITUDE (mV)				
Pre-MVC Twitch	8.54 ± 3.40	5 80 ± 1 89	8.25 ± 4 09	5 78 ± 2.69
Post M-wave Amplitude	8.87 ± 3 71	5 97 ± 1 86	8.35 ± 4.44	5 88 ± 2.90
% Change	↑3.9%	↑2.9%	↑1.2%	↑1 7%

FIGURE LEGENDS

Figure 1. Contraction type differences in young and elderly DF MVC. * ECC MVCs are significantly different than ISO and CON MVCs ($p<0.05$).

Figure 2. DF PAP normalized to the baseline twitch. In the ISO and CON conditions there are no significant age differences. PAP in young subjects is significantly greater than PAP in elderly subjects immediately Post-MVC in the ECC condition.

Figure 3. Time course of PAP, in young subjects, after a 5s MVC (ISO, CON or ECC). Values are expressed as a percentage of the baseline twitch peak torque. * ECC significantly different from ISO, ● ECC significantly different from CON, ◆ CON significantly different from ISO, $p<0.05$.

Figure 4. Age differences in MRTD in the DF muscle group following ISO MVCs. Values are expressed as a percentage of the baseline twitch MRTD. * Post MVC MRTD values are significantly different from pre-MVC for both young and elderly ($p<0.05$). No significant differences in MRTD between young and elderly.

Figure 5. Age differences in MRTD in the DF muscle group following CON MVCs. Values are expressed as a percentage of the baseline twitch MRTD. * Post MVC MRTD values are significantly different from pre MVC for both young and elderly ($p<0.05$). MRTD in elderly tends to be larger than in young , only significant at 2:00 minute time point ●.

Figure 6. Age differences in MRTD in the DF muscle group following ECC MVCs. Values are expressed as a percentage of the baseline twitch MRTD. * Post MVC MRTD values are significantly different from pre MVC for both young and elderly ($p<0.05$). MRTD in young is significantly larger than elderly up until the 2:00 minute time point *.

Figure 7. Contraction type differences in young and elderly PF MVCs. * ECC MVCs are significantly different from ISO and CON MVCs ($p<0.05$).

Figure 8. PF PAP normalized to the baseline twitch, in young and elderly subjects after all three MVCs.

Figure 9. *Time course of PF PT potentiation collapsed across gender and contraction type. Young subjects potentiate significantly more than elderly subjects immediately post-MVC , but potentiation in elderly subjects is maintained ■ during recovery, compared to young subjects .

Figure 10. Normalized PF MRTD contraction by time interaction. * MRTD is significantly greater following ECC and CON MVCs compared to ISO MVCs ($p<0.05$).

Figure 11. Normalized PF MRTD, age by time interaction. * MRTD in young subjects potentiates significantly more than elderly subjects immediately Post-MVC, but MRTD remains elevated in elderly through entire recovery.

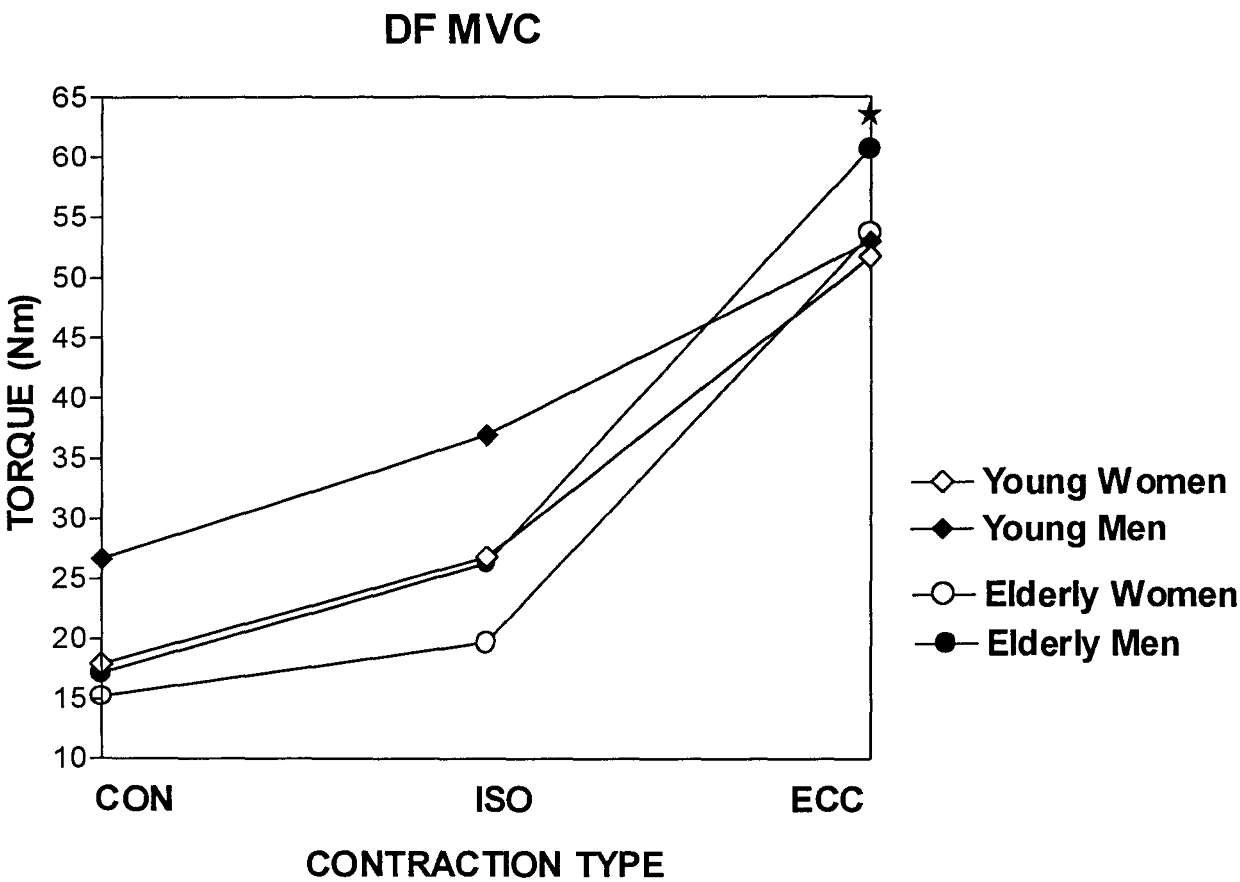
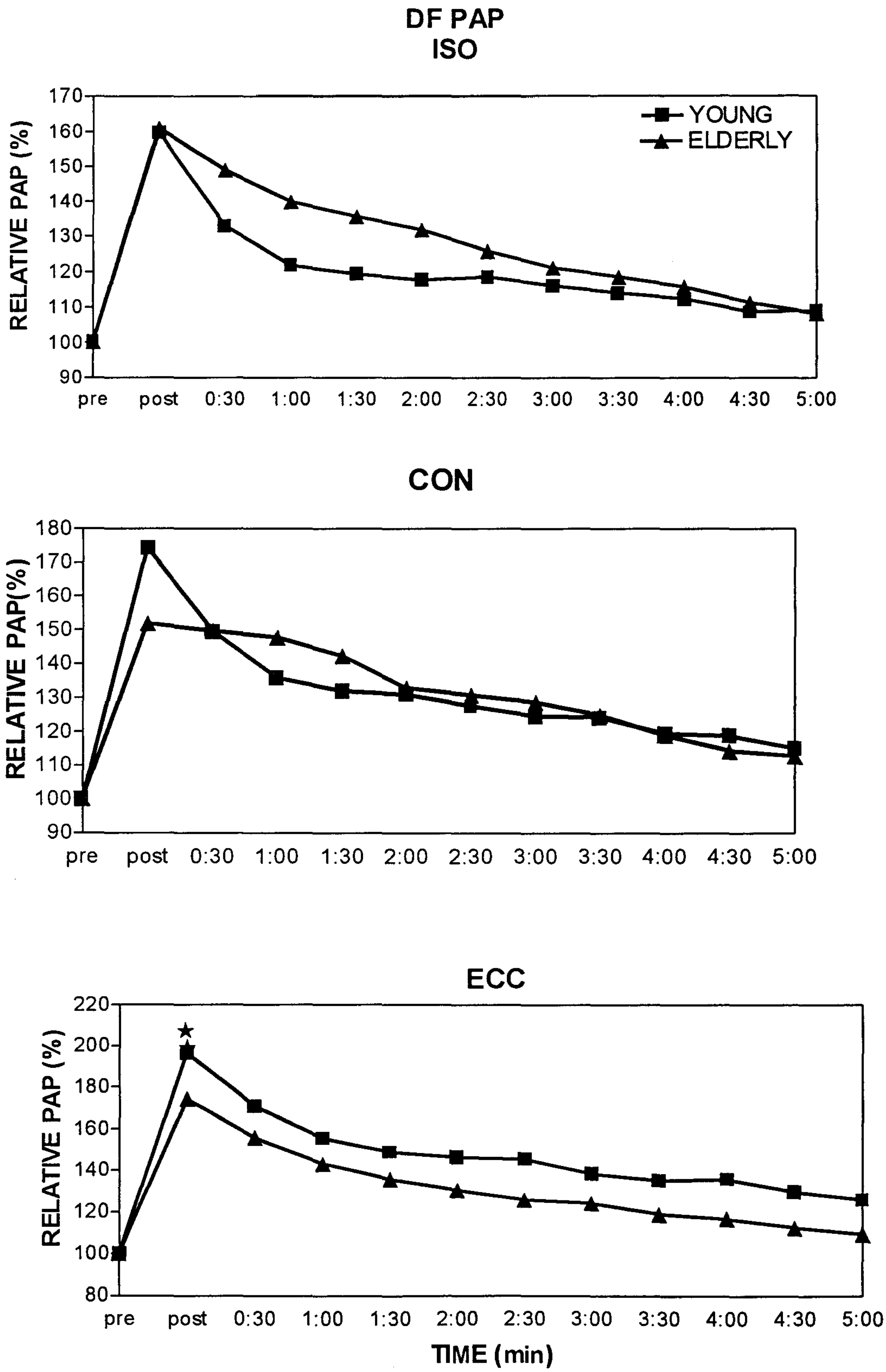

DF MVC
TORQUE (Nm)
65
60
55
50
45
40
35
30
25
20
15
10
CON
ISO
ECC
CONTRACTION TYPE
Young Women
Young Men
Elderly Women
Elderly Men

Figure 1.


DF PAP
ISO
RELATIVE PAP (%)
YOUNG
ELDERLY
170
160
150
140
130
120
110
100
90
pre post 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00
CON
RELATIVE PAP(%)
180
170
160
150
140
130
120
110
100
90
pre post 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00
ECC
RELATIVE PAP (%)
220
200
180
160
140
120
100
80
pre post 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00
TIME (min)

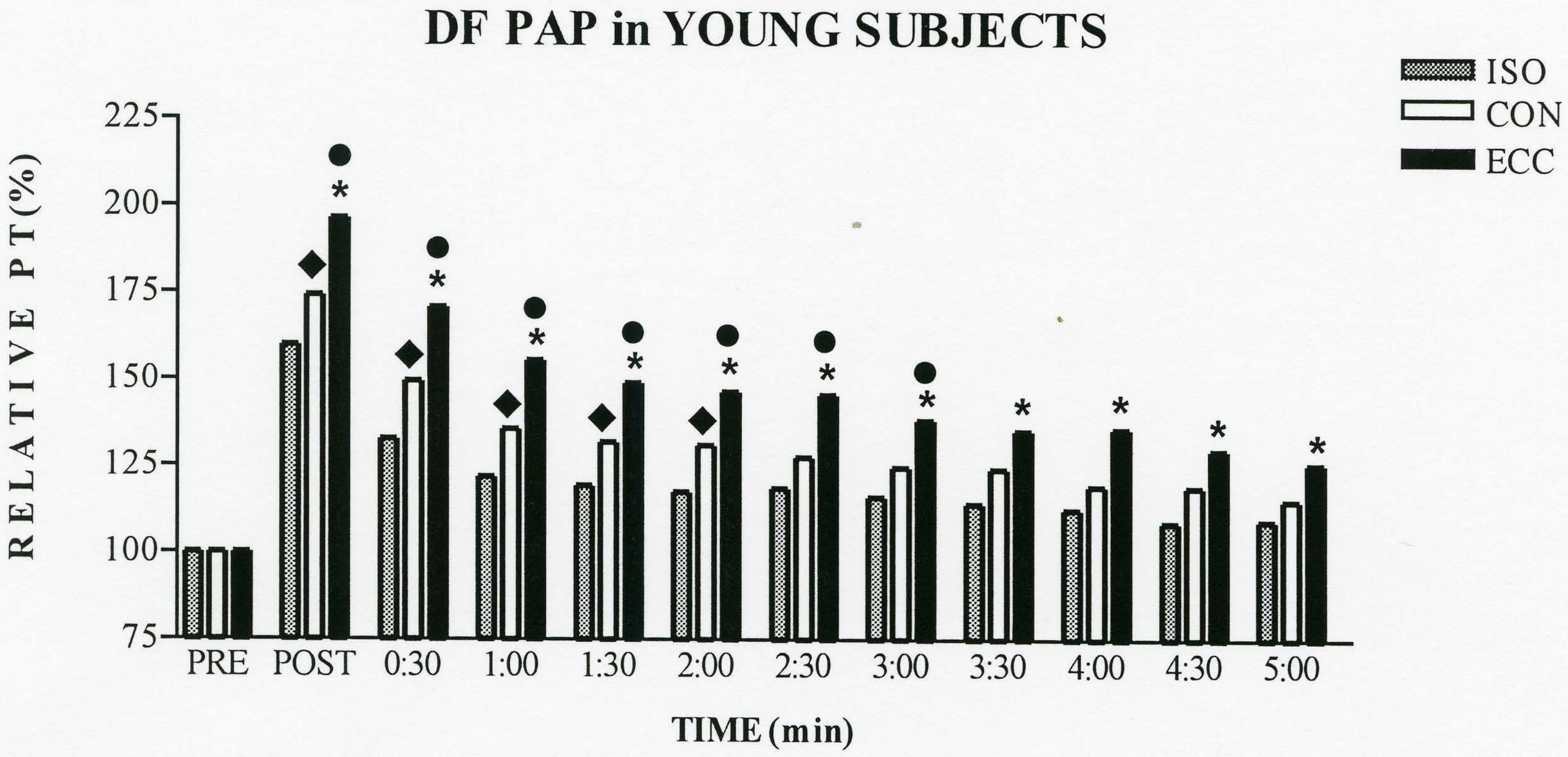

DF PAP in YOUNG SUBJECTS
ISO
CON
ECC
RELATIVE PT(%)
225
200
175
150
125
100
75
PRE
POST
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
TIME (min)

Figure 3.

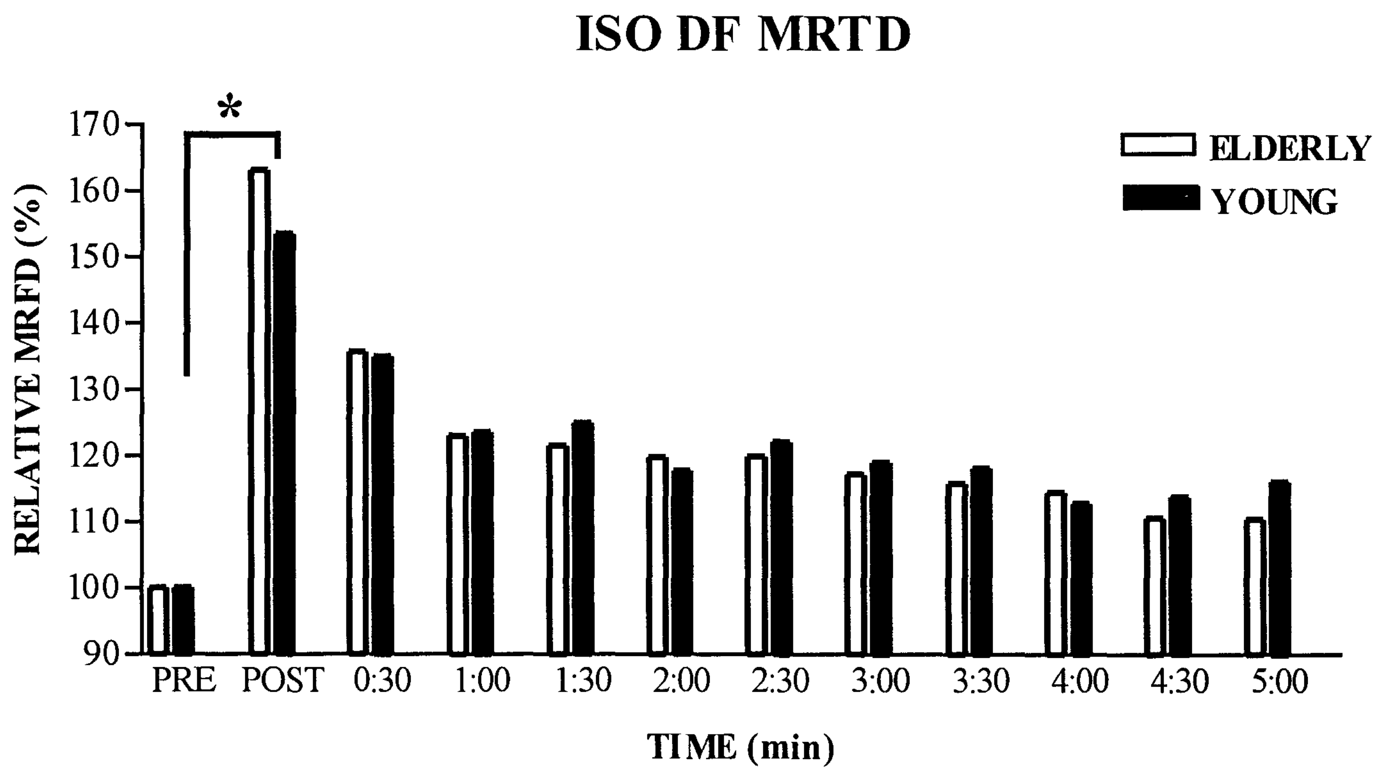

ISO DF MRTD
*
ELDERLY
YOUNG
RELATIVE MRFD (%)
170
160
150
140
130
120
110
100
90
PRE
POST
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
TIME (min)

Figure 4.

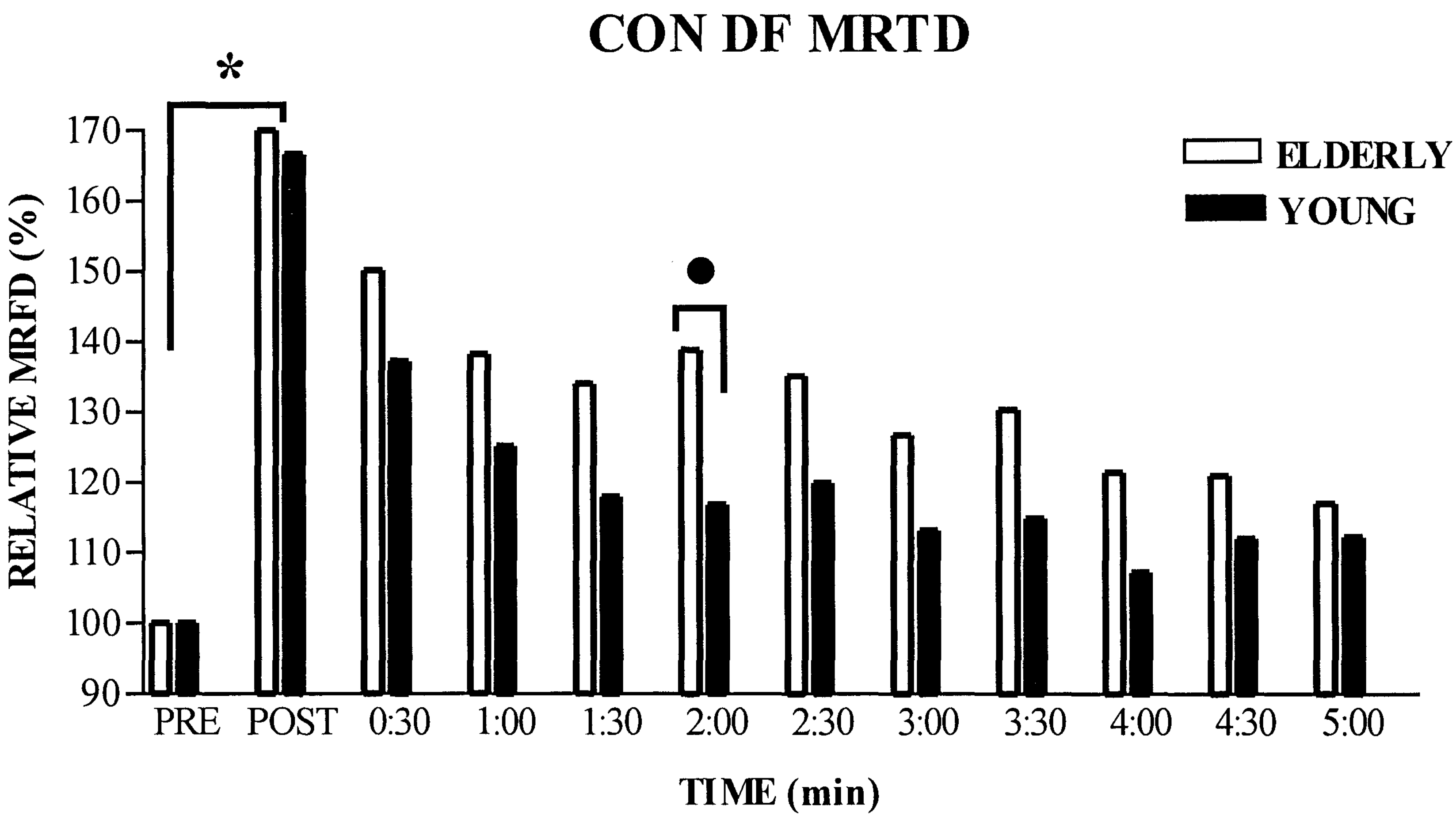

CON DF MRTD
*
170
160
150
140
130
120
110
100
90
RELATIVE MRFD (%)
ELDERLY
YOUNG
PRE
POST
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
TIME (min)

Figure 5.

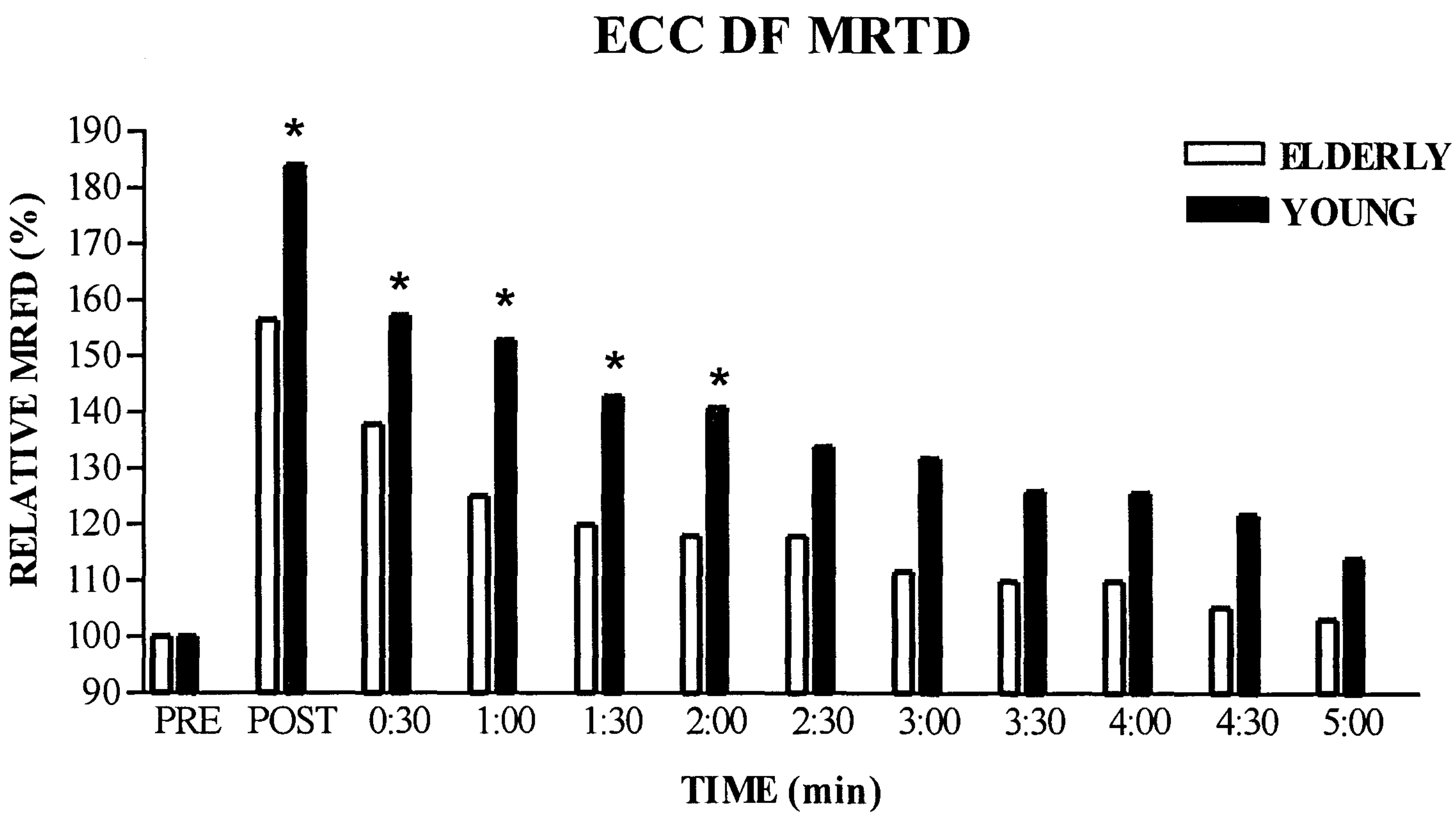

ECC DF MRTD
190
180
170
160
150
140
130
120
110
100
90
RELATIVE MRFD (%)
*
ELDERLY
YOUNG
PRE
POST
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
TIME (min)

Figure 6.

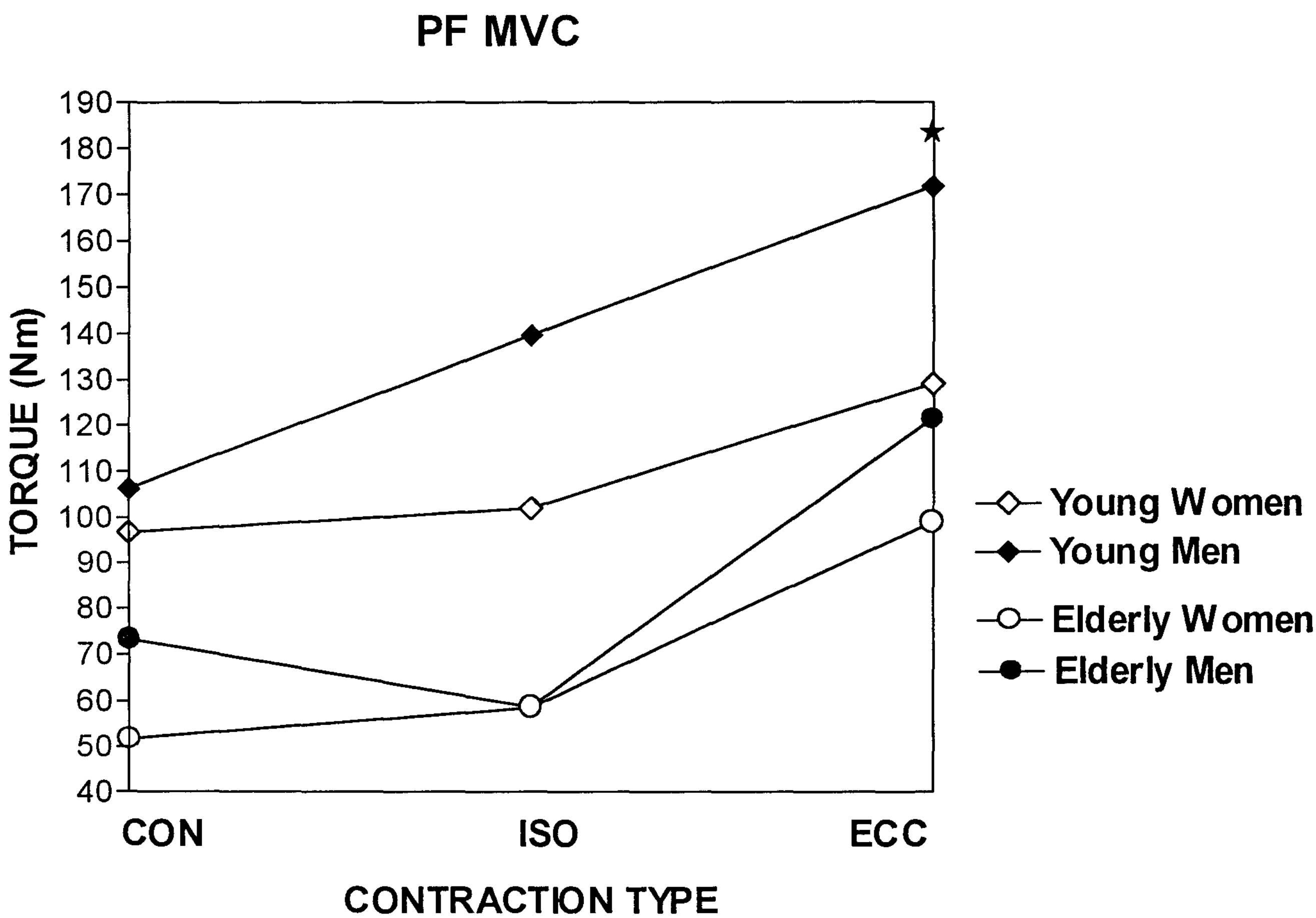

PF MVC
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
TORQUE (Nm)
CON
ISO
ECC
CONTRACTION TYPE
Young Women
Young Men
Elderly Women
Elderly Men

Figure 7.

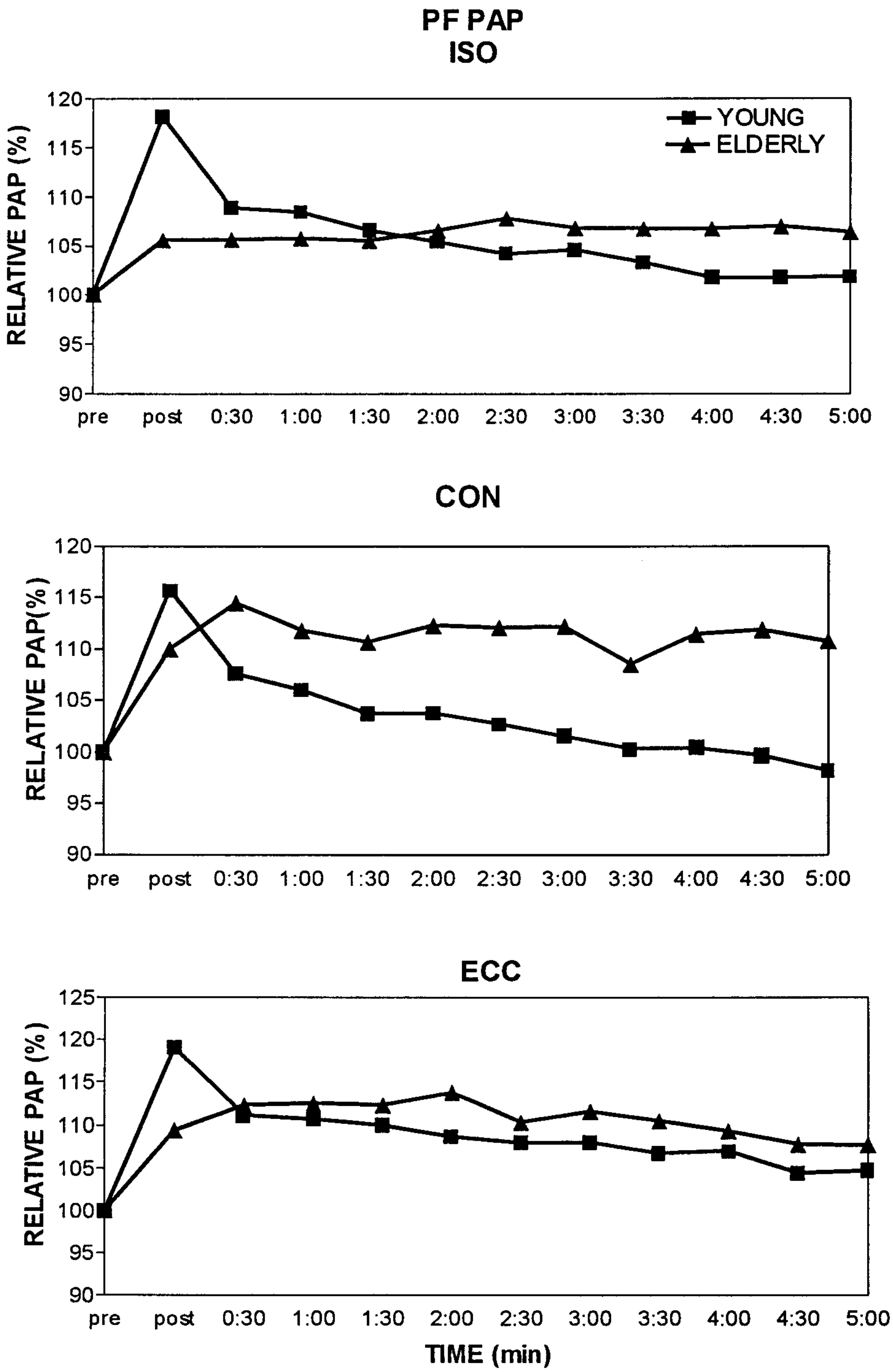

PF PAP
ISO
120
115
110
105
100
95
90
RELATIVE PAP (%)
YOUNG
ELDERLY
pre post 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00
CON
120
115
110
105
100
95
90
RELATIVE PAP(%)
pre post 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00
ECC
125
120
115
110
105
100
95
90
RELATIVE PAP (%)
pre post 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00
TIME (min)

Figure 8.

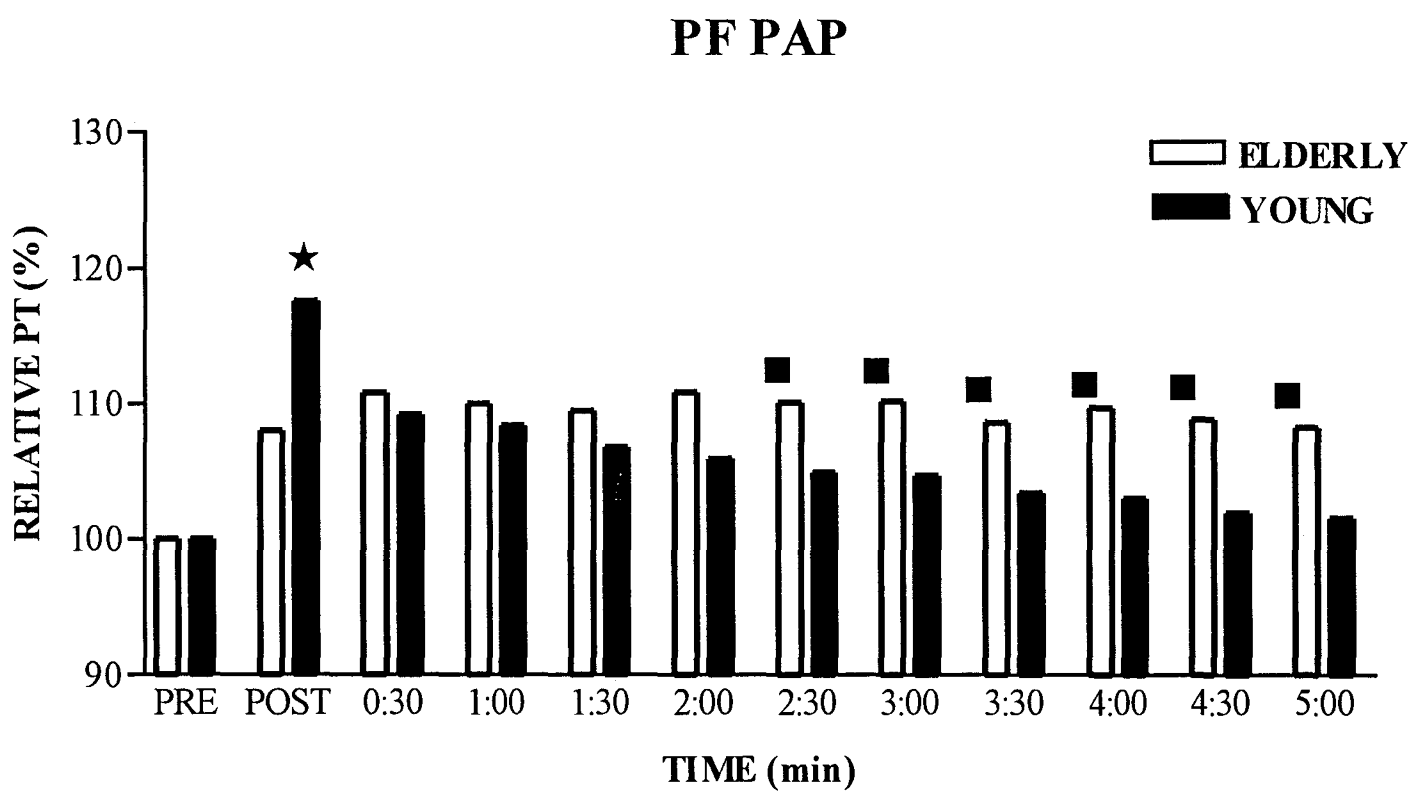

PF PAP
ELDERLY
YOUNG
130
120
110
100
90
RELATIVE PT (%)
PRE
POST
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
TIME (min)

Figure 9.

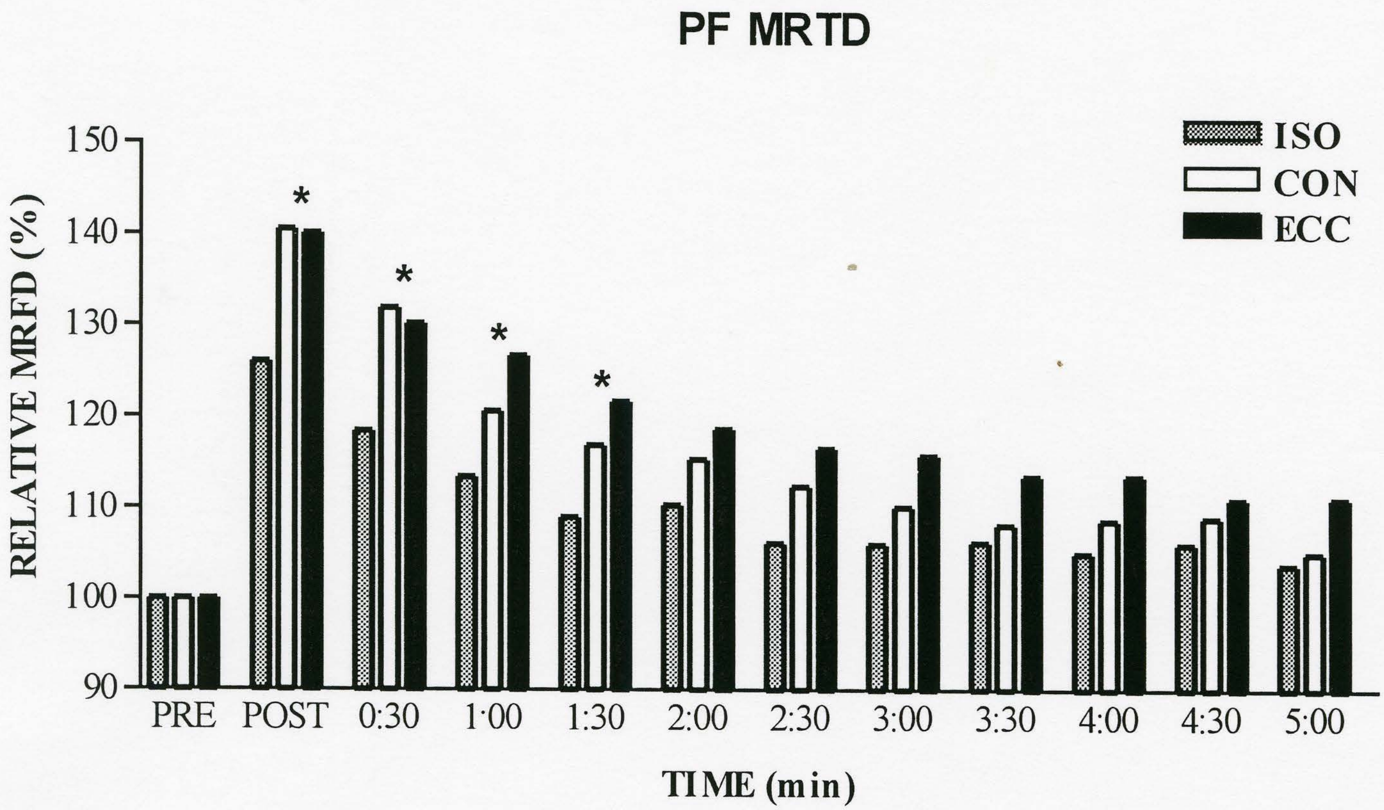

PF MRTD
ISO
CON
ECC
RELATIVE MRFD (%)
150
140
130
120
110
100
90
*
*
*
*
PRE
POST
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
TIME (min)

Figure 10.

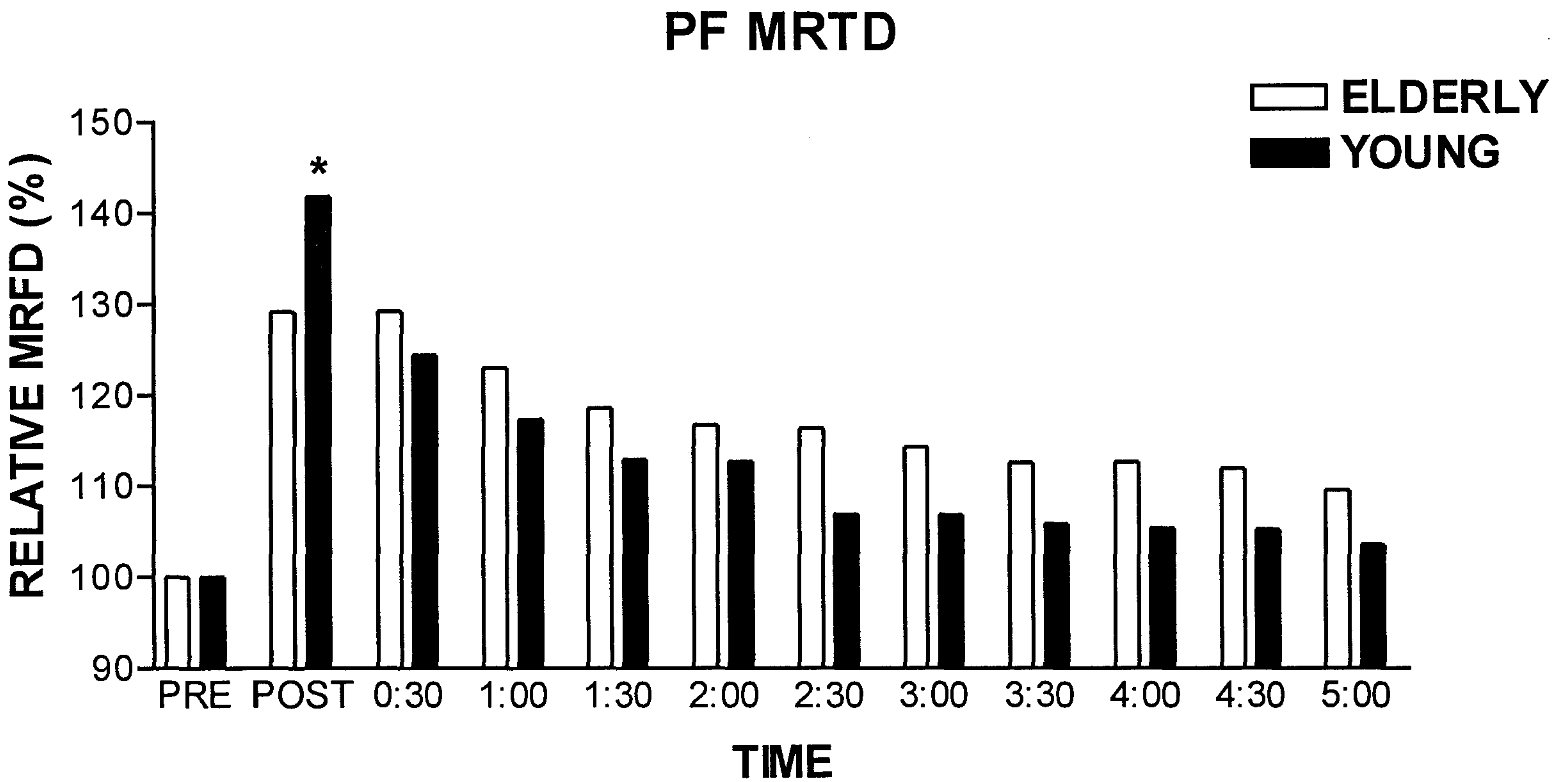

PF MRTD
ELDERLY
YOUNG
RELATIVE MRFD (%)
150
140
130
120
110
100
90
*
PRE
POST
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
TIME

Figure 11.

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APPENDIX A

CONSENT FORM

Department of Kinesiology, McMaster University, Hamilton, Ontario, Canada

Consent Form

PostactivationPotentiation in Human Dorsiflexor and Plantarflexor Muscles Following Isometric, Eccentric and Concentric Contractions: An Age and Gender Comparison

I,______________________________________ , consent to participate in a study directed by Kristen Lougheed and Dr. A. Hicks designed to examine postactivationpotentiation in the ankle muscles of males and females. The results of this study will be made available to the scientific community, but I shall receive no monetary or other benefit from the study results or my participation.

I am aware that I will have electrodes taped to my skin to deliver an electrical stimulation to two different nerves in my lower leg and that I will have my leg strapped into the Biodex dynamometer. Mild electrical shocks will be delivered to my leg and when this happens my leg will contract on its own, but there will be very little discomfort. I understand that apart from this temporary discomfort, there is no long-lasting effects of the muscle stimulation. I will also be asked to make several muscular efforts on my own.

I am aware that I will be expected to come to the laboratory on three different occasions for the various tests that will be performed, and I understand that I may withdraw from the study at any time without repercussions, even after signing this form. Neither my name nor any reference to me will be used in compiling the results nor in publications in any form whatsoever.

I have had the study explained to me by Miss Kristen Lougheed, and understand the nature of the investigation and my rights.

__________________	__________________	__________
Name (print)	**Signature**	**Date**
__________________	__________________	__________
Witness (print)	**Signature**	**Date**

I (one of the investigators) have explained the nature of the study to the subject and believe that he/she understood it.

__________________	__________________	__________
Name (print)	**Signature**	**Date**

APPENDIX B

RAW DATA

SUBJECT CHARACTERISTICS: Age, Height, Weight, and ROM

SUBJECTS	GENDER	AGE	HEIGHT (cm)	WEIGHT (kg)	ROM (°)
1	M	65	100	183	42.5
2	M	76	87	178	51
3	M	76	112.5	184	36.5
4	M	65	81 5	175	55
5	M	66	88.6	180	39
6	M	76	82.5	171	41.5
7	M	82	71.5	168	60
8	M	63	72	166	50.5
9	M	69	78	182	57 5
10	M	68	81	185	44
11	F	68	83	166	38
12	F	74	59.5	167	63.5
13	F	71	87.5	161	57
14	F	72	55.7	168	64.5
15	F	78	61.2	159	64
16	F	63	83.6	165	65
17	F	63	63.5	156	69.5
18	F	75	77 3	171	63
19	F	72	75.8	163	44
20	F	67	61	171	55.5
21	M	35	83.7	184	57 5
22	M	23	57	161	50.5
23	M	23	76.2	182	74.5
24	M	24	76	183	54
25	M	23	78.5	174	57 5
26	M	26	67 5	164	53.5
27	M	26	67 5	175	72
28	M	26	78	181	50
29	M	32	84.5	178	64
30	M	24	79.7	174	61
31	F	23	61	160	63
32	F	22	66.1	172	69.5
33	F	25	55.5	156	52
34	F	22	58.4	160	69
35	F	21	62	170	74
36	F	21	64	171	65
37	F	23	61	172	70
38	F	22	64	175	75
39	F	24	68	173	73
40	F	20	60.5	166	65

BASELINE DF TWITCH CHARACTERISTICS

	PT	MRTD	HRT	TPT	M-WAVE AMP
1	2.70 ± 0.59	45.61 ± 9.23	156.00 ± 11.53	84.67 ± 17 90	1 13 ± 0.10
2	1 53 ± 0.11	79.38 ± 17 66	123.00 ± 28.16	160.00 ± 78.10	1.88 ± 0.31
3	1 11 ± 0.19	86.83 ± 30.13	128.00 ± 1 73	107.67 ± 3.79	1 86 ± 0.27
4	2.04 ± 0.29	82.74 ± 5.32	63.67 ± 13.58	109.33 ± 48.52	1 91 ± 0.06
5	1.28 ± 0.35	102.14 ± 16.94	101 33 ± 8.08	128.67 ± 66.79	1 67 ± 0.08
6	1 69 ± 0.49	89.10 ± 4.58	51 33 ± 11.24	86.67 ± 15.28	1 90 ± 0.19
7	1 45 ± 0.02	94.42 ± 6.59	113.00 ± 23.30	76.00 ± 18.52	1 64 ± 0.19
8	1 52 ± 0.05	94.85 ± 3.65	96.33 ± 7.23	93.00 ± 24.02	2.12 ± 0.65
9	0.89 ± 0.05	166.63 ± 30.24	102.00 ± 13.53	110.00 ± 9.00	1 85 ± 0.11
10	1.41 ± 0.33	65.25 ± 14.36	67 33 ± 17.24	43.00 ± 9.00	2.17 ± 0.20
11	3.35 ± 0.23	43.98 ± 24.60	76.19 ± 15.00	95.33 ± 3.51	2.10 ± 0.04
12	1 34 ± 0.20	46.30 ± 8.03	53.67 ± 34.30	90.00 ± 19.00	1 36 ± 0.54
13	1 00 ± 0.01	88.39 ± 15.22	32.67 ± 26.86	56.331 ± 8.77	1.28 ± 0.17
14	1 74 ± 0.05	66.33 ± 16.55	118.67 ± 14.64	158.00 ± 77 97	2.16 ± 0.11
15	1 38 ± 0.16	47 38 ±27 60	99.52 ±13.79	86.33 ± 28.94	1.55 ± 1 17
16	2.02 ± 0.13	60.9 ± 78.28	69.00 ± 19.97	109.67 ± 79.86	0.87 ± 0.05
17	2.12 ± 0.06	81 36 ± 25.26	66.67 ± 18.48	62.00 ± 2.50	1.68 ± 0.12
18	1 35 ± 0.10	43.10 ± 11 16	67 00 ± 16.09	77 00 ± 21.28	1.26 ± 0.08
19	1.27 ± 0.05	56.48 ± 27.20	63.33 ± 14.74	85.67 ± 16.65	1 32 ± 0.06
20	1.29 ± 0.06	36.27 ± 2.71	127 67 ± 10.41	106.33 ± 3.21	1 67 ± 0.04
21	1 69 ± 0.22	147.28 ± 63.64	81 48 ± 34.43	46.74 ± 4.20	12.77 ± 0.79
22	2.50 ± 0.43	72.94 ± 26.94	73.62 ± 7.22	93.10 ± 6.54	11 86 ± 0.34
23	3.55 ± 1.45	88.79 ± 23.02	65.08 ± 3.03	73.04 ± 5.38	11 34 ± 0.76
24	2.97 ± 0.24	79.34 ± 14.50	79.67 ± 3.28	75.84 ± 18.85	9.35 ± 0.57
25	3.76 ± 0.29	108.9 ± 46.31	78.72 ± 14.44	73.17 ± 18.80	8.53 ± 0.55
26	3.46 ± 0.18	78.12 ± 4.98	82.22 ± 5.90	103.96 ± 10.38	8.11 ± 0.99
27	3.67 ± 0.26	86.56 ± 6.57	71 03 ± 14.99	73.311 ± 1 03	13.05 ± 1 19
28	3.69 ± 0.14	90.05 ± 7.26	72.05 ± 21 82	76.95 ± 3.86	6.34 ± 0.08
29	6.29 ± 0.62	162.85 ± 24.43	88.31 ± 16.08	100.12 ± 3.83	10.58 ± 1.25
30	2.09 ± 0.52	62.31 ± 13.10	54.15 ± 3.35	57.41 ± 5.65	12.75 ± 2.73
31	2.10 ± 0.34	67.05 ± 3.63	71 07 ± 4.85	57 14 ± 10.90	10.94 ± 0.47
32	1 54 ± 0.17	86.70 ± 14.70	58.81 ± 32.08	52.52 ± 19.48	10.73 ± 0.72
33	3.57 ± 0.64	87.23 ± 1 77	76.34 ± 5.58	84.33 ± 11 32	10.29 ± 0.56
34	2.66 ± 0.70	76.94 ± 23.64	69.35 ± 19 72	80.94 ±16.06	11.68 ± 1.20
35	2.55 ± 0.16	91 61 ± 20.98	74.60 ± 1.22	55.64 ± 10.37	10.52 ± 2.35
36	2.37± 0.32	62.98 ± 15.85	52.65 ± 2.42	78.89 ± 13.22	11 86 ± 1.45
37	2.61 ± 0.26	84.65 ± 16.22	94.32 ± 10.19	80.75 ± 12.53	9.88 ± 0.17
38	1 33 ± 0.17	47.40 ± 7.40	55.79 ± 11.29	73.04 ± 11.66	11 37 ± 1 08
39	1 55 ± 0.19	85.77 ± 15.86	54.64 ± 6.76	53.98 ± 13.81	9.69 ± 1.25
40	1 42 ± 0.15	75.86 ± 5.73	48.27 ± 6.84	44.69 ± 1 77	8.42 ± 0.23

BASELINE PF TWITCH CHARACTERISTICS

	PT	MRTD	HRT	TPT	MWAVEAMP
1	18.99 ± 1 61	389.10 ± 64.43	101 07 ± 9.19	108.73 ± 20.15	6.27 ± 0.43
2	10.35 ± 2.99	194.40 ± 115.05	109.33 ± 8.57	129.96 ± 38.81	8.46 ± 8.35
3	20.40 ± 1.63	445.98 ± 68.66	121 03 ± 48.71	96.53 ± 33.93	7.62 ± 4.58
4	19.07 ± 5.46	445.66 ± 102.49	96.19 ± 12.04	105.00 ± 20.88	10.42 ± 4.20
5	12.18 ± 5.45	262.86 ± 103.03	91 36 ± 2.34	123.14 ± 21 94	7 90 ± 1 95
6	12.25 ± 2.55	273.70 ± 49.99	94.91 ± 14.59	107 85 ± 17.55	5.59 ± 0.20
7	12.85 ± 2.44	279.70 ± 35.18	107 38 ± 25.64	126.25 ± 25.22	8.89 ± 4.09
8	10.93 ± 3.56	232.61 ± 91.20	116.14 ± 35.02	89.12 ± 4.63	11 64 ± 5.81
9	19.09 ± 8.20	442.63 ± 226.15	92.24 ± 10.12	112.62 ± 20.16	7 87 ± 0.42
10	20.0 ± 12.98	464.83 ± 53.55	111 13 ± 14.40	97 85 ± 2.83	9.32 ± 2.03
11	11.28 ± 0.88	209.94 ± 88.32	105.80 ± 28.44	134.74 ± 8.26	5.11 ± 2.46
12	14.97 ± 2.73	386.00 ± 96.16	119.48 ± 29.92	131.46 ± 36.48	5.74 ± 2.19
13	6.30 ± 1 54	147 96 ± 57 95	109.37 ± 32.92	113.63 ± 22.57	3.54 ± 0.98
14	15.02 ± 3.65	350.66 ± 43.57	90.82 ± 8.83	136.85 ± 38.58	7.40 ± 3.20
15	12.01 ± 1 00	213.67 ± 150.50	96.07 ± 2.24	153.62 ± 74.93	5.56 ± 3.19
16	15.02 ± 1 55	359.05 ± 62.51	114.98 ± 23.93	96.40 ± 1 03	5.22 ± 2.99
17	11 53 ± 1 88	236.86 ± 65.70	98.86 ± 21.21	122.12 ± 29.62	6.66 ± 2.04
18	12.40 ± 1 77	297 03 ± 110.42	99.41 ± 14.12	110.97 ± 39.03	6.08 ± 1 70
19	8.03 ± 6.65	182.70 ± 189.04	117 00 ± 17 53	106.45 ± 13.39	3.63 ± 0.68
20	14.40 ± 3.30	309.50 ± 65.30	104.76 ± 17 98	144.67 ± 17 10	6.47 ± 0.65
21	20.98 ± 0.47	460.27 ± 85.75	101 79 ± 19.56	108.14 ± 25.94	6.66 ± 2.06
22	13.54± 3.05	298.53 ± 136.66	92.42 ± 17 00	111 92 ± 45.10	12.84 ± 4.75
23	19.25 ± 2.62	482.76 ± 102.93	100.84 ± 41 67	82.08 ± 18.21	5.74 ± 4.30
24	19.65 ± 3.70	520.67 ± 138.87	80.82 ± 10.04	105.58 ± 18.55	8.44 ± 4.99
25	15.71 ± 4.85	365.76 ± 125.37	93.00 ± 13.08	106.67 ± 22.81	7 65 ± 3.57
26	12.26 ± 2.60	262.84 ± 90.35	110.72 ± 10.88	101 85 ± 31.55	5.20 ± 0.45
27	16.58 ± 3.32	331 03 ± 40.76	100.26 ± 21 71	107 96 ± 19.75	12.74 ± 2.67
28	14.68 ± 3.49	355.93 ± 98.62	106.35 ± 21 93	89.86 ± 1 18	9.76 ± 1 74
29	22.20 ± 6.55	506.49 ± 164.03	82.74 ± 8.44	109.96 ± 27 75	6.30 ± 2.38
30	16.68 ± 3.87	453.80 ± 21 00	104.03 ± 23.96	106.90 ± 18.31	8.63 ± 1.65
31	13.23 ± 3.47	285.24 ± 50.56	85.09 ± 25.09	137 55 ± 32.47	6.05 ± 1 36
32	11 31 ± 2.22	268.80 ± 132.38	105.81 ± 20.42	119.36 ± 36.36	3.97 ± 3.00
33	9.99 ± 2.09	245.18 ± 13.56	92.31 ± 14.52	112.73 ± 16.47	6.10 ± 0.29
34	16.18 ± 3.04	403.56 ± 47 05	88.25 ± 11.55	125.46 ± 36.73	7 71 ± 3.41
35	14.11 ± 0.50	373.12 ± 111 36	90.36 ± 4.19	100.58 ± 17 75	7.69 ± 3.02
36	16.41 ± 1 00	367 69 ± 85.23	96.60 ± 30.96	112.33 ± 16.05	3.72 ± 2.79
37	11 15 ± 0.95	237 31 ± 46.22	94.70 ± 19.31	127.67 ± 5.53	6.95 ± 2.31
38	12.31 ± 3.95	302.08 ± 119 97	102.33 ± 10.02	89.67 ± 33.25	6.25 ± 1 09
39	13.24 ± 7.46	354.74 ± 245.82	108.69 ± 25.28	106.57 ± 16.32	5.04 ± 0.57
40	14.14 ± 1 17	336.39 ± 33.07	93.70 ± 35.78	140.41 ± 24.88	7.45 ± 4.01

MVC DATA

ELDERLY DATA

SUB	DORSIFLEXORS			PLANTARFLEXORS		
	ISO	CON	ECC	ISO	CON	ECC
1	16.63	14.55	70.22	81 08	64.47	142.28
2	25.81	10.47	64.83	92.59	22.41	108.81
3	44.72	30.38	74.23	110.33	76.46	113.78
4	21 99	10.83	68.18	57 59	58.46	93.57
5	17.24	21 64	61.50	67 74	43.98	116.48
6	15.26	17 03	54.79	61.2	59.11	61.2
7	22.73	17 84	53.97	40.8	57 93	134
8	32.20	6.96	57 08	73.1	83.35	123.54
9	32.15	19.38	42 65	134.05	139.49	166.78
10	33.77	22.59	59.34	149.96	125.61	154.34
11	25.11	15.14	48.36	37 93	25.28	78.64
12	30.49	14.77	47 07	71 36	51 96	85.31
13	11 86	12.19	52.87	30.03	70.58	74.11
14	20.71	14.37	60.87	56.45	59.76	141 8
15	18.02	29.43	58.01	49.43	17.44	79.79
16	14.92	19.94	56.30	67 13	71 32	114.39
17	20.79	11.26	46.82	89.76	74.8	127.42
18	17.42	15.04	48.61	62.32	55.12	105.88
19	19.47	9.75	57 90	45.6	30.6	73.2
20	18.16	10.04	58.84	74.85	59.33	108.37

YOUNG DATA

SUB	DORSIFLEXORS			PLANTARFLEXORS		
	ISO	CON	ECC	ISO	CON	ECC
1	43.08	33.22	59.82	150.39	119.09	117 03
2	34.44	24.72	49 86	95.34	57 76	95.29
3	39.01	26.19	61 03	148.61	132.61	179.42
4	23.19	25.26	52.06	216.39	165.13	269.4
5	39.25	28.18	57 76	56.15	50.35	148.34
6	28.00	17 18	52.33	124.29	71 611	135.51
7	36.05	21 84	48.60	137 14	124.24	165.48
8	38.01	32.49	57 63	124.54	107.28	188.8
9	51 06	34.18	56.42	148.43	101 61	220.97
10	37 05	22.93	34.27	194.12	131 95	197 12
11	30.72	16.18	51 72	109 94	72.8	128.86
12	28.68	18.54	47 53	114.86	95.74	155.27
13	27.27	14.57	46.58	89.19	100.57	180.79
14	30.12	13.63	48.82	90.54	175.54	142.98
15	34.65	29.22	41 16	106.24	78.2	60.99
16	33.88	21 10	68.90	117 87	88.22	159.24
17	34.44	17 00	58.33	109.94	119.16	127 64
18	27 90	19 07	57.24	91 02	78.62	114.25
19	26.41	15.55	54.10	123.072	65.26	147.28
20	23.86	14.02	42.23	66.13	91 89	72.69

ELDERLY DF ISOMETRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	2.8	4.3	3.2	3.2	3.0	3.2	3.2	2.8	2.9	2.6	2.6	2.6
2	M	1.6	2.0	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.6
3	M	1.3	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3
4	M	2.2	4.1	4.3	4.1	3.9	3.8	3.1	2.5	2.1	2.1	2.1	2.1
5	M	1.7	1.9	1.8	1.8	1.7	1.3	1.3	1.2	1.2	1.6	1.2	1.3
6	M	1.3	1.5	1.4	1.3	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3
7	M	1.5	1.8	1.8	1.7	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5
8	M	1.6	3.7	3.5	2.9	2.9	2.9	2.5	2.5	2.3	2.2	1.9	1.9
9	M	0.9	1.6	1.9	1.7	1.8	1.6	1.6	1.5	1.5	1.5	1.3	1.2
10	M	1.0	4.1	3.2	3.0	3.1	3.1	3.1	2.9	3.0	2.6	2.5	2.3
11	F	3.2	5.2	4.6	4.1	4.0	3.9	3.8	3.6	3.7	3.5	3.7	3.6
12	F	1.6	1.9	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5
13	F	1.0	2.1	2.1	1.9	1.4	1.3	1.1	1.0	1.0	1.0	1.0	1.0
14	F	1.7	2.0	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.7
15	F	1.4	1.9	1.7	1.7	1.7	1.5	1.4	1.4	1.4	1.4	1.4	1.4
16	F	2.1	3.9	2.8	2.6	2.5	2.5	2.5	2.5	2.5	2.3	2.2	2.1
17	F	2.0	3.6	3.5	3.2	3.0	3.1	2.9	3.0	2.6	2.5	2.4	2.0
18	F	1.5	1.7	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.3	1.3
19	F	1.2	1.3	1.4	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
20	F	1.2	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5

ELDERLY DF CONCENTRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	3.2	4.2	4.3	4.3	4.0	3.8	3.8	3.7	3.7	3.5	3.3	3.3
2	M	1.6	1.8	1.7	1.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
3	M	1.0	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.1	1.1	1.1	1.0
4	M	2.2	3.3	3.5	3.2	3.2	2.9	2.8	2.6	2.5	2.3	2.3	2.2
5	M	1.0	1.4	1.3	1.3	1.3	1.3	1.3	1.1	1.1	1.1	1.0	1.1
6	M	1.4	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
7	M	1.4	2.0	1.9	1.9	1.8	1.7	1.6	1.7	1.6	1.6	1.5	1.4
8	M	1.5	2.3	2.3	2.8	2.2	2.3	2.2	2.1	2.0	1.9	1.6	1.7
9	M	0.8	1.1	1.1	1.1	1.1	1.0	0.9	1.0	1.0	0.9	0.9	0.9
10	M	1.6	3.2	3.1	3.0	3.1	3.0	2.9	2.9	2.7	2.1	2.1	2.1
11	F	3.2	4.6	4.6	4.3	4.2	4.1	4.4	4.3	4.4	4.2	4.0	3.9
12	F	1.2	2.5	2.2	2.3	2.1	1.9	1.9	1.6	1.6	1.5	1.5	1.5
13	F	1.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
14	F	1.8	1.9	1.9	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
15	F	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2
16	F	2.1	4.0	3.5	3.6	3.2	3.2	3.0	3.0	2.9	2.9	2.6	2.5
17	F	2.1	3.1	3.9	3.7	3.2	3.2	3.3	3.1	2.9	2.6	2.3	2.1
18	F	1.3	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3
19	F	1.3	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.6	1.5	1.4	1.3
20	F	1.3	1.8	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5

ELDERLY DF ECCENTRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	2.1	4.9	3.8	3.5	3.5	3.0	3.1	3.2	2.9	3.0	2.9	2.6
2	M	1.4	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
3	M	1.0	1.6	1.6	1.3	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.0
4	M	1.7	3.6	1.9	1.7	1.5	1.6	1.5	1.3	1.2	1.2	1.3	1.0
5	M	1.2	1.4	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
6	M	1.5	3.2	3.5	3.2	3.2	3.0	2.9	2.9	2.6	2.5	2.5	2.2
7	M	1.5	1.8	1.6	1.5	1.6	1.5	1.5	1.5	1.5	1.5	1.4	1.4
8	M	1.5	3.2	3.1	2.8	2.7	2.7	2.2	2.3	2.0	1.9	1.9	1.5
9	M	0.9	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.9
10	M	1.6	4.2	4.1	4.0	3.2	3.2	3.0	3.1	3.0	2.9	2.2	2.1
11	F	3.6	6.3	6.0	5.9	5.6	5.3	5.0	5.0	5.3	4.9	4.8	4.6
12	F	1.2	1.9	1.9	1.6	1.7	1.6	1.5	1.5	1.5	1.4	1.4	1.4
13	F	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
14	F	1.7	2.0	2.1	1.9	1.9	1.8	1.8	1.8	1.8	1.7	1.8	1.7
15	F	1.5	2.6	2.4	2.1	2.0	1.9	1.9	2.1	2.1	1.9	1.9	1.8
16	F	1.9	4.0	3.5	3.2	3.2	3.2	3.2	2.6	2.6	2.5	2.1	2.2
17	F	2.2	4.9	4.6	4.0	3.2	3.1	3.0	2.5	2.2	2.2	2.1	2.1
18	F	1.3	1.9	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.5	1.4	1.3
19	F	1.2	1.5	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.3	1.2	1.2
20	F	1.3	2.2	2.1	1.9	1.6	1.4	1.3	1.2	1.2	1.2	1.2	1.9

ELDERLY DF ISOMETRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	43.2	83.4	68.4	63.5	62.5	61.2	63.0	54.5	57.1	56.3	53.5	52.4
2	M	64.1	104.7	83.9	78.5	73.8	72.0	78.0	72.5	72.0	69.5	68.4	70.0
3	M	107.8	157.2	122.2	120.1	121.4	120.4	115.5	116.8	112.4	106.5	112.4	109.1
4	M	78.5	146.6	132.8	118.6	121.9	115.5	110.6	114.7	108.3	107.8	101.9	101.9
5	M	92.4	133.3	120.1	118.6	116.0	116.8	114.3	112.7	110.6	106.0	106.5	105.5
6	M	92.4	109.6	87.5	82.1	82.1	90.6	93.4	93.9	88.5	91.1	84.4	90.6
7	M	100.6	153.1	122.2	112.7	108.3	113.2	116.5	110.9	107.8	109.1	106.5	97.5
8	M	94.2	168.5	160.3	134.6	130.4	127.6	124.0	123.2	120.4	119.1	116.5	120.4
9	M	132.3	217.1	183.4	172.1	166.7	168.8	163.4	147.7	157.2	144.1	140.7	148.4
10	M	49.4	84.9	65.3	60.5	55.1	54.0	54.5	52.7	54.5	51.7	53.3	51.2
11	F	15.6	27.6	24.9	24.3	20.6	20.4	18.8	18.8	18.3	19.2	20.2	17.7
12	F	43.7	63.5	49.4	49.9	45.0	45.5	46.3	49.4	48.6	47.3	45.5	45.8
13	F	73.6	112.7	99.8	97.5	91.1	90.3	89.8	88.5	89.3	88.0	85.7	89.8
14	F	72.4	86.7	75.6	73.6	75.6	77.2	80.3	80.8	79.8	81.0	74.9	76.7
15	F	64.8	102.9	91.1	79.8	83.4	76.7	73.6	73.1	75.4	68.4	74.4	66.6
16	F	67.7	92.4	73.8	73.8	77.2	82.6	82.8	81.6	85.2	81.0	78.0	77.2
17	F	73.8	104.2	88.0	73.8	74.4	67.7	80.3	73.1	70.2	70.7	75.6	70.0
18	F	36.3	53.3	38.6	29.1	32.7	26.5	27.3	29.1	26.0	28.3	17.0	27.3
19	F	36.5	106.5	88.5	73.8	67.7	69.5	64.8	57.6	57.6	64.1	55.1	51.7
20	F	33.7	58.1	42.2	40.4	41.4	38.6	40.1	44.5	41.4	38.6	38.3	40.4

ELDERLY DF CONCENTRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	37.8	77.7	79.4	79.0	74.9	75.6	68.4	67.9	59.4	56.9	55.1	53.5
2	M	75.4	120.4	88.5	70.0	73.6	65.3	60.7	63.0	62.5	59.4	58.9	55.8
3	M	100.4	142.0	134.6	134.3	134.6	148.4	149.0	144.1	140.7	143.0	136.9	135.1
4	M	81.0	118.3	99.3	96.0	98.3	97.5	95.7	94.2	96.0	89.8	88.8	86.2
5	M	92.4	126.3	107.3	107.3	106.0	107.8	101.6	101.6	97.5	93.4	94.7	94.7
6	M	83.9	88.8	82.1	82.1	86.7	84.9	88.8	92.1	92.1	88.5	89.3	84.4
7	M	87.5	177.5	150.2	140.7	131.5	129.9	125.5	121.9	123.2	124.5	123.7	115.5
8	M	91.6	168.8	162.9	144.6	135.1	122.7	116.0	107.3	122.7	120.4	120.1	113.7
9	M	178.3	321.6	275.5	245.7	232.1	232.6	216.9	222.3	213.3	207.9	205.0	200.4
10	M	68.9	142.0	111.9	97.5	89.8	90.6	86.2	84.4	81.6	79.2	79.2	75.4
11	F	59.4	102.4	82.6	80.3	74.9	77.2	78.0	74.4	70.7	75.4	73.6	68.9
12	F	39.9	65.6	65.9	59.4	54.5	53.8	50.9	48.4	47.6	31.9	35.0	34.2
13	F	87.6	131.5	119.6	116.5	117.8	123.2	120.1	116.8	115.5	109.1	116.0	111.4
14	F	79.0	112.4	92.1	83.9	90.6	92.1	90.3	88.5	89.3	90.6	87.0	83.4
15	F	61.7	85.2	85.4	82.6	82.1	81.0	86.2	82.8	83.6	80.8	79.5	79.2
16	F	51.7	99.3	89.8	76.7	73.6	74.4	81.6	75.6	76.7	73.8	87.5	73.8
17	F	60.7	151.8	143.0	129.7	124.0	124.0	123.7	120.9	111.9	112.7	105.2	105.5
18	F	37.0	72.5	60.5	46.3	46.8	43.2	40.1	34.5	40.4	37.3	36.3	40.1
19	F	45.5	95.7	66.6	60.5	61.2	59.9	54.5	57.1	55.1	55.1	52.2	51.7
20	F	39.1	51.7	48.6	37.3	39.6	38.3	37.8	38.6	45.8	41.9	39.1	39.6

ELDERLY DF ECCENTRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	55.8	82.6	78.5	73.6	67.7	67.7	67.9	62.3	61.7	61.2	53.3	54.0
2	M	98.7	112.9	86.7	80.3	73.1	68.4	66.1	66.1	61.2	62.5	56.9	55.8
3	M	52.3	147.2	137.1	141.8	132.8	135.3	134.0	131.7	135.8	122.2	124.5	125.5
4	M	88.7	97.0	86.7	76.2	76.2	70.2	76.7	72.0	64.1	56.3	63.5	58.7
5	M	121.7	133.8	126.8	120.1	125.5	120.4	119.1	114.2	110.6	107.0	113.7	109.1
6	M	91.1	116.0	100.6	95.2	76.7	76.2	73.6	76.7	82.8	72.0	81.6	66.6
7	M	95.2	221.8	164.4	156.2	148.4	145.9	142.3	141.2	138.2	134.0	132.8	131.5
8	M	98.8	209.2	185.7	161.3	150.2	145.4	143.6	136.9	134.6	129.9	132.2	125.8
9	M	189.3	279.1	230.8	202.2	205.6	193.7	194.2	193.2	185.5	184.2	177.0	172.9
10	M	77.4	108.8	107.0	100.1	94.2	95.7	91.3	82.6	78.7	78.7	65.6	62.5
11	F	56.9	90.3	71.8	68.9	70.0	49.1	66.6	60.5	48.6	79.8	52.2	62.5
12	F	55.3	75.6	52.7	50.4	48.6	58.7	55.3	54.0	54.5	50.9	53.3	50.9
13	F	104.0	136.9	137.1	131.7	130.4	132.8	130.4	129.9	128.1	123.7	123.2	125.0
14	F	47.6	95.2	87.0	74.4	75.4	75.4	73.1	70.7	70.7	71.8	66.1	63.5
15	F	15.6	27.8	26.7	21.3	20.4	20.3	20.7	18.8	18.3	19.2	17.9	18.3
16	F	63.5	97.5	89.8	82.8	82.6	80.8	80.8	66.1	76.7	73.8	70.0	75.4
17	F	109.5	133.5	124.0	117.3	114.7	113.2	113.7	109.1	106.0	101.9	97.8	95.7
18	F	56.0	72.0	59.4	38.6	36.0	34.2	25.5	25.2	19.3	24.7	28.8	18.3
19	F	87.5	111.9	97.5	84.9	78.0	75.6	78.0	73.8	71.3	72.0	67.9	64.1
20	F	36.0	60.5	55.3	46.3	44.5	49.1	49.9	41.9	45.0	46.3	43.2	42.2

ELDERLY DF ISOMETRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	64.0	42.0	57.0	78.0	63.0	68.0	78.0	78.0	87.0	70.0	77.0	83.0
2	M	120.0	81.0	80.0	104.0	112.0	114.0	114.0	116.0	108.0	108.0	111.0	115.0
3	M	106.0	42.0	68.0	73.0	79.0	75.0	79.0	80.0	88.0	91.0	89.0	87.0
4	M	165.0	145.0	148.0	180.0	190.0	221.0	203.0	226.0	177.0	179.0	185.0	182.0
5	M	81.0	76.0	82.0	77.0	77.0	78.0	90.0	86.0	81.0	77.0	98.0	79.0
6	M	100.0	103.0	76.0	70.0	93.0	102.0	102.0	104.0	95.0	88.0	108.0	100.0
7	M	55.0	74.0	72.0	70.0	94.0	83.0	85.0	91.0	89.0	99.0	98.0	83.0
8	M	85.0	64.0	66.0	70.0	78.0	79.0	75.0	80.0	81.0	85.0	83.0	83.0
9	M	110.0	98.0	101.0	106.0	126.0	111.0	113.0	107.0	111.0	112.0	118.0	101.0
10	M	34.0	72.0	46.0	43.0	41.0	46.0	42.0	49.0	41.0	37.0	38.0	45.0
11	F	99.0	79.0	76.0	96.0	98.0	97.0	102.0	90.0	97.0	100.0	97.0	99.0
12	F	85.0	64.0	66.0	70.0	78.0	79.0	75.0	80.0	81.0	85.0	83.0	83.0
13	F	45.0	36.0	44.0	38.0	29.0	30.0	41.0	38.0	36.0	47.0	39.0	40.0
14	F	248.0	150.0	163.0	226.0	112.0	231.0	115.0	234.0	233.0	230.0	233.0	227.0
15	F	105.0	95.0	110.0	105.0	97.0	108.0	102.0	110.0	111.0	100.0	107.0	108.0
16	F	201.0	196.0	182.0	185.0	196.0	200.0	185.0	205.0	205.0	206.0	200.0	201.0
17	F	62.0	81.0	80.0	79.0	77.0	74.0	64.0	90.0	84.0	72.0	82.0	61.0
18	F	100.0	85.0	81.0	91.0	92.0	87.0	95.0	96.0	101.0	102.0	100.0	110.0
19	F	91.0	70.0	64.0	62.0	50.0	48.0	87.0	86.0	59.0	91.0	97.0	91.0
20	F	104.0	106.0	108.0	103.0	100.0	101.0	98.0	111.0	103.0	103.0	104.0	103.0

ELDERLY DF CONCENTRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	95.0	85.0	83.0	82.0	90.0	91.0	94.0	90.0	91.0	91.0	92.0	91.0
2	M	250.0	224.0	220.0	238.0	243.0	243.0	250.0	233.0	247.0	248.0	252.0	255.0
3	M	105.0	74.0	75.0	106.0	94.0	106.0	105.0	84.0	101.0	102.0	103.0	104.0
4	M	87.0	63.0	66.0	64.0	56.0	92.0	75.0	78.0	70.0	86.0	76.0	61.0
5	M	205.0	185.0	179.0	179.0	65.0	171.0	97.0	129.0	114.0	80.0	93.0	203.0
6	M	90.0	75.0	76.0	75.0	78.0	76.0	82.0	91.0	73.0	103.0	86.0	77.0
7	M	90.0	92.0	93.0	80.0	76.0	95.0	92.0	97.0	13.0	96.0	94.0	95.0
8	M	74.0	55.0	51.0	54.0	70.0	75.0	76.0	60.0	66.0	53.0	56.0	55.0
9	M	101.0	92.0	91.0	107.0	115.0	109.0	128.0	117.0	126.0	117.0	119.0	116.0
10	M	43.0	69.0	61.0	43.0	41.0	46.0	42.0	49.0	41.0	37.0	38.0	45.0
11	F	92.0	105.0	106.0	98.0	109.0	101.0	102.0	101.0	109.0	106.0	98.0	97.0
12	F	74.0	55.0	51.0	54.0	70.0	75.0	76.0	60.0	66.0	53.0	56.0	55.0
13	F	46.0	42.0	43.0	39.0	38.0	38.0	35.0	35.0	59.0	48.0	53.0	55.0
14	F	111.0	101.0	113.0	106.0	104.0	104.0	108.0	109.0	108.0	111.0	110.0	108.0
15	F	101.0	85.0	82.0	91.0	89.0	92.0	96.0	89.0	91.0	91.0	92.0	95.0
16	F	53.0	55.0	71.0	70.0	64.0	56.0	59.0	58.0	52.0	52.0	61.0	62.0
17	F	62.0	78.0	82.0	77.0	79.0	76.0	69.0	69.0	62.0	80.0	96.0	66.0
18	F	73.0	74.0	51.0	65.0	67.0	70.0	82.0	72.0	75.0	76.0	74.0	80.0
19	F	67.0	68.0	63.0	59.0	67.0	61.0	62.0	97.0	64.0	86.0	96.0	92.0
20	F	105.0	80.0	99.0	100.0	103.0	104.0	102.0	104.0	105.0	102.0	100.0	105.0

ELDERLY DF ECCENTRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	95.0	88.0	90.0	91.0	108.0	97.0	91.0	93.0	71.0	82.0	99.0	83.0
2	M	110.0	74.0	76.0	109.0	106.0	107.0	100.0	101.0	105.0	102.0	103.0	104.0
3	M	112.0	82.0	82.0	101.0	103.0	107.0	110.0	110.0	116.0	111.0	112.0	113.0
4	M	76.0	42.0	43.0	39.0	44.0	40.0	71.0	74.0	75.0	70.0	68.0	69.0
5	M	100.0	91.0	92.0	97.0	93.0	97.0	91.0	93.0	99.0	101.0	102.0	108.0
6	M	70.0	74.0	75.0	74.0	77.0	82.0	80.0	76.0	78.0	69.0	85.0	81.0
7	M	83.0	70.0	67.0	59.0	68.0	79.0	94.0	90.0	87.0	97.0	88.0	88.0
8	M	120.0	98.0	88.0	94.0	86.0	80.0	84.0	87.0	82.0	73.0	46.0	78.0
9	M	119.0	80.0	85.0	101.0	104.0	103.0	106.0	116.0	110.0	117.0	112.0	107.0
10	M	52.0	47.0	53.0	53.0	51.0	51.0	51.0	48.0	49.0	46.0	46.0	43.0
11	F	95.0	100.0	102.0	90.0	91.0	93.0	95.0	99.0	93.0	94.0	92.0	95.0
12	F	111.0	98.0	88.0	94.0	86.0	80.0	84.0	87.0	82.0	73.0	46.0	78.0
13	F	78.0	38.0	47.0	55.0	52.0	40.0	46.0	54.0	41.0	48.0	50.0	65.0
14	F	115.0	104.0	105.0	108.0	110.0	111.0	112.0	114.0	110.0	113.0	112.0	108.0
15	F	53.0	67.0	68.0	66.0	65.0	49.0	61.0	96.0	103.0	87.0	85.0	89.0
16	F	75.0	68.0	64.0	64.0	65.0	61.0	68.0	68.0	55.0	66.0	67.0	70.0
17	F	62.0	78.0	82.0	77.0	79.0	76.0	69.0	69.0	62.0	80.0	96.0	66.0
18	F	58.0	41.0	42.0	50.0	52.0	53.0	54.0	52.0	55.0	60.0	61.0	58.0
19	F	99.0	63.0	72.0	58.0	66.0	58.0	61.0	98.0	89.0	96.0	94.0	91.0
20	F	110.0	106.0	78.0	106.0	105.0	107.0	110.0	106.0	102.0	107.0	98.0	105.0

ELDERLY DF ISOMETRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	143.0	120.0	122.0	120.0	134.0	148.0	134.0	128.0	122.0	120.0	116.0	91.0
2	M	102.0	117.0	115.0	105.0	100.0	107.0	97.0	103.0	114.0	111.0	105.0	105.0
3	M	127.0	119.0	125.0	119.0	121.0	130.0	126.0	132.0	132.0	132.0	138.0	136.0
4	M	78.0	50.0	54.0	52.0	52.0	57.0	31.0	41.0	49.0	50.0	59.0	76.0
5	M	94.0	89.0	82.0	89.0	97.0	102.0	93.0	92.0	104.0	106.0	80.0	102.0
6	M	54.0	52.0	82.0	60.0	57.0	56.0	48.0	59.0	56.0	45.0	53.0	53.0
7	M	132.0	74.0	74.0	94.0	93.0	104.0	107.0	96.0	104.0	97.0	99.0	110.0
8	M	100.0	65.0	54.0	62.0	63.0	73.0	73.0	76.0	74.0	84.0	71.0	79.0
9	M	101.0	78.0	92.0	97.0	80.0	97.0	92.0	98.0	95.0	89.0	90.0	103.0
10	M	52.0	44.0	59.0	59.0	57.0	63.0	59.0	49.0	62.0	65.0	63.0	58.0
11	F	76.6	90.6	90.6	73.2	89.2	93.9	87.2	96.5	91.9	87.9	94.5	84.6
12	F	93.0	70.0	81.0	85.0	85.0	87.0	89.0	90.0	95.0	92.0	91.0	91.0
13	F	2.0	8.0	13.0	5.0	29.0	1.0	7.0	20.0	9.0	16.0	6.0	6.0
14	F	121.0	104.0	119.0	109.0	106.0	111.0	121.0	111.0	128.0	115.0	122.0	120.0
15	F	95.0	84.0	82.0	89.0	90.0	90.0	87.0	89.0	92.0	89.0	89.0	90.0
16	F	92.0	68.0	68.0	69.0	85.0	76.0	77.0	77.0	86.0	83.0	77.0	77.0
17	F	88.0	94.0	72.0	76.0	75.0	75.0	84.0	73.0	69.0	79.0	79.0	70.0
18	F	85.0	72.0	74.0	73.0	80.0	81.0	84.0	84.0	88.0	89.0	89.0	90.0
19	F	58.0	52.0	53.0	65.0	92.0	88.0	50.0	61.0	84.0	62.0	58.0	50.0
20	F	131.0	76.0	85.0	107.0	115.0	125.0	126.0	140.0	129.0	127.0	130.0	124.0

ELDERLY DF CONCENTRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	165.0	111.0	121.0	120.0	125.0	130.0	151.0	154.0	155.0	157.0	160.0	161.0
2	M	155.0	132.0	134.0	135.0	137.0	145.0	149.0	146.0	153.0	134.0	146.0	153.0
3	M	130.0	92.0	94.0	127.0	113.0	119.0	123.0	125.0	124.0	125.0	127.0	129.0
4	M	51.0	69.0	55.0	57.0	65.0	44.0	57.0	64.0	59.0	50.0	65.0	73.0
5	M	110.0	102.0	103.0	102.0	99.0	104.0	84.0	100.0	103.0	103.0	103.0	102.0
6	M	61.0	59.0	57.0	90.0	85.0	85.0	87.0	78.0	100.0	68.0	87.0	92.0
7	M	120.0	89.0	86.0	132.0	161.0	148.0	142.0	145.0	96.0	139.0	132.0	120.0
8	M	101.0	57.0	51.0	62.0	63.0	73.0	75.0	76.0	74.0	84.0	71.0	79.0
9	M	116.0	79.0	79.0	90.0	94.0	119.0	95.0	93.0	84.0	96.0	84.0	89.0
10	M	86.0	76.0	76.0	59.0	57.0	63.0	59.0	49.0	62.0	65.0	63.0	58.0
11	F	91.0	130.0	141.0	145.0	146.0	131.0	130.0	133.0	143.0	125.0	124.0	128.0
12	F	30.0	35.0	46.0	48.0	41.0	33.0	16.0	17.0	25.0	22.0	21.0	22.0
13	F	44.0	72.0	67.0	70.0	78.0	82.0	82.0	82.0	77.0	59.0	58.0	67.0
14	F	103.0	102.0	101.0	117.0	117.0	109.0	108.0	108.0	110.0	113.0	113.0	112.0
15	F	115.0	99.0	98.0	101.0	106.0	110.0	112.0	108.0	107.0	116.0	114.0	114.0
16	F	56.0	42.0	45.0	51.0	55.0	66.0	67.0	60.0	68.0	67.0	62.0	54.0
17	F	56.0	74.0	64.0	67.0	77.0	81.0	77.0	71.0	107.0	107.0	86.0	110.0
18	F	62.0	42.0	45.0	53.0	55.0	55.0	67.0	51.0	60.0	63.0	68.0	64.0
19	F	52.0	59.0	70.0	92.0	105.0	93.0	104.0	67.0	98.0	70.0	78.0	83.0
20	F	116.0	107.0	87.0	99.0	120.0	114.0	122.0	131.0	128.0	140.0	137.0	131.0

ELDERLY DF ECCENTRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	160.0	102.0	110.0	127.0	110.0	105.0	135.0	131.0	101.0	153.0	122.0	152.0
2	M	112.0	108.0	107.0	110.0	124.0	110.0	101.0	104.0	108.0	109.0	110.0	111.0
3	M	127.0	94.0	94.0	112.0	107.0	111.0	107.0	111.0	107.0	119.0	118.0	118.0
4	M	62.0	22.0	35.0	42.0	39.0	47.0	57.0	46.0	21.0	32.0	42.0	42.0
5	M	100.0	65.0	66.0	70.0	72.0	74.0	88.0	84.0	86.0	84.0	93.0	95.0
6	M	39.0	59.0	56.0	66.0	60.0	61.0	64.0	68.0	66.0	71.0	58.0	58.0
7	M	87.0	70.0	69.0	99.0	105.0	98.0	86.0	89.0	99.0	80.0	96.0	92.0
8	M	88.0	60.0	60.0	56.0	67.0	74.0	78.0	82.0	83.0	85.0	76.0	88.0
9	M	89.0	88.0	86.0	90.0	97.0	96.0	93.0	112.0	96.0	102.0	99.0	110.0
10	M	64.0	65.0	62.0	54.0	56.0	56.0	60.0	60.0	63.0	68.0	61.0	61.0
11	F	61.0	50.0	55.0	65.0	70.0	63.0	64.0	68.0	62.0	66.0	67.0	61.0
12	F	38.0	43.0	42.0	38.0	47.0	45.0	12.0	37.0	19.0	30.0	16.0	15.0
13	F	52.0	74.0	60.0	50.0	52.0	44.0	65.0	57.0	70.0	52.0	51.0	49.0
14	F	132.0	115.0	117.0	120.0	125.0	121.0	115.0	117.0	117.0	115.0	120.0	122.0
15	F	88.6	77.2	78.6	83.2	91.2	89.2	91.2	77.9	87.9	64.5	85.9	55.9
16	F	59.0	50.0	52.0	51.0	54.0	63.0	60.0	65.0	65.0	61.0	60.0	63.0
17	F	56.0	74.0	64.0	67.0	77.0	84.0	77.0	70.0	107.0	107.0	86.0	110.0
18	F	54.0	51.0	50.0	84.0	87.0	85.0	83.0	81.0	80.0	84.0	88.0	78.0
19	F	80.0	60.0	53.0	81.0	89.0	98.0	100.0	59.0	67.0	56.0	55.0	60.0
20	F	136.0	93.0	121.0	116.0	121.0	125.0	133.0	133.0	131.0	128.0	142.0	142.0

ELDERLY DF ISOMETRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.013	0.013	0.018	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.013
2	M	0.014	0.012	0.012	0.016	0.016	0.016	0.015	0.015	0.014	0.014	0.016	0.016
3	M	0.015	0.015	0.016	0.016	0.016	0.016	0.016	0.017	0.016	0.015	0.016	0.015
4	M	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.019	0.018	0.018	0.017	0.017
5	M	0.013	0.013	0.012	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
6	M	0.022	0.025	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.022	0.022	0.022
7	M	0.012	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
8	M	0.019	0.020	0.020	0.023	0.023	0.021	0.021	0.023	0.022	0.023	0.023	0.021
9	M	0.017	0.017	0.017	0.017	0.018	0.019	0.019	0.018	0.020	0.019	0.018	0.019
10	M	0.019	0.017	0.019	0.019	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
11	F	0.013	0.014	0.013	0.013	0.031	0.030	0.030	0.029	0.029	0.025	0.026	0.025
12	F	0.009	0.009	0.009	0.008	0.011	0.009	0.008	0.009	0.010	0.013	0.009	0.008
13	F	0.010	0.011	0.010	0.013	0.011	0.013	0.012	0.012	0.012	0.012	0.014	0.012
14	F	0.017	0.017	0.018	0.020	0.021	0.019	0.019	0.018	0.019	0.018	0.017	0.017
15	F	0.013	0.013	0.013	0.013	0.014	0.014	0.146	0.014	0.013	0.014	0.013	0.013
16	F	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.008	0.009	0.008
17	F	0.015	0.013	0.017	0.015	0.016	0.016	0.017	0.017	0.013	0.014	0.014	0.014
18	F	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.014	0.013	0.014
19	F	0.012	0.010	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.020
20	F	0.019	0.019	0.019	0.019	0.019	0.019	0.020	0.019	0.020	0.020	0.020	0.020

ELDERLY DF CONCENTRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.092	0.093	0.093	0.097	0.098	0.093	0.093	0.093	0.093	0.093	0.094	0.093
2	M	0.011	0.013	0.014	0.014	0.016	0.013	0.012	0.016	0.013	0.013	0.013	0.012
3	M	0.013	0.013	0.014	0.014	0.013	0.013	0.015	0.014	0.014	0.014	0.013	0.013
4	M	0.019	0.020	0.017	0.017	0.021	0.019	0.020	0.019	0.021	0.020	0.019	0.019
5	M	0.014	0.014	0.015	0.014	0.015	0.016	0.014	0.014	0.015	0.014	0.014	0.015
6	M	0.022	0.022	0.023	0.024	0.024	0.024	0.024	0.023	0.023	0.023	0.023	0.023
7	M	0.014	0.015	0.015	0.015	0.014	0.015	0.015	0.014	0.015	0.014	0.014	0.014
8	M	0.019	0.019	0.019	0.019	0.019	0.019	0.020	0.020	0.019	0.020	0.020	0.019
9	M	0.019	0.018	0.019	0.020	0.023	0.020	0.020	0.019	0.020	0.019	0.021	0.019
10	M	0.019	0.018	0.019	0.020	0.020	0.020	0.020	0.020	0.020	0.019	0.019	0.019
11	F	0.014	0.014	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
12	F	0.014	0.014	0.014	0.013	0.014	0.014	0.013	0.013	0.013	0.013	0.013	0.014
13	F	0.011	0.009	0.009	0.010	0.010	0.011	0.010	0.010	0.010	0.010	0.010	0.010
14	F	0.017	0.017	0.018	0.019	0.018	0.018	0.018	0.018	0.019	0.017	0.017	0.017
15	F	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.005
16	F	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006
17	F	0.023	0.018	0.018	0.024	0.019	0.020	0.021	0.021	0.021	0.019	0.021	0.020
18	F	0.014	0.014	0.015	0.014	0.014	0.015	0.014	0.014	0.014	0.014	0.014	0.014
19	F	0.010	0.010	0.011	0.012	0.013	0.012	0.012	0.013	0.012	0.012	0.012	0.012
20	F	0.019	0.020	0.020	0.020	0.020	0.021	0.020	0.021	0.021	0.023	0.021	0.020

ELDERLY DF ECCENTRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.012	0.013	0.012	0.011	0.012	0.013	0.012	0.011	0.013	0.013	0.012	0.013
2	M	0.015	0.015	0.014	0.014	0.015	0.015	0.014	0.015	0.015	0.015	0.016	0.015
3	M	0.013	0.014	0.016	0.015	0.015	0.047	0.015	0.014	0.015	0.015	0.014	0.014
4	M	0.015	0.014	0.014	0.014	0.014	0.014	0.015	0.016	0.016	0.016	0.015	0.014
5	M	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.014
6	M	0.022	0.021	0.022	0.022	0.022	0.002	0.022	0.022	0.022	0.021	0.021	0.021
7	M	0.011	0.013	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011
8	M	0.025	0.026	0.027	0.028	0.026	0.028	0.026	0.025	0.026	0.025	0.028	0.025
9	M	0.016	0.015	0.015	0.015	0.016	0.016	0.016	0.016	0.016	0.016	0.017	0.017
10	M	0.017	0.019	0.018	0.019	0.019	0.019	0.019	0.019	0.019	0.018	0.018	0.018
11	F	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
12	F	0.008	0.007	0.007	0.007	0.008	0.007	0.007	0.008	0.008	0.008	0.008	0.008
13	F	0.010	0.010	0.010	0.010	0.011	0.010	0.010	0.100	0.010	0.010	0.010	0.010
14	F	0.016	0.017	0.017	0.020	0.019	0.019	0.019	0.018	0.018	0.017	0.015	0.015
15	F	0.005	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004	0.005	0.004
16	F	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.008	0.009	0.008	0.008	0.008
17	F	0.012	0.012	0.013	0.014	0.014	0.017	0.014	0.014	0.014	0.014	0.014	0.014
18	F	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.012	0.012
19	F	0.011	0.010	0.010	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
20	F	0.020	0.020	0.021	0.020	0.020	0.021	0.020	0.019	0.019	0.018	0.018	0.019

ELDERLY DF ISOMETRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	1.218	1.201	1.199	1.177	1.172	1.172	1.157	1.177	1.157	1.177	1.160	1.138
2	M	2.075	2.107	2.158	2.358	2.134	2.195	2.227	2.170	2.195	2.205	2.124	2.224
3	M	2.146	2.110	2.120	2.087	2.063	2.072	2.097	2.070	2.087	2.063	2.022	2.066
4	M	1.965	1.982	1.993	1.974	1.965	2.007	1.693	1.982	1.965	1.954	1.931	1.943
5	M	1.741	1.697	1.690	1.711	1.736	1.687	1.711	1.707	1.721	1.733	1.741	1.751
6	M	1.762	1.787	1.814	1.824	1.829	1.838	1.838	1.838	1.835	1.809	1.802	1.792
7	M	1.765	1.587	1.763	1.758	1.755	1.763	1.790	1.833	1.834	1.834	1.882	1.858
8	M	1.419	1.369	1.401	1.421	1.416	1.404	1.409	1.406	1.406	1.397	1.433	1.411
9	M	1.762	1.787	1.814	1.824	1.824	1.839	1.839	1.838	1.809	1.802	1.792	1.787
10	M	2.390	2.114	2.044	2.078	2.073	2.036	2.063	2.053	2.070	2.085	2.041	2.073
11	F	2.108	1.997	1.987	2.152	2.221	2.147	2.169	2.135	2.050	2.087	1.978	1.985
12	F	1.865	2.561	2.107	2.422	2.607	2.600	2.195	2.175	2.644	2.835	2.185	2.324
13	F	1.125	1.089	1.067	1.084	1.113	1.101	1.094	1.145	1.140	1.126	1.106	1.143
14	F	2.219	2.284	2.321	2.349	2.241	2.285	2.279	2.273	2.271	2.231	2.180	2.258
15	F	1.056	1.064	1.120	1.135	1.147	1.125	1.122	1.097	1.085	1.065	1.077	1.087
16	F	0.818	0.818	0.844	0.845	0.869	0.977	0.862	0.842	0.857	0.845	0.847	0.857
17	F	1.541	1.631	1.641	1.618	1.631	1.606	1.614	1.577	1.550	1.580	1.570	1.590
18	F	1.345	1.255	1.280	1.345	1.366	1.687	1.311	1.264	1.249	1.205	1.189	1.187
19	F	1.387	1.306	1.362	1.389	1.399	1.360	1.401	1.392	1.387	1.387	1.399	1.360
20	F	1.619	1.636	1.670	1.663	1.648	1.677	1.668	1.655	1.663	1.670	1.653	1.665

ELDERLY DF CONCENTRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	1.020	1.029	1.030	1.122	1.141	1.090	1.080	1.075	1.099	1.087	1.085	1.086
2	M	1.532	1.521	1.546	1.597	1.610	1.521	1.588	1.553	1.489	1.477	1.509	1.502
3	M	1.821	1.854	1.866	1.858	1.858	1.870	1.838	1.846	1.843	1.833	1.831	1.831
4	M	1.853	1.860	1.878	1.875	1.859	1.890	1.868	1.865	1.848	1.860	1.846	1.853
5	M	1.668	1.616	1.668	1.612	1.614	1.654	1.641	1.628	1.626	1.636	1.638	1.582
6	M	2.122	2.122	2.141	2.146	2.310	2.153	2.170	2.126	2.136	2.166	2.185	2.092
7	M	1.734	1.784	1.762	1.799	1.784	1.765	1.731	1.715	1.724	1.725	1.716	1.720
8	M	2.244	2.201	2.195	2.153	2.197	2.161	2.107	2.029	2.065	2.058	2.017	2.043
9	M	1.821	1.824	1.841	1.846	1.873	1.882	1.848	1.836	1.855	1.792	1.819	1.831
10	M	1.987	2.029	2.075	2.087	2.056	2.068	2.039	2.034	2.026	2.007	2.005	2.003
11	F	2.134	2.125	2.048	2.006	1.990	2.029	2.009	2.026	2.000	2.022	1.958	1.995
12	F	1.433	1.426	1.433	1.460	1.478	1.470	1.431	1.450	1.436	1.421	1.399	1.404
13	F	1.465	1.262	1.282	1.382	1.365	1.396	1.399	1.379	1.355	1.365	1.365	1.355
14	F	2.219	2.255	2.291	2.349	2.275	2.263	2.279	2.285	2.271	2.251	2.251	2.258
15	F	0.714	0.706	0.698	0.693	0.679	0.710	0.703	0.689	0.679	0.764	0.693	0.662
16	F	0.921	0.980	1.240	1.030	0.991	0.972	0.984	0.971	0.965	0.970	0.961	0.940
17	F	1.777	1.670	1.893	1.953	1.931	1.951	1.941	1.938	1.943	1.909	1.914	1.897
18	F	1.250	1.264	1.274	1.261	1.243	1.227	1.225	1.221	1.211	1.210	1.208	1.199
19	F	1.279	1.206	1.265	1.333	1.301	1.316	1.316	1.316	1.333	1.306	1.353	1.333
20	F	1.702	1.726	1.707	1.738	1.729	1.736	1.746	1.726	1.726	1.738	1.716	1.690

ELDERLY DF ECCENTRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	1.148	1.148	1.156	1.167	1.169	1.262	1.193	1.201	1.226	1.196	1.191	1.260
2	M	2.047	2.057	2.061	2.085	2.079	2.051	2.083	2.008	2.073	2.065	2.058	2.048
3	M	1.619	1.829	2.041	1.826	1.860	1.814	1.826	1.768	1.816	1.765	1.736	1.750
4	M	1.921	1.933	1.925	1.946	1.958	1.912	1.863	1.978	1.961	1.921	1.916	1.915
5	M	1.587	1.543	1.563	1.552	1.543	1.558	1.567	1.587	1.584	1.561	1.571	1.597
6	M	1.821	1.799	1.792	1.821	1.799	1.782	1.787	1.792	1.782	1.768	1.763	1.763
7	M	1.418	1.472	1.484	1.484	1.497	1.489	1.515	1.472	1.462	1.453	1.443	1.440
8	M	2.693	2.703	2.717	2.717	2.730	2.717	2.686	2.662	2.634	2.619	2.603	2.588
9	M	1.968	1.863	1.809	1.864	1.873	1.834	1.853	1.865	1.865	1.870	1.870	1.884
10	M	2.141	2.332	2.097	2.330	2.209	2.021	2.012	1.985	2.002	2.002	1.973	1.956
11	F	2.049	2.007	2.002	2.006	2.019	2.020	2.020	2.015	2.067	2.055	2.041	2.042
12	F	0.794	0.828	0.808	0.788	0.784	0.771	0.803	0.776	0.786	0.825	0.764	0.733
13	F	1.245	1.237	1.227	1.225	1.238	1.245	1.265	1.249	1.241	1.240	1.234	1.234
14	F	2.026	2.045	2.063	2.058	2.063	2.080	2.085	2.080	2.080	2.074	2.063	2.029
15	F	2.884	3.282	3.343	3.468	3.419	3.369	3.344	3.319	3.244	3.369	3.281	3.195
16	F	0.867	0.895	0.914	0.935	0.921	0.902	0.911	0.909	0.907	0.905	0.903	0.905
17	F	1.709	1.931	1.914	1.980	1.985	2.004	1.987	1.934	1.953	1.914	1.892	1.917
18	F	1.189	1.187	1.863	1.898	1.912	1.868	1.864	1.863	1.875	1.878	1.859	1.865
19	F	1.294	1.218	1.250	1.323	1.311	1.338	1.318	1.318	1.343	1.328	1.328	1.326
20	F	1.687	1.743	1.738	1.709	1.709	1.701	1.658	1.638	1.659	1.616	1.580	1.567

ELDERLY PF ISOMETRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	19.45	20.22	17.46	19.53	17.76	17.6	18.2	18.5	18.72	18.64	18.91	18.92
2	M	8.2	7.18	7.6	7.43	7.3	7.74	7.71	8.06	8.16	8.08	8.16	8.08
3	M	22.14	28.04	26.74	26.88	25.84	25.3	25.93	25.16	24.44	23.98	23.63	24.21
4	M	14.19	13.96	14.54	13.8	13.61	13.8	13.68	14.53	14.19	14.53	13.45	13.86
5	M	9.89	13.01	12.29	11.68	11.31	11.03	10.91	10.73	10.89	10.62	10.83	10.89
6	M	11.19	11.54	11.31	11.24	11.43	11.38	11.57	11.41	11.47	11.24	11.26	11.1
7	M	11.06	10.18	10.76	11.22	11.43	11.56	11.68	11.85	11.87	12.08	11.92	12.03
8	M	13.95	15.02	15.51	14.98	15.3	15.28	15.3	15.35	15.42	15.33	15.39	15.42
9	M	13.38	16.7	16.2	15.11	15.3	15.65	15.79	15.26	15.23	14.93	15.04	15.07
10	M	23.45	26.48	25.19	23.7	22.82	23.21	23.89	23.02	22.82	22.87	22.49	22.68
11	F	12.15	11.27	11.84	11.95	12.01	12.12	12.26	12.35	12.45	12.26	12.07	12.08
12	F	14.38	14.37	14.65	15.07	15.3	15.35	15.25	15.32	15.49	15.4	15.53	15.35
13	F	4.86	4.42	4.93	5.25	5.39	5.69	5.67	5.76	5.95	6.04	5.98	5.95
14	F	16.72	18.55	16.73	16.74	17.21	17.39	17.41	17.25	17.36	17.28	17	17.14
15	F	10.91	10.62	11.4	11.19	11.27	11.56	11.52	11.38	11.54	11.47	11.7	11.61
16	F	14.35	17	16.3	16.41	16.24	16.18	16.39	16.7	15.97	16.04	15.72	15.6
17	F	12.14	11.77	12.26	12.21	12.42	12.35	12.63	12.38	12.56	12.43	12.93	12.08
18	F	11.24	13.52	12.32	12.22	11.98	12.01	11.87	11.85	11.86	11.65	11.55	11.54
19	F	4.6	3.79	5.47	5.46	5.7	5.9	6.44	5.53	5.25	5.84	6.11	5.98
20	F	12.79	14.44	12.47	13.93	13.84	13.93	14.09	14.05	14.31	13.98	14.65	14.03

ELDERLY PF CONCENTRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	17.2	21.36	21.08	20.43	20.11	19.17	19.32	18.57	18.6	18.74	18.55	18.6
2	M	9.08	7.04	7.99	7.83	8.06	8.44	8.06	8.74	8.85	8.87	8.9	8.13
3	M	20.15	25.49	25.51	24.54	24.1	23.77	23.61	23.1	23.03	22.75	22.49	22.29
4	M	18.06	16.56	18.89	18.55	17.46	17.34	18.02	18.23	18.34	18.05	18.03	18.23
5	M	8.25	12.73	12.86	12.05	11.54	11.64	11.7	11.47	11.22	11.13	11.26	11.06
6	M	10.41	11.91	12.41	11.1	11.22	11.36	11.29	11.31	11.2	11.13	11.1	11.22
7	M	11.85	12.05	12.94	13.37	12.96	13.12	13.31	13.12	12.91	13.1	12.91	12.72
8	M	11.84	16.92	16.79	15.14	14.74	14.53	14.09	14.09	14.14	13.8	13.8	13.54
9	M	15.4	18.04	17.25	16.69	16.63	16.72	16.69	16.39	16.63	16.51	16.55	16.23
10	M	18.44	25.28	24.02	22.87	21.92	22.05	22.07	21.92	21.84	21.91	21.75	21.52
11	F	10.4	9	10.03	10.22	10.41	10.43	10.47	10.66	10.62	10.59	10.57	10.39
12	F	12.59	13.95	13.51	12.24	13.65	14.33	14.47	14.49	14.16	14.1	13.91	13.84
13	F	6.12	6.81	7.16	7	7.11	7.34	7.5	7.28	7.39	7.58	7.83	7.9
14	F	17.5	15.9	16.65	16.25	16.83	16.9	17.18	17.53	17.39	17.46	17.43	17.07
15	F	12.24	12.54	12.63	12.45	12.4	12.42	12.43	12.47	13.19	12.47	12.4	12.42
16	F	13.91	15.63	16.32	16.37	16.49	16.56	16.49	16.56	16.6	16.6	16.28	15.98
17	F	9.43	7.3	8.18	9.59	8.5	9.89	9.59	10.04	10.22	9.57	9.82	10.18
18	F	11.52	13.54	12.28	12.59	12.34	12.01	11.89	11.64	11.68	11.89	11.74	11.68
19	F	3.79	4.37	5.7	5.69	5.54	5.93	5.69	6	5.84	5.95	6.23	6.09
20	F	12.22	10.73	12.05	11.84	12.08	11.96	12.42	11.89	11.59	11.41	11.85	11.84

ELDERLY PF ECCENTRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	20.54	23.77	22.91	21.29	19.94	20.29	20.06	18.86	21.41	19.36	18.74	18.95
2	M	11.43	10.71	11.75	11.8	12.45	12.54	12.4	11.99	11.77	12.59	12.29	11.31
3	M	16.55	22.42	22.28	21.28	20.92	20.82	20.61	20.45	20.34	20.17	20.01	20.13
4	M	15.39	14.17	14.51	14.51	14.44	14.74	15.25	15.23	15.39	15.11	14.61	14.88
5	M	10.22	13.79	13.93	13.68	13.37	15.16	13.1	14.68	12.82	12.77	12.52	12.64
6	M	9.83	11.92	12.31	13.3	12.21	12.01	12.07	12.12	12.14	12.03	11.89	12.01
7	M	12.86	16.58	17.43	16.25	16.18	15.88	15.6	15.46	15.44	15.39	15.19	15.18
8	M	10.76	12.98	12.68	16.81	16.21	15.81	15.37	15.18	15.02	14.74	14.44	14.75
9	M	14.79	15.79	15.79	15.88	16.44	16.56	16.51	16.09	16.44	15.88	16.04	16.21
10	M	19.59	23.47	23.47	23.1	22.57	22.5	22.64	22.49	22.36	22.36	22.17	22.19
11	F	9.94	8.2	8.2	8.39	8.48	8.48	8.48	8.39	8.97	8.51	8.67	8.94
12	F	12.94	15.62	15.67	15.76	15.84	15.93	15.51	15.84	15.65	15.7	15.47	15.63
13	F	8.15	7.92	8.15	8.37	8.51	8.66	8.8	8.95	8.97	8.51	9.09	9.01
14	F	18.2	18.15	19.18	18.6	19.08	19.38	18.95	18.97	18.85	18.69	18.76	18.3
15	F	13.56	14.85	13.42	13.22	13.11	13.42	12.56	12.87	12.97	12.84	12.54	12.21
16	F	16.62	16.23	17.09	17.34	18.11	17.93	16.72	16.81	16.63	16.56	16.04	16.65
17	F	10.08	12.24	12.34	11.87	11.65	11.43	11.21	11.09	10.78	10.82	10.43	10.22
18	F	11.05	13.25	12.89	12.56	12.75	12.44	12.04	11.98	11.87	11.85	11.56	11.44
19	F	4.63	3.56	5.39	4.6	5.19	5.7	5	5.96	4.96	5.18	5.07	5.32
20	F	13.31	12.5	12.63	13.15	12.73	13.35	12.77	12.77	13.85	13.51	12.82	11.85

ELDERLY PF ISOMETRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	364	477	416	422	338	340	351	355	360	357	362	365
2	M	154	150	155	148	140	136	133	146	140	146	138	142
3	M	424	709	642	619	570	552	523	518	485	469	455	461
4	M	343	303	296	350	309	293	293	276	267	273	281	279
5	M	210	390	355	319	306	291	272	262	267	248	255	247
6	M	301	312	321	312	306	294	296	293	286	291	291	285
7	M	249	230	251	262	230	231	248	278	252	239	246	241
8	M	269	324	340	322	317	324	317	307	319	323	323	325
9	M	286	427	388	359	343	350	325	329	333	315	324	315
10	M	517	650	625	538	512	523	513	490	480	480	466	481
11	F	291	265	269	263	260	265	264	258	263	261	258	256
12	F	333	391	385	384	389	388	382	379	372	372	379	370
13	F	114	98	110	114	115	129	131	139	132	133	139	133
14	F	386	394	384	373	378	383	385	371	370	362	378	359
15	F	317	324	345	327	334	331	332	321	323	336	335	334
16	F	379	462	454	443	411	396	436	385	385	375	366	368
17	F	195	221	223	207	206	213	212	223	205	218	238	211
18	F	256	255	221	235	245	268	255	264	275	272	256	252
19	F	85	73	99	102	103	112	116	102	87	92	93	100
20	F	296	284	288	359	304	310	276	296	310	305	326	296

ELDERLY PF CONCENTRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	341	574	508	465	450	414	434	392	373	406	391	378
2	M	105	81	90	88	101	106	105	100	106	104	100	101
3	M	391	662	650	620	573	559	528	521	507	494	488	481
4	M	446	470	450	448	460	461	441	443	445	448	444	440
5	M	197	390	379	341	303	287	286	282	277	269	271	263
6	M	216	395	373	334	333	322	321	308	308	310	302	295
7	M	272	320	344	324	300	286	287	288	283	312	275	271
8	M	300	497	464	381	349	369	339	343	340	322	318	320
9	M	340	461	420	384	365	361	349	345	351	342	338	334
10	M	410	578	602	531	482	464	462	453	456	463	449	455
11	F	223	277	262	244	244	245	244	237	239	240	242	228
12	F	328	543	478	503	513	482	464	460	469	420	414	414
13	F	115	202	172	150	154	173	179	157	175	173	179	174
14	F	364	465	420	420	417	420	416	425	420	418	419	413
15	F	41	68	80	51	66	59	55	52	49	51	55	43
16	F	289	436	435	409	372	366	359	352	330	338	323	303
17	F	203	211	225	213	196	224	217	222	197	219	219	214
18	F	213	201	204	208	210	216	218	217	218	219	216	216
19	F	62.5	91	115	101	86	95	95	96	94	98	107	101
20	F	252	310	336	297	286	275	285	287	274	268	237	256

ELDERLY PF ECCENTRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	364	595	573	492	443	388	376	348	375	393	345	348
2	M	143	219	196	183	177	176	189	170	176	189	170	176
3	M	365	577	559	514	491	123	475	468	456	457	454	443
4	M	362	399	393	382	390	386	388	374	379	398	390	365
5	M	221	393	390	370	345	382	388	362	309	299	292	300
6	M	200	340	346	356	300	310	286	272	272	277	294	260
7	M	286	471	509	454	428	441	419	412	399	379	371	381
8	M	248	326	362	487	433	434	440	414	408	394	382	384
9	M	319	400	383	374	367	351	354	338	334	333	334	328
10	M	442	549	558	538	509	485	477	478	477	472	474	465
11	F	227	232	250	256	258	221	241	254	228	234	236	211
12	F	368	565	548	528	511	504	506	507	492	489	494	483
13	F	232	267	258	260	260	253	244	249	239	248	248	260
14	F	395	549	549	464	464	438	443	429	430	433	421	430
15	F	245	285	271	276	274	265	255	264	258	254	254	251
16	F	450	431	438	436	444	400	403	391	385	388	387	400
17	F	184	235	232	230	222	225	210	208	201	192	190	187
18	F	230	285	274	267	274	271	250	255	259	254	240	239
19	F	72	58	96	78	91	102	79	81	84	85	85	87
20	F	313	323	329	339	290	307	287	283	311	297	280	225

ELDERLY PF ISOMETRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	97.2	89.21	89.21	100	95	97	99	98	97	98	96	97
2	M	135	104	109	110	107	117	136	137	131	140	143	141
3	M	101	85	79	87	90	88	96	103	91	93	94	97
4	M	91	95	91	85	89	100	124	93	90	117	91	85
5	M	133	94	95	95	95	99	96	95	100	95	97	95
6	M	127	101	100	101	117	124	131	129	128	122	131	136
7	M	135	123	133	136	139	131	131	135	128	135	130	135
8	M	84	86	87	96	91	91	90	97	97	93	95	95
9	M	107	100	99	103	139	139	135	137	129	134	136	137
10	M	101	99	100	100	97	101	100	101	99	101	96	95
11	F	139	137	135	134	135	131	132	139	132	135	137	136
12	F	154	150	153	159	153	152	156	158	159	154	160	159
13	F	130	72	103	119	124	119	121	119	113	121	106	88
14	F	163	132	142	167	164	164	169	165	164	160	165	165
15	F	128	89	89	91	89	95	134	128	95	89	131	87
16	F	97	90	92	93	92	91	92	93	97	90	93	93
17	F	127	139	120	138	157	153	157	122	150	131	150	154
18	F	133	114	120	125	126	134	132	137	140	124	142	138
19	F	119	86	100	119	111	109	117	109	111	114	119	121
20	F	156	113	119	131	159	155	153	156	163	157	159	151

ELDERLY PF CONCENTRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	132	97	101	97	95	99	98	127	100	97	96	97
2	M	166	172	177	169	177	171	173	177	174	179	175	167
3	M	128	92	89	93	93	95	95	95	97	97	96	95
4	M	129	92	90	91	96	95	94	95	95	95	94	93
5	M	98	64	66	95	92	93	94	95	93	93	93	95
6	M	104	99	99	105	103	107	105	101	105	107	109	125
7	M	146	96	93	127	130	133	132	125	137	130	127	127
8	M	93	86	89	90	89	88	93	89	88	88	91	91
9	M	135	99	99	103	133	131	131	130	107	135	132	133
10	M	97	96	97	99	131	133	129	129	127	125	129	127
11	F	140	134	138	129	143	134	141	137	137	140	141	130
12	F	151	132	149	152	155	158	153	159	156	156	155	153
13	F	123	131	131	134	133	129	125	125	125	126	122	126
14	F	155	161	162	168	173	168	164	167	169	168	170	169
15	F	238	193	197	196	196	199	199	199	230	235	147	235
16	F	97	97	95	94	95	126	129	129	27	125	100	123
17	F	149	124	138	154	155	153	157	154	149	157	157	155
18	F	134	125	124	122	126	130	138	137	134	134	139	131
19	F	108	108	107	113	128	131	125	121	127	116	115	123
20	F	153	95	95	130	143	146	150	141	148	149	147	147

ELDERLY PF ECCENTRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	138	93	93	97	96	131	129	129	123	128	103	127
2	M	164	143	136	135	159	153	156	157	163	163	153	155
3	M	95	95	93	95	95	95	95	93	95	95	95	93
4	M	127	95	94	90	95	97	92	91	91	90	93	95
5	M	133	96	98	97	97	95	100	97	131	135	99	98
6	M	137	134	136	136	135	138	139	139	137	137	139	138
7	M	130	99	91	92	93	128	121	131	133	134	131	128
8	M	89	95	96	91	93	93	91	91	93	92	93	91
9	M	142	101	100	103	109	135	133	139	133	133	134	131
10	M	99	104	100	101	98	133	99	101	101	99	103	101
11	F	175	123	167	169	181	174	177	169	183	170	172	168
12	F	161	142	156	158	161	155	158	159	155	158	157	155
13	F	120	83	85	88	120	127	123	122	125	123	124	122
14	F	162	93	132	164	163	169	163	162	166	163	165	166
15	F	121	100	98	104	106	104	106	108	105	105	107	102
16	F	94	89	90	93	89	125	89	94	89	91	91	89
17	F	134	100	109	112	119	125	122	126	130	130	132	130
18	F	125	122	128	129	137	134	132	130	128	126	125	124
19	F	106	101	97	115	110	123	111	109	113	107	104	121
20	F	158	107	103	103	157	152	149	142	159	145	161	155

ELDERLY PF ISOMETRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	103.2	93.9	90.6	115.9	103.9	103.2	106.2	107.3	108.7	109.1	110.2	107.3
2	M	106.3	113.2	116.5	118.5	125.2	118.5	101.2	103.9	107.9	102.5	101.9	102.5
3	M	161.2	167.1	163.8	174.4	171.8	176.4	172.4	169.8	179.1	165.8	170.4	166.4
4	M	98.3	87.2	97.9	107.9	103.2	95.3	73.2	105.2	105.2	81.2	105.2	111.9
5	M	90.6	108.5	96.5	107.2	117.8	120.5	123.2	127.2	123.2	127.2	128.5	134.5
6	M	90.6	96.5	101.9	103.9	99.2	91.8	90.6	91.2	93.9	89.2	86.6	95.5
7	M	119.2	116.5	113.7	110.7	109.2	125.8	127.8	124.5	119.8	127.2	123.2	121.2
8	M	150.2	148.5	165.1	152.5	153.8	155.8	149.8	148.5	149.8	154.5	147.8	147.8
9	M	98.5	81.9	93.9	111.2	75.2	75.2	81.9	76.6	80.6	75.9	72.6	72.6
10	M	120.3	103.2	105.9	119.8	131.2	130.5	133.2	133.2	135.2	133.2	137.8	140.5
11	F	128.5	119.8	121.8	126.4	129.2	132.5	131.8	127.2	135.8	127.2	135.8	132.5
12	F	150.1	148.5	165.1	152.5	153.8	155.8	149.8	148.5	149.8	154.5	147.8	147.8
13	F	95.2	143.4	116.5	107.9	105.2	111.2	109.2	109.2	119.2	109.0	126.5	143.8
14	F	85.2	100.5	93.0	79.9	85.9	85.2	88.6	89.9	88.6	93.2	89.2	89.2
15	F	93.9	125.2	121.8	129.2	135.8	94.5	98.5	132.5	140.5	101.2	140.5	128.5
16	F	116.7	117.8	115.2	132.5	131.8	135.8	131.8	135.8	137.2	135.2	130.5	134.4
17	F	119.4	108.5	127.2	115.9	95.2	99.2	97.2	129.8	101.9	121.2	97.9	97.9
18	F	100.0	85.3	91.5	95.2	98.9	97.6	101.2	105.7	106.6	103.5	102.5	103.2
19	F	122.7	119.2	133.8	123.8	136.5	143.1	142.5	137.8	135.8	132.5	129.2	126.5
20	F	115.3	111.3	115.1	133.8	118.2	118.5	121.8	121.2	113.2	117.2	116.5	125.8

ELDERLY PF CONCENTRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	109.0	125.0	128.0	135.0	141.0	141.0	147.0	115.0	142.0	147.0	147.0	147.0
2	M	119.0	101.0	102.0	109.0	107.0	115.0	115.0	115.0	117.0	115.0	119.0	123.0
3	M	135.0	143.0	143.0	147.0	151.0	149.0	155.0	155.0	158.0	156.0	156.0	160.0
4	M	107.0	129.0	128.0	139.0	139.0	141.0	142.0	143.0	150.0	145.0	153.0	158.0
5	M	94.0	119.0	115.0	97.0	103.0	106.0	108.0	108.0	113.0	112.0	115.0	112.0
6	M	83.0	89.0	87.0	89.0	97.0	96.0	102.0	107.0	104.0	104.0	99.0	87.0
7	M	125.0	97.0	127.0	111.0	107.0	103.0	105.0	111.0	102.0	112.0	111.0	111.0
8	M	118.0	105.0	107.0	107.0	106.0	107.0	113.0	107.0	109.0	111.0	105.0	103.0
9	M	80.6	81.2	86.6	97.2	70.6	73.2	73.2	73.2	95.9	71.2	71.9	72.6
10	M	118.5	97.2	101.9	108.5	99.2	95.9	97.0	97.0	99.0	103.0	97.0	100.0
11	F	115.0	149.0	123.0	134.0	121.0	131.0	120.0	128.0	127.0	118.0	118.0	132.0
12	F	118.0	105.0	107.0	107.0	106.0	107.0	113.0	107.0	109.0	111.0	105.0	103.0
13	F	147.0	122.0	123.0	123.0	131.0	143.0	141.0	145.0	141.0	147.0	139.0	140.0
14	F	101.0	89.0	93.0	94.0	93.0	97.0	98.0	93.0	93.0	95.0	91.0	91.0
15	F	96.0	94.0	89.0	127.0	157.0	125.0	137.0	147.0	107.0	115.0	145.0	118.0
16	F	138.0	127.0	131.0	147.0	155.0	128.0	127.0	127.0	128.0	129.0	152.0	125.0
17	F	77.0	91.0	94.0	97.0	81.0	97.0	93.0	93.0	92.0	81.0	79.0	83.0
18	F	85.0	80.0	81.0	78.0	79.0	88.0	86.0	90.0	81.0	82.0	87.0	88.0
19	F	131.0	110.0	103.0	130.0	117.0	117.0	117.0	131.0	120.0	128.0	131.0	125.0
20	F	115.0	163.0	154.0	129.0	115.0	113.0	111.0	124.0	114.0	110.0	119.0	122.0

ELDERLY PF ECCENTRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	81.0	119.0	121.0	131.0	139.0	105.0	107.0	105.0	109.0	106.0	131.0	113.0
2	M	112.0	122.0	135.0	141.0	117.0	125.0	125.0	121.0	115.0	117.0	129.0	125.0
3	M	147.0	129.0	136.0	142.0	147.0	149.0	152.0	156.0	155.0	155.0	155.0	155.0
4	M	92.0	113.0	114.0	128.0	121.0	125.0	13.0	134.0	135.0	90.0	133.0	132.0
5	M	99.0	115.0	111.0	127.0	131.0	133.0	135.0	134.0	137.0	97.0	106.0	102.0
6	M	103.0	81.0	85.0	88.0	99.0	93.0	88.0	91.0	94.0	97.0	101.0	96.0
7	M	125.0	120.0	125.0	145.0	155.0	162.0	125.0	109.0	117.0	121.0	110.0	124.0
8	M	129.0	120.0	119.0	117.0	117.0	126.0	123.0	124.0	128.0	123.0	125.0	125.0
9	M	73.0	96.0	101.0	101.0	103.0	81.0	81.0	74.0	85.0	80.0	85.0	86.0
10	M	131.0	106.0	110.0	125.0	131.0	102.0	136.0	135.0	137.0	138.0	133.0	132.0
11	F	113.0	105.0	114.0	111.0	109.0	113.0	117.0	124.0	107.0	115.0	119.0	124.0
12	F	129.0	120.0	119.0	117.0	117.0	126.0	123.0	124.0	128.0	123.0	125.0	125.0
13	F	109.0	140.0	151.0	140.0	115.0	109.0	118.0	119.0	116.0	120.0	117.0	118.0
14	F	79.0	141.0	105.0	93.0	90.0	85.0	88.0	86.0	84.0	86.0	85.0	85.0
15	F	95.0	100.0	118.0	115.0	113.0	118.0	112.0	114.0	116.0	109.0	108.0	99.0
16	F	132.0	117.0	119.0	128.0	137.0	106.0	133.0	129.0	134.0	132.0	128.0	136.0
17	F	117.0	99.0	100.0	101.0	106.0	104.0	110.0	110.0	112.0	115.0	114.0	117.0
18	F	110.0	118.0	117.0	114.0	115.0	120.0	103.0	109.0	107.0	105.0	115.0	116.0
19	F	131.0	95.0	133.0	115.0	133.0	128.0	142.0	146.0	141.0	145.0	150.0	132.0
20	F	119.0	155.0	159.0	158.0	113.0	115.0	123.0	129.0	111.0	128.0	111.0	129.0

ELDERLY PF ISOMETRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.035	0.033	0.032	0.033	0.033	0.034	0.034	0.031	0.034	0.034	0.033	0.033
2	M	0.028	0.030	0.031	0.031	0.031	0.032	0.032	0.032	0.033	0.032	0.033	0.033
3	M	0.064	0.061	0.061	0.063	0.064	0.065	0.064	0.064	0.064	0.058	0.064	0.064
4	M	0.074	0.072	0.070	0.069	0.070	0.069	0.069	0.070	0.088	0.069	0.069	0.069
5	M	0.053	0.053	0.054	0.055	0.054	0.053	0.054	0.054	0.052	0.053	0.053	0.053
6	M	0.026	0.025	0.025	0.024	0.025	0.025	0.025	0.025	0.021	0.025	0.025	0.026
7	M	0.029	0.030	0.030	0.030	0.030	0.029	0.029	0.030	0.029	0.029	0.029	0.029
8	M	0.072	0.074	0.078	0.077	0.077	0.075	0.077	0.077	0.078	0.077	0.078	0.077
9	M	0.058	0.059	0.061	0.061	0.060	0.060	0.059	0.057	0.058	0.058	0.059	0.058
10	M	0.068	0.067	0.068	0.070	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069
11	F	0.039	0.034	0.034	0.035	0.039	0.038	0.038	0.037	0.038	0.039	0.038	0.039
12	F	0.051	0.052	0.052	0.052	0.052	0.052	0.053	0.052	0.052	0.052	0.052	0.052
13	F	0.017	0.015	0.017	0.018	0.019	0.020	0.020	0.021	0.021	0.022	0.023	0.023
14	F	0.070	0.073	0.073	0.071	0.068	0.073	0.070	0.068	0.071	0.065	0.069	0.068
15	F	0.027	0.027	0.027	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.027	0.028
16	F	0.048	0.050	0.051	0.005	0.050	0.050	0.050	0.049	0.095	0.094	0.095	0.049
17	F	0.042	0.042	0.043	0.043	0.045	0.044	0.046	0.045	0.046	0.046	0.045	0.046
18	F	0.045	0.046	0.047	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
19	F	0.028	0.028	0.033	0.035	0.035	0.034	0.035	0.034	0.033	0.033	0.033	0.033
20	F	0.037	0.033	0.037	0.037	0.038	0.037	0.037	0.036	0.037	0.037	0.036	0.036

ELDERLY PF CONCENTRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.043	0.043	0.043	0.043	0.043	0.044	0.044	0.044	0.045	0.044	0.045	0.045
2	M	0.019	0.018	0.019	0.021	0.020	0.022	0.021	0.022	0.021	0.021	0.022	0.021
3	M	0.044	0.062	0.062	0.063	0.062	0.063	0.063	0.062	0.062	0.063	0.063	0.062
4	M	0.054	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068
5	M	0.033	0.037	0.037	0.038	0.038	0.038	0.037	0.037	0.036	0.037	0.036	0.036
6	M	0.021	0.025	0.024	0.024	0.025	0.025	0.026	0.025	0.026	0.025	0.026	0.026
7	M	0.042	0.041	0.042	0.042	0.042	0.042	0.043	0.042	0.042	0.041	0.042	0.042
8	M	0.094	0.098	0.098	0.100	0.099	0.099	0.099	0.098	0.099	0.098	0.098	0.099
9	M	0.059	0.059	0.058	0.060	0.060	0.056	0.059	0.058	0.059	0.059	0.059	0.059
10	M	0.054	0.067	0.068	0.069	0.070	0.069	0.070	0.070	0.069	0.069	0.069	0.069
11	F	0.054	0.029	0.029	0.029	0.029	0.030	0.030	0.030	0.029	0.029	0.029	0.029
12	F	0.050	0.051	0.054	0.052	0.053	0.053	0.053	0.053	0.052	0.053	0.051	0.050
13	F	0.024	0.032	0.031	0.030	0.031	0.031	0.035	0.031	0.033	0.003	0.034	0.035
14	F	0.060	0.063	0.062	0.063	0.063	0.062	0.062	0.062	0.062	0.062	0.062	0.062
15	F	0.052	0.042	0.035	0.040	0.036	0.034	0.040	0.041	0.045	0.038	0.044	0.037
16	F	0.050	0.050	0.048	0.050	0.050	0.051	0.051	0.050	0.051	0.051	0.050	0.051
17	F	0.039	0.026	0.031	0.034	0.040	0.036	0.038	0.040	0.046	0.043	0.041	0.042
18	F	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.050	0.050	0.050	0.050	0.050
19	F	0.024	0.023	0.035	0.035	0.034	0.034	0.034	0.034	0.034	0.035	0.034	0.034
20	F	0.037	0.034	0.040	0.040	0.040	0.040	0.040	0.040	0.039	0.039	0.038	0.039

ELDERLY PF ECCENTRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.028	0.032	0.031	0.033	0.032	0.033	0.033	0.033	0.032	0.032	0.033	0.034
2	M	0.042	0.045	0.046	0.046	0.045	0.045	0.045	0.045	0.045	0.046	0.045	0.042
3	M	0.063	0.060	0.059	0.060	0.060	0.061	0.061	0.061	0.061	0.062	0.060	0.061
4	M	0.085	0.085	0.086	0.086	0.085	0.086	0.084	0.086	0.087	0.086	0.087	0.087
5	M	0.022	0.023	0.023	0.023	0.023	0.021	0.022	0.020	0.022	0.022	0.023	0.023
6	M	0.034	0.041	0.042	0.044	0.041	0.041	0.039	0.041	0.041	0.041	0.041	0.040
7	M	0.062	0.062	0.064	0.065	0.066	0.066	0.065	0.066	0.065	0.065	0.065	0.064
8	M	0.064	0.051	0.060	0.096	0.095	0.095	0.094	0.096	0.096	0.094	0.095	0.095
9	M	0.057	0.057	0.058	0.058	0.058	0.057	0.058	0.057	0.058	0.058	0.057	0.057
10	M	0.068	0.066	0.066	0.068	0.068	0.068	0.068	0.068	0.069	0.068	0.068	0.068
11	F	0.042	0.039	0.037	0.041	0.042	0.039	0.041	0.042	0.041	0.040	0.041	0.041
12	F	0.047	0.049	0.052	0.052	0.051	0.053	0.052	0.051	0.052	0.052	0.052	0.053
13	F	0.036	0.037	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
14	F	0.072	0.072	0.073	0.074	0.074	0.073	0.073	0.073	0.073	0.073	0.072	0.073
15	F	0.029	0.032	0.031	0.035	0.028	0.028	0.029	0.031	0.027	0.024	0.026	0.028
16	F	0.039	0.034	0.036	0.038	0.039	0.039	0.038	0.039	0.039	0.039	0.039	0.039
17	F	0.024	0.026	0.026	0.025	0.025	0.024	0.024	0.024	0.024	0.024	0.024	0.024
18	F	0.032	0.032	0.032	0.033	0.033	0.035	0.032	0.032	0.033	0.032	0.033	0.033
19	F	0.026	0.019	0.036	0.033	0.035	0.035	0.035	0.034	0.029	0.029	0.033	0.033
20	F	0.038	0.034	0.034	0.038	0.037	0.038	0.037	0.037	0.037	0.037	0.036	0.029

ELDERLY PF ISOMETRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	5.96	5.66	5.63	6.03	5.78	5.94	5.90	5.90	5.86	5.95	5.84	5.81
2	M	4.49	4.95	4.93	4.91	4.95	4.95	4.93	4.97	5.05	4.98	4.96	5.02
3	M	10.67	10.40	9.89	10.42	10.53	10.60	10.62	10.55	10.42	10.11	10.53	10.48
4	M	13.91	13.66	13.07	12.89	12.77	12.87	12.72	12.80	12.74	12.72	12.65	12.64
5	M	7.87	8.07	8.17	8.15	7.99	8.12	8.14	8.07	7.94	8.07	7.96	8.06
6	M	5.77	6.19	5.99	5.94	5.92	5.81	5.82	5.68	6.00	5.72	6.02	6.02
7	M	5.83	6.10	6.03	5.97	6.03	5.97	5.97	5.99	5.90	5.94	5.84	5.99
8	M	13.71	14.39	14.81	14.54	14.51	14.28	14.38	14.38	14.42	14.38	14.31	14.33
9	M	8.16	8.42	8.47	8.41	8.37	8.44	7.98	8.30	8.24	8.27	8.14	8.22
10	M	10.35	10.69	10.68	10.75	10.63	10.71	10.72	10.59	10.57	10.65	10.60	10.52
11	F	6.92	6.74	6.62	6.70	6.76	6.83	6.86	6.92	6.89	6.93	6.91	6.97
12	F	7.16	7.38	7.31	7.31	7.24	7.30	7.36	7.26	7.27	7.31	7.27	7.38
13	F	2.46	2.32	2.51	2.67	3.03	3.04	3.05	3.23	3.29	3.29	3.39	3.49
14	F	9.81	9.95	9.95	9.91	9.89	9.86	9.88	9.87	9.52	9.74	9.79	9.81
15	F	3.93	3.88	3.89	3.94	3.93	4.02	3.82	3.88	3.92	3.95	3.83	3.88
16	F	6.76	7.10	7.17	7.02	7.10	6.94	6.87	6.96	6.90	6.91	6.90	6.87
17	F	5.47	5.48	5.53	5.62	5.68	5.66	5.68	5.74	5.82	5.84	5.92	5.83
18	F	6.24	6.23	6.29	6.35	6.21	6.24	6.54	6.33	6.21	6.12	6.16	6.13
19	F	3.53	4.08	4.48	4.50	4.58	4.54	4.58	4.43	4.36	4.45	4.43	4.45
20	F	6.18	6.15	6.13	6.13	6.27	6.15	6.19	6.13	6.12	6.12	5.99	5.99

ELDERLY PF CONCENTRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	6.09	6.37	6.44	6.35	6.43	6.39	6.48	6.46	6.51	6.55	6.63	6.65
2	M	2.85	2.66	2.79	2.66	2.78	3.06	3.03	3.16	3.18	4.18	3.12	3.07
3	M	9.85	9.86	9.91	9.75	9.77	9.73	9.75	9.77	9.73	9.71	9.58	9.67
4	M	11.60	11.55	11.63	11.86	11.90	11.91	11.93	11.92	11.93	11.92	11.92	11.92
5	M	5.97	6.60	6.45	6.46	6.43	6.38	6.36	6.34	6.29	6.25	6.29	6.29
6	M	5.63	5.78	5.71	5.36	5.81	5.84	5.66	5.84	5.88	5.68	6.02	5.61
7	M	7.30	7.37	7.45	7.42	7.38	7.47	7.37	7.42	7.35	7.37	7.42	7.41
8	M	16.13	16.86	16.83	16.92	16.82	16.59	16.66	16.77	16.66	16.61	16.60	16.71
9	M	8.07	8.44	8.25	8.48	8.48	8.42	8.39	8.34	8.37	8.30	8.29	8.27
10	M	10.63	10.53	10.40	10.48	10.52	10.59	10.54	10.59	10.50	10.40	10.34	10.37
11	F	6.09	5.59	5.59	5.49	5.61	5.77	5.53	5.77	5.69	5.77	5.66	5.58
12	F	6.85	7.14	7.16	6.96	7.16	7.14	7.20	7.16	7.20	7.21	6.96	6.85
13	F	3.78	5.03	4.98	5.03	5.07	5.01	5.35	5.03	5.31	5.47	5.61	5.64
14	F	8.61	8.90	8.84	8.84	8.76	8.73	8.75	8.75	8.81	8.74	8.71	8.66
15	F	3.53	3.23	2.40	3.38	2.85	2.95	3.49	3.41	3.75	3.00	3.87	2.94
16	F	7.13	7.00	7.07	7.10	7.07	7.14	7.17	7.16	7.17	7.14	7.11	7.14
17	F	5.50	3.51	4.29	4.64	5.47	5.10	5.26	5.57	5.82	5.88	5.62	5.82
18	F	4.31	4.23	4.34	4.56	4.61	4.54	4.53	4.51	4.52	4.34	4.47	4.80
19	F	3.01	2.81	4.61	4.56	4.44	4.42	4.35	4.43	4.36	4.44	4.49	4.39
20	F	6.02	5.36	6.66	6.59	6.63	6.53	6.46	6.44	6.51	6.40	6.10	6.35

ELDERLY PF ECCENTRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	4.34	4.66	4.74	4.87	4.70	4.86	4.87	4.83	4.69	4.54	4.84	4.92
2	M	7.36	7.32	7.21	7.31	7.30	7.32	7.22	7.27	7.21	7.33	7.25	6.76
3	M	10.47	9.82	9.85	9.92	10.06	9.99	10.07	9.96	10.02	10.07	9.98	9.92
4	M	14.13	14.43	14.64	14.57	14.43	14.67	14.18	15.30	14.73	14.58	14.63	14.69
5	M	3.53	4.03	4.10	3.93	4.07	3.57	3.77	3.77	3.84	3.82	3.82	3.82
6	M	5.20	6.13	6.18	6.30	6.14	6.03	5.87	5.99	6.07	6.02	6.07	5.97
7	M	10.00	10.40	10.59	10.58	10.55	10.50	10.45	10.43	10.52	10.47	10.38	10.34
8	M	11.56	9.21	10.86	17.08	16.50	16.52	16.64	16.48	16.51	16.45	16.41	16.21
9	M	8.28	8.20	8.13	8.19	8.27	8.20	8.28	8.23	8.18	8.23	8.04	8.23
10	M	10.53	10.45	10.36	10.37	10.33	10.39	10.37	10.33	10.32	10.28	10.31	10.29
11	F	7.60	7.05	6.91	7.38	7.48	7.04	7.42	7.52	7.20	7.21	7.20	7.11
12	F	7.22	7.37	7.69	7.79	7.68	7.77	7.77	7.57	7.48	7.51	7.53	7.68
13	F	6.23	6.27	6.20	6.18	6.24	6.31	6.18	6.27	6.20	6.25	6.31	6.22
14	F	10.11	10.42	10.62	10.52	10.44	10.47	10.32	10.37	10.39	10.40	10.28	10.28
15	F	4.21	4.32	4.26	4.25	4.32	4.22	4.20	4.26	4.21	4.21	4.20	4.23
16	F	6.93	6.73	6.85	6.90	6.95	6.97	6.94	6.95	6.99	6.97	6.94	6.92
17	F	4.34	4.42	4.53	4.50	4.43	4.46	4.38	4.32	4.37	4.31	4.38	4.34
18	F	5.08	4.98	4.92	5.21	5.16	5.07	5.06	4.97	4.89	4.88	4.91	4.90
19	F	4.39	4.31	4.36	4.60	4.39	4.35	4.40	4.39	4.38	4.40	4.36	4.32
20	F	4.61	4.64	4.67	4.66	4.65	4.68	4.67	4.66	4.66	4.67	4.66	4.67

YOUNG DATA

YOUNG DF ISOMETRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	1.7	3.2	2.7	2.5	2.4	2.4	2.5	2.1	2.2	2.2	2.1	2.0
2	M	2.5	4.1	3.3	3.1	2.9	2.8	3.0	2.8	2.8	2.7	2.7	2.7
3	M	4.2	6.1	4.8	4.7	4.7	4.7	4.5	4.5	4.4	4.1	4.4	4.2
4	M	3.1	5.7	5.2	4.6	4.7	4.5	4.3	4.5	4.2	4.2	4.0	4.0
5	M	3.6	5.2	4.7	4.6	4.5	4.5	4.4	4.4	4.3	4.1	4.1	4.1
6	M	3.6	4.3	3.4	3.2	3.2	3.5	3.6	3.7	3.4	3.5	3.3	3.5
7	M	3.9	6.0	4.8	4.4	4.2	4.4	4.5	4.3	4.2	4.2	4.1	3.8
8	M	3.7	6.6	6.2	5.2	5.1	5.0	4.8	4.8	4.7	4.6	4.5	4.7
9	M	5.7	8.4	7.1	6.7	6.5	6.6	6.4	5.7	6.1	5.6	5.5	5.8
10	M	1.9	3.3	2.5	2.4	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.0
11	F	2.3	3.1	2.8	2.7	2.5	2.4	2.6	2.7	2.3	2.3	2.5	2.4
12	F	1.7	2.5	1.9	1.9	1.8	1.8	1.8	1.9	1.9	1.8	1.8	1.8
13	F	2.9	4.4	3.9	3.8	3.5	3.5	3.5	3.4	3.5	3.4	3.3	3.5
14	F	3.1	3.4	2.9	2.9	2.9	3.0	3.1	3.1	3.1	3.2	2.9	3.0
15	F	2.5	4.0	3.5	3.1	3.2	3.0	2.9	2.8	2.9	2.7	2.9	2.6
16	F	2.6	3.6	2.9	2.9	3.0	3.2	3.2	3.2	3.3	3.2	3.0	3.0
17	F	2.9	4.1	3.4	2.9	2.9	2.6	3.1	2.8	2.7	2.8	2.9	2.7
18	F	1.4	2.1	1.5	1.1	1.3	1.0	1.1	1.1	1.0	1.1	0.7	1.1
19	F	1.4	4.1	3.4	2.9	2.6	2.7	2.5	2.2	2.2	2.5	2.1	2.0
20	F	1.3	2.3	1.6	1.6	1.6	1.5	1.6	1.7	1.6	1.5	1.5	1.6

YOUNG DF CONCENTRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	1.5	4.2	3.2	3.1	2.9	2.9	2.7	2.6	2.3	2.2	2.1	2.1
2	M	2.9	4.7	3.4	2.7	2.9	2.5	2.4	2.5	2.4	2.3	2.3	2.2
3	M	4.6	6.9	6.2	6.1	5.2	5.8	5.8	5.6	5.5	5.6	5.3	5.3
4	M	3.2	4.6	3.9	3.7	3.8	3.8	3.7	3.7	3.7	3.5	3.5	3.4
5	M	3.6	4.9	4.2	4.2	4.1	4.2	4.0	4.0	3.8	3.6	3.7	3.7
6	M	3.3	3.5	3.2	3.2	3.4	3.3	3.5	3.6	3.6	3.4	3.5	3.3
7	M	3.4	6.9	5.8	5.5	5.1	5.1	4.9	4.7	4.8	4.8	4.8	4.5
8	M	3.6	6.6	6.3	5.6	5.3	4.8	4.5	4.2	4.8	4.7	4.7	4.4
9	M	6.9	12.5	10.7	9.6	9.0	9.0	8.4	8.6	8.3	8.1	8.0	7.8
10	M	2.7	5.5	4.4	3.8	3.5	3.5	3.4	3.3	3.2	3.1	3.1	2.9
11	F	2.3	4.0	3.2	3.1	2.9	3.0	3.0	2.9	2.8	2.9	2.9	2.7
12	F	1.6	2.6	2.6	2.3	2.1	2.1	2.0	1.9	1.9	1.2	1.4	1.3
13	F	4.1	5.1	4.7	4.5	4.6	4.8	4.7	4.5	4.5	4.2	4.5	4.3
14	F	3.1	4.4	3.6	3.3	3.5	3.6	3.5	3.4	3.5	3.5	3.4	3.2
15	F	2.4	3.3	3.3	3.2	3.2	3.2	3.4	3.2	3.3	3.1	3.1	3.1
16	F	2.0	3.9	3.5	3.0	2.9	2.9	3.2	2.9	3.0	2.9	3.4	2.9
17	F	2.4	5.9	5.6	5.0	4.8	4.8	4.8	4.7	4.4	4.4	4.1	4.1
18	F	1.4	2.8	2.4	1.8	1.8	1.7	1.6	1.3	1.6	1.5	1.4	1.6
19	F	1.8	3.7	2.6	2.4	2.4	2.3	2.1	2.2	2.1	2.1	2.0	2.0
20	F	1.5	2.0	1.9	1.5	1.5	1.5	1.5	1.5	1.8	1.6	1.5	1.5

YOUNG DF ECCENTRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	1.9	3.2	3.1	2.9	2.6	2.6	2.6	2.4	2.4	2.4	2.1	2.1
2	M	2.1	4.4	3.4	3.1	2.8	2.7	2.6	2.6	2.4	2.4	2.2	2.2
3	M	1.9	5.7	5.3	5.5	5.2	5.3	5.2	5.1	5.3	4.8	4.8	4.9
4	M	2.7	3.8	3.4	3.0	3.0	2.7	3.0	2.8	2.5	2.2	2.5	2.3
5	M	4.1	5.2	4.9	4.7	4.9	4.7	4.6	4.4	4.3	4.2	4.4	4.2
6	M	3.5	4.5	3.9	3.7	3.0	3.0	2.9	3.0	3.2	2.8	3.2	2.6
7	M	3.7	8.6	6.4	6.1	5.8	5.7	5.5	5.5	5.4	5.2	5.2	5.1
8	M	3.8	8.1	7.2	6.3	5.8	5.7	5.6	5.3	5.2	5.1	5.1	4.9
9	M	6.3	10.9	9.0	7.9	8.0	7.5	7.6	7.5	7.2	7.2	6.9	6.7
10	M	1.7	4.2	4.2	3.9	3.7	3.7	3.6	3.2	3.1	3.1	2.6	2.4
11	F	1.7	3.5	2.8	2.7	2.7	1.9	2.6	2.4	1.9	3.1	2.0	2.4
12	F	1.4	2.9	2.1	2.0	1.9	2.3	2.2	2.1	2.1	2.0	2.1	2.0
13	F	3.7	5.3	5.3	5.1	5.1	5.2	5.1	5.1	5.0	4.8	4.8	4.9
14	F	1.9	3.7	3.4	2.9	2.9	2.9	2.8	2.8	2.8	2.8	2.6	2.5
15	F	2.7	4.1	3.2	3.1	3.1	3.0	3.0	2.9	2.9	2.9	2.7	2.6
16	F	2.5	3.8	3.5	3.2	3.2	3.1	3.1	2.6	3.0	2.9	2.7	2.9
17	F	2.6	5.2	4.8	4.6	4.5	4.4	4.4	4.2	4.1	4.0	3.8	3.7
18	F	1.1	2.8	2.3	1.5	1.4	1.3	1.0	1.0	0.8	1.0	1.1	0.7
19	F	1.5	4.4	3.8	3.3	3.0	2.9	3.0	2.9	2.8	2.8	2.6	2.5
20	F	1.4	2.4	2.2	1.8	1.7	1.9	1.9	1.6	1.8	1.8	1.7	1.6

YOUNG DF ISOMETRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	335.9	552.1	456.0	429.7	369.1	417.8	387.2	352.3	388.6	381.3	344.8	360.2
2	M	50.3	100.8	97.5	82.4	78.5	73.9	77.8	74.6	77.1	69.4	64.4	71.5
3	M	98.2	171.9	155.0	163.0	155.6	148.9	151.5	148.4	146.0	138.6	143.6	138.3
4	M	92.9	144.9	135.9	106.0	117.9	122.5	138.7	114.8	134.5	131.0	128.1	125.9
5	M	114.1	158.1	157.4	148.9	139.0	148.2	135.2	108.8	142.2	121.5	117.2	112.3
6	M	83.1	116.7	101.7	92.6	91.2	82.7	93.3	79.6	84.1	75.2	79.2	85.2
7	M	79.2	151.0	125.7	120.0	99.6	83.7	111.1	86.6	85.9	81.8	91.1	92.0
8	M	81.7	189.4	155.2	135.2	134.8	118.3	130.3	128.1	129.5	119.0	111.2	104.9
9	M	142.8	227.4	219.0	175.7	157.1	155.5	153.1	135.2	144.6	135.7	132.0	141.2
10	M	49.6	100.6	90.1	58.8	66.3	51.5	58.6	63.6	59.1	53.1	57.6	49.4
11	F	63.0	94.0	66.2	70.8	71.1	76.0	67.2	65.2	57.1	54.6	67.6	69.0
12	F	82.3	94.3	69.7	84.1	89.8	84.7	102.1	103.2	99.5	102.4	96.6	100.8
13	F	89.1	97.9	109.0	95.3	98.5	97.1	68.0	86.1	87.7	86.6	86.1	85.8
14	F	74.4	87.9	90.3	84.7	95.1	91.6	92.9	86.3	92.7	76.4	75.2	88.2
15	F	105.6	147.6	136.0	115.9	154.9	111.7	125.9	116.9	116.4	125.4	127.0	105.9
16	F	71.1	101.0	78.5	89.4	73.6	68.6	79.2	79.7	82.0	71.5	84.5	86.3
17	F	103.0	141.1	103.7	121.7	127.0	132.8	134.6	135.5	123.5	129.9	127.5	125.9
18	F	53.1	80.8	67.8	63.7	69.2	54.1	63.1	64.2	57.0	69.4	63.9	76.0
19	F	69.5	118.0	89.2	70.0	81.6	85.8	87.9	99.5	72.6	72.9	78.2	78.4
20	F	79.9	77.6	87.3	83.1	91.5	88.4	70.2	100.0	88.0	77.8	78.2	95.9

YOUNG DF CONCENTRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	58.9	113.9	113.1	110.2	88.5	98.7	86.9	87.9	87.2	59.6	81.8	70.1
2	M	65.7	133.3	89.8	74.0	65.5	73.6	65.5	52.0	60.2	56.0	56.0	52.1
3	M	105.6	196.7	149.5	149.9	142.5	133.3	136.0	127.5	122.2	119.3	116.9	106.6
4	M	81.0	129.4	100.4	100.8	95.6	90.5	91.3	94.3	94.0	80.3	80.8	88.4
5	M	110.9	128.3	113.4	108.1	104.9	101.4	111.4	100.3	90.8	84.1	97.7	82.4
6	M	73.1	86.3	67.8	75.0	68.6	70.0	74.4	79.6	86.3	78.9	67.6	80.5
7	M	88.7	204.3	141.5	115.4	116.4	116.7	118.0	114.6	123.8	119.8	119.3	109.0
8	M	94.5	175.5	152.3	134.8	111.7	115.5	116.2	122.5	113.5	110.5	116.2	114.2
9	M	190.1	504.1	277.4	229.4	201.4	197.8	190.6	194.3	192.4	182.4	186.1	178.2
10	M	75.8	133.3	119.7	86.9	89.0	87.4	96.9	102.4	88.2	85.3	78.5	72.6
11	F	70.1	121.1	90.5	72.6	82.1	87.0	77.6	73.6	73.9	66.3	71.0	72.3
12	F	103.1	135.7	111.1	112.7	109.5	108.8	99.9	97.0	85.7	88.7	82.3	74.2
13	F	85.5	124.3	106.6	107.7	90.5	95.1	94.0	86.6	90.0	91.1	92.9	95.5
14	F	101.7	124.3	105.6	86.6	99.3	109.8	110.6	115.6	116.9	114.6	114.8	117.2
15	F	67.5	81.0	85.2	84.7	88.8	86.1	81.2	85.3	87.1	84.7	89.4	92.9
16	F	44.7	102.7	94.9	96.1	78.7	79.0	95.4	72.9	82.0	71.3	85.8	94.0
17	F	78.9	177.2	162.1	128.8	129.6	123.9	116.9	112.5	109.9	105.9	128.6	125.9
18	F	50.1	82.7	73.1	61.5	59.4	61.0	75.0	48.6	58.4	52.0	54.6	54.9
19	F	101.2	121.2	115.9	124.3	128.5	112.7	125.7	114.3	102.4	115.8	104.0	104.6
20	F	71.8	76.0	70.0	66.5	64.9	35.7	83.7	57.5	72.6	71.0	67.6	90.5

YOUNG DF ECCENTRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	47.0	99.9	87.8	79.4	75.1	73.1	75.5	68.2	74.5	69.3	60.1	53.9
2	M	102.8	134.6	92.4	134.6	81.0	86.6	75.5	72.3	68.3	62.3	63.1	65.5
3	M	62.6	161.0	123.5	131.3	134.1	125.7	123.0	123.8	114.0	114.1	110.9	102.2
4	M	64.1	112.7	97.7	81.3	79.5	84.2	88.4	90.1	78.9	73.1	70.8	61.3
5	M	101.9	133.3	121.8	124.1	135.2	128.5	125.7	126.7	119.7	113.0	117.6	121.8
6	M	78.2	134.1	101.0	81.8	83.9	78.1	76.6	74.2	80.0	77.4	71.5	60.2
7	M	91.8	216.0	177.8	150.3	139.1	155.2	128.1	126.0	119.0	106.7	102.8	102.8
8	M	94.0	195.7	160.2	153.8	139.4	140.8	134.5	133.1	140.5	139.1	123.9	122.5
9	M	155.7	309.4	199.6	190.6	176.0	207.8	182.4	170.8	171.3	175.0	160.2	163.9
10	M	61.5	165.4	133.6	125.3	101.8	98.9	95.6	88.3	78.6	79.7	74.1	70.2
11	F	68.1	92.6	87.9	86.0	74.7	44.4	61.8	69.7	57.0	81.3	59.5	59.9
12	F	74.7	114.4	105.3	114.3	123.6	135.5	111.1	106.4	97.1	106.3	109.3	96.1
13	F	87.1	119.3	111.7	116.9	124.6	122.9	121.7	121.2	116.9	115.3	112.3	106.9
14	F	54.6	92.7	81.3	82.4	85.3	85.0	76.6	84.2	77.3	85.3	81.3	77.1
15	F	101.7	109.8	102.9	101.7	120.7	89.1	118.0	130.3	121.8	115.1	113.0	117.6
16	F	73.1	112.3	99.1	118.9	102.4	109.0	93.5	88.7	92.7	96.3	105.9	102.2
17	F	72.1	154.2	141.5	151.0	129.9	133.0	116.2	113.5	102.7	106.1	97.4	96.1
18	F	39.0	76.7	89.5	50.4	46.2	36.4	36.7	27.7	15.1	23.0	33.0	19.5
19	F	86.6	137.5	137.0	118.0	126.0	123.0	100.6	112.2	128.6	104.5	98.7	101.4
20	F	65.8	82.6	64.2	65.2	66.3	76.4	78.2	72.9	77.9	69.7	77.3	52.8

YOUNG DF ISOMETRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	46.6	61.4	49.9	55.3	52.4	48.4	81.9	47.9	44.9	80.9	77.9	77.9
2	M	95.9	77.5	71.9	79.4	82.4	83.4	87.4	90.9	85.9	89.9	80.9	81.9
3	M	67.2	69.2	72.6	68.9	74.4	71.9	73.2	69.9	70.6	68.9	70.6	68.9
4	M	90.6	56.3	56.4	58.9	58.4	59.9	81.9	57.9	57.9	86.9	81.9	82.3
5	M	61.4	56.4	61.9	59.9	62.6	65.4	64.4	68.4	58.4	90.4	91.9	66.9
6	M	112.8	77.2	83.4	75.9	85.4	88.9	93.4	78.9	94.9	91.9	105.8	102.9
7	M	70.6	53.9	63.3	60.4	65.9	95.2	79.2	98.9	78.9	73.9	95.2	77.9
8	M	79.9	83.4	72.6	69.4	85.4	86.4	47.9	80.9	94.4	89.9	80.4	83.9
9	M	101.2	86.9	87.9	86.4	93.9	89.9	91.2	90.6	96.6	88.6	90.4	87.4
10	M	58.6	49.3	56.4	57.9	56.6	51.9	51.9	54.6	56.6	55.9	58.6	55.9
11	F	64.4	41.9	55.9	58.4	66.4	56.4	62.4	65.9	58.9	62.9	68.3	62.9
12	F	40.6	44.6	48.6	43.9	48.4	44.6	39.9	44.6	42.6	43.3	44.6	43.9
13	F	79.9	77.9	79.9	78.6	75.2	76.6	78.9	76.6	76.6	74.6	76.6	78.6
14	F	87.9	83.9	81.2	85.2	92.4	95.9	85.2	89.2	89.2	89.9	93.0	98.5
15	F	63.9	56.6	59.3	53.3	60.9	58.9	55.3	59.4	58.5	52.6	57.9	57.3
16	F	88.9	62.9	71.0	80.4	80.9	87.9	81.9	81.2	85.9	85.9	85.2	87.9
17	F	90.4	65.5	77.2	86.6	84.6	82.6	85.9	85.9	85.9	84.6	83.2	87.9
18	F	75.9	47.9	41.4	40.9	41.9	46.6	43.9	45.3	71.9	38.6	69.9	38.9
19	F	69.9	55.8	61.3	57.9	57.9	59.3	45.9	49.3	55.0	47.0	51.0	43.3
20	F	43.4	53.3	44.4	40.4	42.4	41.9	43.3	44.4	38.9	38.9	44.9	39.9

YOUNG DF CONCENTRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	42.6	53.3	49.4	46.4	48.6	49.3	47.3	49.3	40.9	82.9	44.4	44.4
2	M	85.6	77.2	79.4	75.0	57.3	75.9	81.2	74.4	89.2	75.4	82.9	84.3
3	M	77.9	75.2	77.2	80.6	79.2	82.6	83.2	79.2	79.4	86.6	87.9	89.2
4	M	54.6	54.6	55.0	57.3	53.4	54.6	61.3	57.9	55.3	57.3	57.0	52.6
5	M	94.9	67.2	60.4	88.9	63.9	87.9	78.6	92.4	82.6	78.9	93.2	83.9
6	M	106.5	79.2	83.0	85.4	94.5	77.9	116.5	97.4	107.3	115.8	114.8	90.6
7	M	63.9	77.2	71.9	84.6	71.2	81.9	74.6	79.2	79.2	86.6	89.2	83.9
8	M	72.6	75.2	56.7	61.0	84.6	56.4	55.9	79.2	78.9	87.0	80.4	82.3
9	M	95.9	55.0	69.9	88.6	98.4	99.9	102.5	103.9	107.2	105.9	102.5	109.9
10	M	62.4	50.4	64.6	67.2	63.3	59.3	58.9	58.6	57.3	58.9	57.3	52.1
11	F	62.4	73.9	58.6	62.6	63.3	68.9	66.6	63.3	59.9	60.6	63.3	60.6
12	F	41.9	43.3	43.0	42.6	42.7	41.3	41.2	40.6	40.4	40.4	40.2	40.2
13	F	97.2	70.5	87.2	89.2	92.9	97.4	96.0	89.4	94.5	91.9	95.2	92.5
14	F	92.4	47.9	73.9	85.9	86.6	86.9	89.2	87.2	81.2	88.6	83.9	84.6
15	F	44.0	51.9	50.6	50.3	49.9	49.9	49.3	48.8	48.3	47.9	47.6	47.3
16	F	63.9	65.3	70.9	61.4	73.2	80.6	87.9	83.4	82.9	67.2	89.2	61.9
17	F	85.3	75.2	70.6	73.9	67.2	94.4	85.9	77.2	81.2	87.2	77.9	83.2
18	F	60.2	61.9	57.3	58.6	50.6	47.9	44.4	75.9	48.4	45.9	48.6	50.9
19	F	46.6	57.3	55.3	46.9	49.4	46.6	49.4	51.3	53.3	49.4	47.9	48.4
20	F	45.9	43.9	43.3	41.3	45.9	40.0	43.9	45.0	48.6	43.3	47.9	41.9

YOUNG DF ECCENTRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	51.0	54.9	49.3	45.3	51.3	47.9	43.9	76.5	81.4	46.4	72.4	72.4
2	M	97.8	71.2	47.3	55.3	85.2	60.6	91.2	95.4	61.3	86.6	61.9	72.4
3	M	74.0	59.3	67.9	78.4	74.9	77.2	75.2	78.6	78.6	72.9	93.4	81.2
4	M	82.4	47.4	84.6	84.6	87.2	87.9	84.9	81.9	88.9	76.6	86.9	84.4
5	M	63.3	54.3	57.9	63.3	65.4	60.4	66.9	63.9	68.4	69.4	76.9	65.9
6	M	92.5	74.4	73.9	107.2	114.5	105.9	106.5	113.2	112.5	121.3	111.2	116.2
7	M	85.5	80.2	85.8	95.4	89.9	84.9	92.4	87.9	81.9	84.4	82.4	80.9
8	M	78.4	78.9	79.6	80.4	87.9	88.4	88.4	93.9	84.4	80.4	87.9	85.4
9	M	103.3	61.9	83.9	103.2	84.4	93.2	92.5	90.6	101.9	101.9	95.9	97.2
10	M	51.3	47.3	48.6	49.0	49.3	49.4	49.7	49.8	49.2	50.7	51.2	51.3
11	F	44.6	38.9	55.9	55.9	49.3	26.0	61.9	57.9	56.6	102.5	53.9	57.3
12	F	75.0	50.9	43.9	45.3	41.4	43.9	41.9	41.9	46.6	39.4	42.6	47.3
13	F	75.9	81.0	89.2	83.2	94.5	90.9	97.9	101.2	103.3	87.9	93.4	85.9
14	F	62.6	41.9	47.3	47.4	48.6	86.6	85.9	80.6	91.9	55.9	81.2	88.3
15	F	59.0	58.9	52.9	55.9	52.9	57.4	51.4	50.4	53.4	54.9	45.5	48.9
16	F	83.9	59.9	72.0	81.8	87.2	85.9	92.5	66.6	72.2	85.9	79.9	83.9
17	F	66.6	68.6	65.9	66.9	66.6	63.3	63.3	61.9	75.2	70.6	59.9	63.9
18	F	83.0	61.9	56.6	57.3	59.9	77.0	71.9	75.2	57.3	63.9	65.9	66.2
19	F	45.4	68.6	58.6	53.9	53.9	55.3	57.9	56.6	49.9	53.9	57.3	49.3
20	F	44.4	47.9	36.0	46.6	45.3	50.9	49.9	40.6	42.6	45.3	47.9	46.6

YOUNG DF ISOMETRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	91.2	55.3	57.9	67.9	80.9	84.4	62.9	87.4	97.9	59.9	61.9	60.4
2	M	70.4	47.7	55.4	56.4	54.4	54.4	70.4	59.9	37.4	65.9	63.4	72.9
3	M	63.3	49.3	53.4	56.6	55.4	61.4	64.6	69.2	68.6	63.3	70.9	66.6
4	M	75.9	53.9	90.4	87.4	91.4	86.4	83.4	68.4	94.4	89.9	60.4	57.4
5	M	89.9	77.4	79.4	87.9	90.1	91.4	93.4	87.9	100.9	64.9	66.4	90.9
6	M	76.9	69.2	85.9	89.4	91.4	89.4	107.8	90.4	86.6	76.4	79.9	79.9
7	M	86.6	75.9	65.9	81.4	79.9	55.3	77.9	55.9	71.4	79.9	55.9	65.6
8	M	51.4	45.4	55.7	69.9	58.9	68.4	66.9	73.9	60.4	62.4	76.9	69.4
9	M	73.9	70.9	71.4	84.9	78.6	81.9	83.2	82.6	81.9	89.2	84.3	88.9
10	M	57.3	49.9	40.9	45.9	48.6	53.3	55.9	55.9	51.9	55.9	53.9	57.9
11	F	66.9	74.9	63.9	75.9	59.9	58.4	70.9	73.9	64.4	56.9	70.9	62.9
12	F	80.6	51.4	49.9	62.4	51.9	63.9	60.4	60.6	60.6	59.3	53.3	51.3
13	F	79.9	58.6	63.3	73.9	77.9	79.2	74.8	79.9	81.9	82.6	77.9	83.9
14	F	91.9	48.6	65.9	62.6	66.9	61.9	83.9	72.6	83.2	80.4	65.0	65.9
15	F	73.9	57.3	50.6	57.3	51.9	54.6	54.3	54.9	53.9	53.9	58.6	51.3
16	F	49.9	52.9	46.4	46.9	51.9	51.9	57.4	57.9	53.9	51.9	54.6	50.4
17	F	90.6	58.3	55.3	77.2	87.9	94.5	88.9	89.9	103.9	91.2	102.5	99.6
18	F	68.5	42.9	45.9	49.9	57.9	63.3	56.4	26.5	66.9	54.6	69.9	70.4
19	F	62.2	51.9	50.6	53.3	52.6	56.6	67.9	59.3	69.0	67.0	62.0	70.6
20	F	18.0	44.6	47.4	50.4	49.9	45.4	59.9	54.4	77.4	66.4	62.9	56.4

YOUNG DF CONCENTRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	43.2	18.0	62.3	81.9	85.2	91.9	93.2	94.5	101.5	53.4	109.3	90.4
2	M	81.9	49.9	44.4	51.0	77.2	56.9	81.9	65.6	74.9	55.9	74.4	61.4
3	M	63.4	51.3	53.9	60.6	65.3	59.9	61.3	97.9	91.4	65.3	63.3	60.6
4	M	81.2	51.9	83.0	81.2	87.9	84.6	77.2	85.4	85.9	81.2	84.8	82.6
5	M	62.4	61.9	85.4	61.9	82.4	62.9	69.2	56.4	61.4	66.9	64.6	62.9
6	M	81.2	69.9	97.0	91.9	91.2	97.9	69.2	90.4	79.9	69.4	69.4	89.2
7	M	69.9	47.9	58.6	55.3	69.2	57.2	67.2	61.3	63.9	58.6	53.3	59.3
8	M	69.9	43.3	51.4	67.9	75.9	52.6	76.9	76.4	63.3	62.6	64.0	63.9
9	M	105.7	77.2	89.9	93.9	91.9	89.9	82.9	81.2	86.6	85.2	88.6	79.2
10	M	54.6	44.2	53.4	48.6	49.9	55.9	57.3	62.4	60.6	59.3	60.9	57.9
11	F	76.4	51.4	71.4	73.9	76.6	93.9	89.2	90.9	99.2	103.0	92.5	95.3
12	F	73.9	55.0	65.2	69.9	72.1	72.3	75.2	74.3	75.7	78.9	79.7	78.9
13	F	69.9	77.9	63.4	74.6	79.9	81.9	84.0	86.4	78.6	73.2	80.6	79.2
14	F	60.9	79.9	87.9	48.4	57.3	55.4	55.6	57.9	68.6	59.9	63.3	60.6
15	F	76.0	77.3	65.4	31.2	66.9	70.9	83.9	81.2	73.2	79.6	80.6	81.2
16	F	53.4	59.3	53.4	71.4	63.3	54.6	53.4	52.4	58.4	71.2	53.3	74.4
17	F	86.6	87.1	80.6	93.2	102.5	79.9	89.4	102.5	98.5	88.6	93.9	84.5
18	F	46.9	15.0	43.9	45.3	42.6	24.0	16.0	10.7	15.3	22.0	23.4	9.3
19	F	49.3	57.9	48.6	51.4	54.4	54.4	50.9	51.3	51.9	59.4	57.9	59.4
20	F	78.6	45.3	43.3	45.3	46.6	55.0	45.3	54.0	55.3	68.6	58.6	53.9

YOUNG DF ECCENTRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	110.0	65.7	78.4	99.2	104.5	91.9	98.9	117.8	66.3	62.4	101.4	98.4
2	M	68.6	49.3	78.6	80.6	50.6	79.9	49.3	51.4	48.9	86.6	51.9	81.9
3	M	68.6	73.9	78.6	79.8	74.9	75.9	77.9	75.2	81.9	82.9	75.9	80.6
4	M	81.9	71.4	43.9	44.6	39.3	40.6	46.9	47.9	39.9	50.6	45.9	43.4
5	M	83.9	82.9	94.9	87.2	85.9	92.9	86.9	83.9	80.9	76.4	81.4	84.4
6	M	88.6	65.9	100.9	87.9	73.9	89.9	83.2	79.2	73.9	73.4	83.2	77.9
7	M	56.6	51.3	61.0	53.4	57.4	61.4	54.4	61.9	69.9	67.9	67.9	67.4
8	M	94.9	53.4	72.4	61.3	67.4	72.4	85.9	71.9	77.4	81.9	77.4	78.9
9	M	85.4	83.9	77.9	77.2	98.5	79.9	90.6	76.6	77.2	79.9	79.9	79.9
10	M	50.6	44.3	50.1	51.2	52.0	53.0	53.4	52.9	56.1	54.2	54.2	52.9
11	F	69.9	55.9	57.9	75.4	79.2	66.5	64.6	65.3	50.6	83.4	60.9	77.2
12	F	22.0	46.9	45.4	49.9	55.9	67.4	63.9	73.9	67.9	72.9	72.6	73.9
13	F	79.2	71.0	73.9	87.9	77.2	84.9	77.2	73.9	71.9	79.9	75.9	89.9
14	F	55.3	78.6	74.4	83.9	87.2	50.6	49.3	50.6	57.3	49.9	80.6	56.6
15	F	73.9	54.4	62.4	68.6	67.9	67.9	72.4	67.9	66.4	63.9	67.4	67.4
16	F	54.6	63.4	50.0	51.7	50.6	54.6	51.3	58.6	63.9	51.9	51.9	57.3
17	F	105.9	76.6	82.4	86.4	85.2	95.9	89.9	94.5	83.2	90.6	103.2	91.9
18	F	51.9	45.3	37.3	17.5	50.6	43.3	47.9	18.3	53.3	53.3	54.9	54.2
19	F	52.4	45.3	53.9	59.9	69.9	66.6	64.6	69.2	73.2	76.6	63.9	65.6
20	F	84.4	57.3	62.6	50.6	53.9	66.9	79.9	85.2	87.2	85.9	84.9	86.6

YOUNG DF ISOMETRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.102	0.107	0.108	0.109	0.109	0.107	0.107	0.110	0.107	0.107	0.105	0.107
2	M	0.084	0.081	0.087	0.085	0.090	0.093	0.091	0.095	0.096	0.099	0.093	0.095
3	M	0.105	0.113	0.123	0.134	0.126	0.125	0.126	0.119	0.122	0.115	0.121	0.117
4	M	0.095	0.098	0.105	0.106	0.111	0.112	0.111	0.109	0.112	0.105	0.107	0.107
5	M	0.057	0.054	0.059	0.059	0.063	0.059	0.062	0.061	0.062	0.062	0.062	0.060
6	M	0.067	0.068	0.078	0.080	0.081	0.071	0.077	0.078	0.078	0.081	0.074	0.076
7	M	0.105	0.112	0.112	0.111	0.115	0.105	0.107	0.103	0.108	0.100	0.101	0.101
8	M	0.060	0.056	0.060	0.063	0.070	0.069	0.065	0.071	0.070	0.068	0.062	0.068
9	M	0.135	0.139	0.136	0.157	0.160	0.153	0.154	0.148	0.149	0.144	0.149	0.141
10	M	0.109	0.101	0.111	0.113	0.115	0.118	0.116	0.115	0.117	0.114	0.117	0.117
11	F	0.114	0.106	0.119	0.117	0.122	0.122	0.122	0.129	0.120	0.126	0.121	0.120
12	F	0.099	0.101	0.107	0.103	0.111	0.110	0.107	0.110	0.108	0.106	0.107	0.104
13	F	0.075	0.071	0.082	0.075	0.083	0.085	0.082	0.083	0.083	0.081	0.081	0.085
14	F	0.091	0.080	0.135	0.096	0.095	0.113	0.098	0.099	0.102	0.099	0.105	0.100
15	F	0.092	0.088	0.093	0.097	0.099	0.100	0.123	0.102	0.100	0.102	0.100	0.100
16	F	0.124	0.121	0.127	0.134	0.137	0.136	0.138	0.137	0.136	0.131	0.136	0.131
17	F	0.078	0.075	0.084	0.088	0.082	0.089	0.087	0.089	0.089	0.093	0.089	0.088
18	F	0.084	0.083	0.104	0.103	0.112	0.116	0.119	0.116	0.112	0.112	0.114	0.114
19	F	0.118	0.104	0.102	0.109	0.102	0.105	0.111	0.106	0.111	0.113	0.112	0.113
20	F	0.086	0.111	0.095	0.101	0.101	0.100	0.100	0.100	0.097	0.097	0.099	0.097

YOUNG DF CONCENTRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.125	0.138	0.132	0.139	0.141	0.134	0.131	0.133	0.136	0.135	0.135	0.130
2	M	0.094	0.090	0.102	0.104	0.108	0.110	0.110	0.110	0.109	0.108	0.112	0.111
3	M	0.114	0.126	0.137	0.134	0.135	0.133	0.138	0.129	0.129	0.130	0.128	0.125
4	M	0.095	0.110	0.121	0.126	0.123	0.124	0.120	0.121	0.120	0.113	0.111	0.115
5	M	0.058	0.060	0.074	0.072	0.074	0.073	0.078	0.075	0.069	0.075	0.074	0.073
6	M	0.068	0.084	0.100	0.086	0.094	0.086	0.091	0.086	0.092	0.094	0.085	0.088
7	M	0.089	0.090	0.102	0.106	0.105	0.103	0.107	0.105	0.100	0.099	0.099	0.099
8	M	0.058	0.068	0.068	0.095	0.093	0.086	0.080	0.093	0.094	0.094	0.076	0.081
9	M	0.119	0.131	0.152	0.154	0.152	0.150	0.148	0.145	0.144	0.143	0.141	0.139
10	M	0.099	0.100	0.103	0.104	0.106	0.105	0.103	0.105	0.103	0.096	0.103	0.099
11	F	0.093	0.088	0.098	0.104	0.101	0.103	0.102	0.105	0.097	0.097	0.103	0.101
12	F	0.091	0.088	0.092	0.099	0.097	0.098	0.095	0.094	0.093	0.093	0.092	0.092
13	F	0.099	0.096	0.105	0.103	0.103	0.107	0.115	0.106	0.106	0.108	0.098	0.097
14	F	0.090	0.090	0.093	0.097	0.100	0.100	0.101	0.103	0.108	0.099	0.101	0.102
15	F	0.099	0.093	0.094	0.097	0.092	0.090	0.090	0.092	0.094	0.098	0.096	0.094
16	F	0.092	0.101	0.105	0.104	0.105	0.108	0.109	0.105	0.105	0.104	0.109	0.106
17	F	0.072	0.080	0.090	0.086	0.091	0.085	0.085	0.085	0.081	0.080	0.076	0.077
18	F	0.082	0.080	0.079	0.080	0.087	0.086	0.087	0.087	0.087	0.088	0.086	0.087
19	F	0.101	0.101	0.113	0.113	0.116	0.114	0.111	0.111	0.111	0.110	0.111	0.109
20	F	0.084	0.084	0.085	0.093	0.094	0.105	0.095	0.100	0.095	0.097	0.094	0.094

YOUNG DF ECCENTRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.119	0.154	0.141	0.146	0.149	0.151	0.144	0.147	0.149	0.144	0.142	0.149
2	M	0.099	0.093	0.098	0.097	0.100	0.099	0.103	0.096	0.090	0.086	0.096	0.084
3	M	0.108	0.114	0.116	0.117	0.118	0.113	0.117	0.117	0.115	0.113	0.109	0.109
4	M	0.108	0.106	0.123	0.112	0.129	0.128	0.132	0.131	0.130	0.133	0.126	0.131
5	M	0.073	0.065	0.068	0.069	0.070	0.069	0.007	0.070	0.069	0.073	0.073	0.073
6	M	0.056	0.052	0.058	0.068	0.069	0.067	0.069	0.065	0.064	0.063	0.061	0.060
7	M	0.102	0.096	0.107	0.113	0.114	0.114	0.113	0.111	0.104	0.108	0.107	0.106
8	M	0.043	0.041	0.055	0.067	0.047	0.048	0.047	0.005	0.049	0.049	0.048	0.049
9	M	0.107	0.125	0.130	0.128	0.126	0.125	0.121	0.120	0.122	0.120	0.117	0.116
10	M	0.107	0.107	0.108	0.109	0.107	0.107	0.107	0.107	0.106	0.106	0.106	0.106
11	F	0.092	0.087	0.094	0.104	0.098	0.101	0.100	0.095	0.100	0.093	0.091	0.092
12	F	0.117	0.110	0.121	0.121	0.126	0.123	0.125	0.121	0.123	0.123	0.129	0.127
13	F	0.103	0.103	0.117	0.110	0.112	0.111	0.117	0.108	0.113	0.108	0.110	0.101
14	F	0.117	0.089	0.099	0.104	0.101	0.100	0.122	0.101	0.105	0.098	0.106	0.107
15	F	0.088	0.089	0.101	0.119	0.010	0.102	0.115	0.114	0.110	0.108	0.107	0.108
16	F	0.126	0.130	0.136	0.124	0.137	0.137	0.133	0.134	0.133	0.136	0.137	0.130
17	F	0.083	0.080	0.087	0.092	0.093	0.094	0.094	0.091	0.090	0.088	0.090	0.087
18	F	0.092	0.076	0.086	0.086	0.087	0.090	0.094	0.094	0.097	0.093	0.090	0.092
19	F	0.087	0.088	0.093	0.097	0.098	0.099	0.097	0.098	0.099	0.095	0.095	0.095
20	F	0.105	0.107	0.108	0.112	0.125	0.118	0.118	0.119	0.119	0.116	0.117	0.117

YOUNG DF ISOMETRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	12.29	12.55	12.39	12.47	12.27	12.28	12.21	12.31	12.18	12.24	12.22	12.24
2	M	11.57	11.05	11.15	11.39	11.40	11.29	11.47	11.59	10.98	10.09	11.44	11.50
3	M	10.64	10.95	11.25	11.09	11.15	11.21	11.15	11.03	10.90	10.83	11.00	10.75
4	M	9.56	10.23	10.79	10.21	10.57	10.55	10.81	10.90	10.43	10.45	10.24	10.53
5	M	8.24	8.40	8.86	8.96	8.86	8.59	8.60	8.57	8.59	8.63	8.60	8.74
6	M	9.04	9.30	9.53	9.53	9.71	9.45	9.55	9.46	9.50	9.40	9.37	9.31
7	M	11.76	11.70	11.88	12.24	12.37	12.22	12.06	12.27	12.07	12.05	12.06	12.07
8	M	6.38	5.97	5.90	5.87	6.30	6.12	6.14	6.29	6.24	6.15	6.17	6.05
9	M	9.72	11.06	11.51	11.50	11.45	11.12	11.00	11.36	11.00	11.37	11.25	11.05
10	M	14.83	15.02	15.27	15.24	15.28	15.53	15.36	15.04	15.45	15.28	15.26	15.41
11	F	11.41	11.55	11.57	11.49	11.76	11.68	11.65	11.59	11.77	11.66	11.85	11.66
12	F	10.19	10.35	10.18	10.12	10.11	9.98	10.17	10.09	10.09	10.08	9.99	10.07
13	F	9.73	9.61	10.11	9.89	10.11	9.88	9.90	9.94	9.88	9.60	9.86	9.72
14	F	11.10	10.45	10.23	10.33	10.68	10.99	11.03	10.95	11.14	11.00	10.85	11.04
15	F	11.78	12.70	12.63	14.03	12.52	12.68	12.38	12.77	12.73	12.43	12.78	13.13
16	F	12.00	11.98	11.88	11.76	11.85	12.02	11.83	11.76	11.71	11.71	11.74	11.75
17	F	9.93	9.75	9.86	9.83	9.88	9.93	9.77	9.80	9.68	9.81	9.67	9.67
18	F	12.27	12.31	12.89	12.84	13.10	13.14	13.28	12.92	12.79	12.79	12.85	12.72
19	F	8.64	9.07	9.26	9.06	8.96	8.90	8.94	8.77	8.66	8.65	8.64	8.58
20	F	8.25	8.13	8.38	8.57	8.50	8.61	8.57	8.51	8.53	8.56	8.50	8.40

YOUNG DF CONCENTRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	13.67	13.66	13.39	13.28	13.25	13.35	13.40	13.47	13.39	13.41	13.39	13.44
2	M	12.23	12.39	12.93	12.55	12.62	12.70	12.65	12.92	12.93	12.96	12.93	12.98
3	M	11.21	11.97	12.20	12.14	12.11	12.00	11.90	11.77	11.82	11.66	11.72	11.55
4	M	8.70	9.60	9.55	9.78	9.61	9.62	9.50	9.53	9.66	9.56	9.58	9.51
5	M	8.18	9.46	9.86	9.84	9.97	9.71	9.57	9.57	9.71	9.66	9.45	9.53
6	M	7.06	7.33	7.47	7.74	7.87	7.77	7.83	7.78	7.78	7.81	7.77	7.61
7	M	13.29	13.82	14.22	14.07	13.94	13.97	13.82	13.80	13.54	13.55	13.50	13.44
8	M	6.25	5.75	5.76	6.12	6.03	5.97	6.07	6.00	5.17	5.99	5.81	5.43
9	M	12.01	12.34	12.84	12.84	12.72	12.54	12.42	12.29	12.01	12.20	11.91	11.81
10	M	13.77	13.44	13.44	13.56	13.24	13.49	13.56	13.50	13.04	13.52	13.13	13.13
11	F	10.94	10.72	10.84	10.83	10.79	10.69	10.70	10.39	10.67	10.59	10.52	10.17
12	F	10.44	10.67	10.24	10.23	10.30	10.28	10.00	9.90	10.10	10.10	9.99	10.02
13	F	10.85	11.16	11.14	11.13	11.00	10.99	10.94	10.90	10.76	10.76	10.73	10.72
14	F	10.89	10.70	10.72	10.90	10.84	11.09	11.11	11.11	11.17	11.09	11.08	11.10
15	F	11.97	12.20	12.33	12.22	12.01	11.96	11.66	11.82	11.56	11.42	11.20	11.34
16	F	10.35	10.83	10.91	10.70	10.70	10.73	10.88	10.65	10.58	10.54	10.70	10.80
17	F	10.02	9.31	9.67	9.93	9.92	9.88	9.75	9.70	9.61	9.61	9.55	9.39
18	F	11.67	11.68	11.90	12.06	12.05	12.12	12.23	12.23	12.13	12.14	12.10	12.01
19	F	11.08	10.91	10.90	11.11	10.98	10.94	10.95	10.95	10.98	10.94	10.98	10.89
20	F	8.58	8.24	8.33	8.65	8.75	8.22	8.77	8.63	8.73	8.71	8.49	8.66

YOUNG DF ECCENTRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	12.33	13.09	13.09	12.54	12.72	12.98	12.93	12.79	12.53	12.78	12.58	12.85
2	M	11.79	12.05	12.15	12.13	12.16	12.05	11.72	11.42	11.45	11.16	11.05	10.98
3	M	12.15	11.24	11.50	11.51	11.66	11.57	11.46	11.35	11.41	11.47	11.30	11.22
4	M	9.78	10.22	10.09	10.07	10.00	10.13	10.19	10.14	10.24	10.22	9.93	10.24
5	M	9.16	9.78	9.86	9.67	9.30	9.14	8.86	8.83	8.59	8.49	8.51	8.44
6	M	8.23	7.83	8.23	8.21	8.99	9.07	9.00	9.01	8.65	9.01	8.73	8.98
7	M	14.10	14.44	14.47	14.59	14.57	14.55	14.31	14.23	14.02	14.02	14.02	13.86
8	M	6.39	6.41	6.23	5.43	6.12	6.54	6.25	6.27	6.55	6.59	6.36	6.45
9	M	10.01	11.05	11.47	11.17	11.11	10.83	10.89	10.62	10.49	10.40	10.31	10.19
10	M	9.66	9.62	9.79	9.89	9.77	9.72	9.69	6.56	9.59	9.56	9.55	9.25
11	F	10.48	10.38	10.59	10.63	10.55	10.68	10.58	10.55	10.50	10.45	10.55	10.48
12	F	11.55	10.65	10.83	10.64	11.34	10.99	10.96	11.01	10.96	11.20	11.25	11.15
13	F	10.28	9.43	10.17	10.24	10.48	10.52	10.60	10.47	10.57	10.48	10.54	10.26
14	F	13.06	11.97	12.11	12.62	13.10	13.36	13.64	13.74	13.84	13.76	13.97	14.08
15	F	7.81	9.05	8.83	8.91	8.79	8.79	8.88	8.79	8.70	8.79	8.75	8.68
16	F	13.24	13.67	13.55	13.52	13.44	13.35	13.39	13.39	13.44	13.44	13.36	13.35
17	F	9.68	10.09	10.21	10.29	10.23	10.22	10.28	10.08	10.08	10.08	10.11	10.03
18	F	10.18	9.91	10.14	10.43	10.32	10.42	10.53	10.40	10.39	10.25	9.96	10.32
19	F	9.36	9.65	9.45	9.50	9.41	9.41	9.50	9.37	9.41	9.36	9.25	9.26
20	F	10.75	10.79	10.78	10.63	10.91	10.86	10.85	10.83	10.85	10.68	10.78	10.77

YOUNG PF ISOMETRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	20.3	23.1	22.2	21.6	21.3	21.3	21.2	20.7	20.7	20.2	19.7	20.2
2	M	13.8	15.2	13.1	12.3	12.2	12.3	12.0	11.8	11.3	11.3	11.9	11.4
3	M	18.9	20.8	20.8	20.2	20.4	19.7	19.9	19.7	19.8	19.5	19.9	19.4
4	M	25.0	34.1	30.1	28.7	28.1	27.8	27.9	27.6	27.6	26.5	26.9	26.6
5	M	18.4	28.9	17.0	27.1	26.3	25.3	25.4	23.0	22.6	21.3	20.2	20.2
6	M	15.2	15.5	15.4	16.1	16.1	15.9	14.7	15.6	15.3	15.2	15.2	14.8
7	M	15.6	21.4	19.0	18.2	17.0	17.0	16.9	16.5	15.7	16.2	16.1	16.5
8	M	7.0	10.7	10.0	9.6	8.3	8.0	8.1	7.8	7.6	7.4	7.6	8.0
9	M	28.5	31.6	29.7	29.3	29.4	30.5	29.2	28.1	28.6	29.0	28.5	29.2
10	M	18.2	20.8	18.8	18.5	18.4	17.9	17.9	18.0	17.8	17.4	17.9	17.7
11	F	11.3	10.8	11.4	12.6	13.1	11.3	11.4	13.0	13.1	14.9	12.5	12.1
12	F	18.0	20.3	18.8	19.2	19.2	19.2	18.3	19.2	19.2	18.2	17.8	17.8
13	F	7.9	10.8	10.3	9.6	9.7	9.6	9.7	9.7	9.6	9.5	9.5	9.5
14	F	10.8	10.9	11.1	10.0	10.1	10.4	10.1	11.0	10.5	10.4	10.8	11.0
15	F	12.9	11.5	11.4	11.7	10.8	12.3	10.8	10.8	11.0	9.8	10.5	10.4
16	F	16.8	20.0	18.1	17.4	16.4	16.2	16.2	16.1	16.4	15.8	16.1	15.9
17	F	13.0	16.1	14.1	13.8	14.0	13.2	13.7	13.9	13.4	12.6	13.8	13.7
18	F	14.4	16.8	16.2	15.0	14.9	14.7	14.8	14.8	14.7	14.8	15.0	14.8
19	F	15.7	19.1	18.5	16.8	16.9	17.1	17.5	17.6	16.9	16.8	16.4	17.1
20	F	18.2	18.6	19.1	17.8	18.2	18.1	18.2	18.4	17.9	17.9	17.9	17.9

YOUNG PF CONCENTRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	20.9	22.9	22.5	21.7	21.6	21.4	20.9	21.1	20.7	20.0	20.2	20.1
2	M	17.0	18.6	18.3	18.4	18.2	18.1	18.0	17.9	17.7	17.4	17.3	17.3
3	M	21.8	31.6	27.2	27.6	26.8	25.6	25.3	24.8	24.7	24.3	23.7	22.2
4	M	21.5	28.3	25.6	24.9	24.8	24.4	24.2	23.8	23.3	23.6	23.4	22.7
5	M	17.5	19.2	17.6	17.4	17.8	17.2	17.5	16.8	17.5	16.6	17.2	17.0
6	M	15.0	15.0	14.8	15.0	14.7	14.9	15.3	15.3	14.6	15.8	14.3	15.4
7	M	19.2	23.1	21.6	21.0	20.8	19.1	19.3	17.8	17.5	16.9	16.6	16.4
8	M	15.8	22.2	19.6	18.4	17.7	17.4	16.7	16.3	15.9	15.9	15.5	15.5
9	M	27.2	32.6	30.6	29.3	29.5	28.8	28.7	28.3	28.2	28.0	27.7	27.5
10	M	12.3	16.6	14.8	14.6	13.3	13.2	13.3	13.1	12.8	12.8	12.5	13.1
11	F	12.9	12.2	11.2	11.5	12.0	12.2	11.2	12.1	11.3	11.6	11.9	11.3
12	F	12.2	13.3	12.9	13.2	13.1	13.2	13.3	13.1	13.2	13.1	12.7	13.3
13	F	12.3	15.2	14.8	14.4	14.2	14.1	13.9	13.9	13.1	13.0	13.7	13.1
14	F	12.7	14.1	13.9	14.1	14.5	14.6	14.3	14.4	14.7	14.8	14.2	14.1
15	F	14.2	17.1	16.0	15.5	14.6	15.7	16.5	16.7	16.0	16.8	16.7	16.3
16	F	15.3	14.6	11.7	12.6	10.9	12.9	10.8	10.4	11.4	12.5	12.1	10.6
17	F	11.9	12.8	11.9	11.1	10.6	11.2	11.1	11.0	11.2	10.9	11.4	11.1
18	F	16.7	19.0	17.5	16.7	15.7	16.7	16.0	15.8	15.4	15.4	15.4	15.0
19	F	17.8	22.3	20.1	19.9	19.3	18.5	18.2	18.1	18.3	17.9	17.9	17.6
20	F	15.0	14.1	14.2	13.9	14.1	13.6	14.5	13.9	13.6	13.3	13.9	13.2

YOUNG PF ECCENTRIC PEAK TWITCH TORQUE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	21.5	25.6	23.5	23.8	23.3	23.7	23.4	23.2	22.9	22.9	22.1	22.3
2	M	12.2	13.9	12.7	12.4	12.1	12.2	12.6	12.1	12.1	12.0	11.7	12.2
3	M	19.4	27.6	25.1	22.1	21.9	21.7	22.1	21.8	21.1	21.5	21.5	20.8
4	M	22.0	27.9	27.8	27.3	26.6	25.7	25.7	24.8	25.5	24.7	24.4	23.7
5	M	19.4	22.5	21.4	21.8	22.0	22.1	21.4	21.4	21.1	20.4	20.4	20.1
6	M	11.9	13.4	12.0	12.6	12.7	12.9	11.9	12.9	11.5	12.1	10.7	12.8
7	M	17.7	23.8	21.9	21.3	20.8	19.9	19.2	18.7	18.7	18.7	18.7	18.5
8	M	17.5	19.6	18.3	16.6	17.0	15.9	16.2	16.4	16.2	16.1	15.9	15.8
9	M	24.6	34.2	29.6	29.2	29.3	28.7	28.5	28.3	28.2	28.0	27.7	27.5
10	M	18.2	19.3	17.4	18.0	18.1	18.2	18.3	18.1	18.1	18.3	18.1	17.7
11	F	16.9	21.1	18.9	20.1	18.4	18.7	19.2	19.2	18.4	19.4	18.7	18.6
12	F	8.8	8.0	9.8	10.1	11.1	10.1	10.1	12.0	10.5	11.7	10.7	10.0
13	F	9.6	11.6	10.0	9.7	9.9	10.6	10.5	10.0	10.2	10.1	9.9	10.3
14	F	17.7	20.0	19.0	18.6	18.8	18.9	18.8	18.0	18.6	18.4	17.9	18.3
15	F	14.5	14.8	14.2	14.0	14.4	14.0	13.9	14.0	14.4	14.3	13.9	13.9
16	F	17.3	18.1	18.0	17.9	17.6	17.6	17.6	17.5	17.6	17.4	17.0	17.2
17	F	11.5	11.8	13.4	13.6	12.6	12.2	12.2	12.2	12.3	11.9	11.9	11.9
18	F	9.2	13.5	12.0	11.3	11.5	11.2	11.0	10.6	10.6	10.5	10.3	10.2
19	F	17.3	23.8	19.0	20.1	19.3	18.7	18.2	18.0	18.3	18.3	17.7	17.9
20	F	15.3	16.9	15.7	17.3	17.1	17.5	17.7	17.6	17.5	17.1	17.5	17.0

YOUNG PF ISOMETRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	462.3	680.2	571.8	522.1	485.4	470.1	480.4	450.6	450.6	422.1	428.4	478.6
2	M	324.2	424.5	370.3	340.4	329.1	326.3	325.5	316.1	292.2	285.8	309.1	303.8
3	M	522.9	588.1	590.2	602.7	591.0	578.6	563.1	556.5	561.8	577.0	555.9	496.7
4	M	548.0	996.0	769.0	781.1	660.0	674.8	630.6	599.7	640.0	604.4	610.8	578.6
5	M	381.6	374.2	344.4	329.8	344.8	344.6	352.6	355.1	350.6	346.0	346.7	344.8
6	M	304.1	320.5	328.7	276.5	335.5	304.0	255.2	301.3	287.3	306.3	291.3	260.5
7	M	318.1	515.1	437.2	354.0	345.3	329.2	295.2	308.8	319.7	327.3	348.5	299.1
8	M	128.8	256.3	243.9	226.0	171.9	177.4	174.6	167.1	148.4	145.7	182.9	171.3
9	M	701.9	836.5	735.7	728.3	693.1	688.9	634.6	650.9	739.2	795.9	739.9	760.0
10	M	467.5	726.9	650.5	593.7	567.2	545.4	546.0	507.8	538.0	548.6	523.7	531.6
11	F	115.8	199.2	188.2	207.7	210.1	225.2	200.9	204.6	272.4	258.7	264.0	212.5
12	F	497.0	587.9	489.0	446.1	458.3	457.5	409.4	435.8	434.0	401.5	422.4	401.0
13	F	214.9	333.7	279.3	261.5	236.0	231.8	223.1	226.8	229.2	233.1	214.4	223.1
14	F	302.0	331.6	313.1	260.5	267.4	273.0	257.4	250.3	270.0	250.8	241.5	250.3
15	F	283.0	356.3	277.0	240.1	224.9	359.8	269.7	245.7	209.8	187.3	215.8	222.5
16	F	409.2	601.3	577.7	448.0	496.5	515.0	436.7	446.1	467.0	443.9	425.5	460.0
17	F	312.6	489.7	390.7	371.9	368.5	337.1	323.6	345.0	344.8	332.3	322.3	334.7
18	F	422.1	499.9	484.9	484.9	446.9	438.7	451.9	448.9	436.9	431.3	451.3	442.2
19	F	400.6	515.3	464.9	441.1	452.2	484.0	452.7	458.3	455.1	436.9	413.5	463.6
20	F	380.5	459.1	489.7	446.4	443.7	418.1	411.8	439.7	413.3	415.5	402.0	401.1

YOUNG PF CONCENTRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	528.5	663.1	605.8	577.7	547.7	528.7	515.4	515.7	493.9	483.9	471.0	473.1
2	M	399.4	487.6	422.6	421.4	418.9	401.4	400.7	402.2	398.0	400.0	399.2	395.7
3	M	555.6	999.8	864.9	855.5	833.9	777.3	732.3	707.8	690.8	661.8	675.8	674.7
4	M	620.1	962.4	856.8	783.6	745.7	708.8	726.9	696.3	678.7	660.5	663.6	640.1
5	M	437.8	507.4	493.9	496.4	454.3	413.4	402.3	404.1	411.2	369.0	404.8	374.6
6	M	366.4	503.5	392.0	388.1	367.7	352.7	357.2	361.2	358.2	352.0	367.7	354.0
7	M	341.7	595.3	533.2	494.0	485.5	412.8	430.9	420.2	366.6	399.5	406.4	349.1
8	M	378.4	625.6	531.9	509.4	472.2	458.7	421.0	383.0	380.2	376.3	370.3	368.9
9	M	577.0	987.5	921.3	888.6	882.2	875.2	843.7	812.2	755.2	722.0	702.9	698.4
10	M	441.4	520.6	406.6	393.3	308.3	295.9	265.9	274.5	282.5	289.1	267.4	278.8
11	F	317.9	469.6	285.5	281.3	268.7	293.8	262.9	253.7	174.1	258.2	317.2	259.2
12	F	319.9	502.6	365.3	323.9	358.0	347.1	313.9	339.5	340.3	360.1	336.9	357.7
13	F	259.1	388.0	341.8	283.2	261.0	270.3	281.4	250.8	259.4	256.1	259.8	254.5
14	F	361.4	441.4	428.4	394.3	403.4	369.8	417.6	375.4	376.0	362.7	372.5	358.5
15	F	446.6	566.5	529.8	488.1	476.5	545.4	427.8	463.0	464.6	463.6	495.0	461.7
16	F	279.8	333.1	233.1	215.8	179.5	214.1	174.6	183.7	207.3	228.5	228.8	187.3
17	F	261.9	371.0	349.2	269.8	276.4	258.2	245.5	246.0	234.0	235.0	247.1	240.0
18	F	440.6	436.6	654.7	555.1	518.2	508.9	496.0	464.6	477.8	473.3	476.4	442.7
19	F	517.9	774.7	652.3	642.1	633.2	622.9	616.9	620.5	600.3	550.2	545.4	523.3
20	F	359.8	351.9	409.4	319.4	314.7	317.9	296.2	304.1	293.3	295.0	298.6	280.2

YOUNG PF ECCENTRIC MRTD

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	488.4	717.8	592.8	558.7	479.7	543.2	503.4	458.0	505.2	495.7	448.2	468.2
2	M	353.2	446.7	383.4	335.8	330.0	326.0	336.5	333.0	314.4	318.6	294.1	339.0
3	M	527.7	882.9	746.8	643.6	614.8	586.5	580.5	571.0	554.1	559.1	552.8	529.3
4	M	580.0	882.9	796.4	745.2	711.1	681.5	654.1	648.1	622.2	611.2	589.7	609.5
5	M	438.5	507.7	545.3	509.2	492.0	501.6	493.9	517.5	465.4	483.3	483.1	498.1
6	M	222.1	363.4	207.5	229.0	317.0	307.3	228.3	305.9	212.1	310.2	209.9	295.1
7	M	365.4	590.0	512.6	482.8	472.1	402.0	425.3	361.9	387.2	360.3	365.3	382.7
8	M	441.4	591.8	524.2	646.3	445.0	386.9	397.3	387.8	398.4	384.1	378.4	363.2
9	M	623.5	928.4	871.9	741.2	744.6	716.2	658.4	687.7	729.1	755.0	727.6	745.5
10	M	478.1	590.7	468.3	455.6	420.5	440.3	414.2	414.3	413.9	423.7	425.3	397.5
11	F	310.8	494.2	434.4	387.2	369.3	377.4	349.2	393.9	351.7	363.9	335.8	331.6
12	F	118.5	265.2	194.3	279.6	241.0	291.8	253.7	272.7	278.6	273.5	281.6	255.3
13	F	244.4	368.2	283.7	242.6	234.9	261.1	247.3	230.2	227.8	222.3	213.3	220.2
14	F	454.3	634.1	571.2	529.8	507.9	524.9	493.9	493.6	503.1	493.1	489.7	522.9
15	F	427.7	465.1	455.2	386.1	436.9	384.4	414.0	400.5	410.1	406.7	398.6	399.1
16	F	373.3	516.8	477.3	436.1	413.6	430.5	413.6	397.0	420.7	420.7	404.4	412.9
17	F	266.1	448.1	386.2	374.2	337.9	322.5	293.0	295.7	276.6	176.0	272.2	286.9
18	F	235.7	384.9	341.1	303.5	322.1	314.7	318.1	302.3	299.3	305.2	293.3	282.7
19	F	474.4	590.7	560.7	564.7	574.9	543.9	522.9	506.6	503.4	513.2	504.5	468.3
20	F	387.5	521.0	459.3	468.8	445.6	435.6	437.7	457.5	432.1	427.1	416.6	426.8

YOUNG PF ISOMETRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	97.0	94.4	99.2	97.1	99.4	99.2	97.9	99.2	101.4	87.9	103.2	89.2
2	M	88.9	82.9	77.9	86.4	81.9	85.9	86.4	85.9	91.9	91.9	89.4	90.9
3	M	60.6	95.9	93.2	94.9	92.5	61.9	61.3	63.9	62.9	63.4	60.6	62.0
4	M	95.0	95.2	93.2	92.9	96.4	95.4	97.2	95.9	97.4	93.9	95.9	93.2
5	M	138.4	96.9	97.4	158.8	160.5	170.7	175.2	176.5	172.4	179.0	180.0	180.3
6	M	92.5	80.8	104.5	108.0	104.5	105.0	108.7	99.4	95.6	95.9	97.7	107.2
7	M	97.9	92.5	93.4	99.0	95.9	94.5	98.5	96.0	93.9	97.2	99.4	97.0
8	M	90.4	92.4	86.6	90.4	100.5	95.2	100.4	101.2	96.5	100.4	99.2	99.2
9	M	95.9	55.0	69.9	88.6	98.4	99.9	102.5	103.9	107.2	105.9	102.5	109.9
10	M	95.5	60.4	95.1	96.7	89.4	94.4	93.7	98.7	96.1	88.1	94.1	95.4
11	F	125.2	93.4	111.0	124.0	127.3	136.5	135.8	133.8	126.5	127.8	129.8	127.2
12	F	89.4	88.9	92.4	125.9	121.8	125.8	124.5	123.2	125.8	124.5	124.8	119.8
13	F	87.9	66.6	82.6	87.2	89.2	93.9	93.9	95.9	91.9	87.9	90.6	85.9
14	F	92.5	90.2	92.8	93.2	95.9	96.5	94.4	95.2	97.2	92.5	94.4	95.9
15	F	94.9	95.9	136.8	101.9	106.8	96.0	110.3	101.4	105.8	106.3	98.9	103.2
16	F	95.2	64.2	81.9	91.2	83.2	79.9	79.0	91.9	91.9	92.7	94.5	89.9
17	F	90.4	65.8	77.2	86.6	84.6	82.6	85.9	85.9	85.9	84.6	83.2	87.9
18	F	65.9	72.4	64.6	69.2	67.9	65.9	58.9	60.6	59.9	60.4	61.3	61.3
19	F	92.4	86.2	89.2	83.2	88.6	93.9	91.2	91.4	84.6	79.9	74.0	89.9
20	F	125.0	93.0	92.5	94.5	126.5	126.5	129.2	127.8	127.8	124.5	127.8	129.8

YOUNG PF CONCENTRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	95.2	95.9	95.4	98.4	128.8	130.3	130.3	129.8	130.8	127.2	130.3	127.3
2	M	86.6	65.3	83.2	84.6	85.6	86.7	86.0	86.4	88.1	87.3	86.3	85.5
3	M	90.0	58.9	61.4	88.8	92.4	94.9	93.9	94.5	95.9	91.9	94.5	95.2
4	M	94.5	59.9	93.4	91.9	93.9	93.2	91.9	89.9	93.9	91.2	93.4	90.6
5	M	93.0	91.2	94.9	93.4	94.0	94.0	91.9	92.9	93.9	93.4	93.9	94.5
6	M	92.5	77.5	83.9	83.9	85.2	83.9	82.9	84.6	83.9	86.0	82.4	87.9
7	M	102.0	75.2	94.1	97.7	94.1	98.7	97.7	96.7	96.0	94.4	92.1	95.2
8	M	89.4	92.3	89.9	90.9	93.4	88.9	92.9	90.9	89.9	91.4	88.4	91.4
9	M	94.0	89.0	90.2	90.7	92.6	95.5	98.8	99.2	94.6	95.1	95.4	95.1
10	M	93.9	64.2	91.9	89.9	91.2	93.2	89.9	94.5	90.6	91.9	90.6	93.9
11	F	117.3	92.9	130.3	131.3	127.2	124.5	129.2	130.5	124.0	128.5	126.8	128.5
12	F	93.9	99.9	127.2	127.0	127.2	91.2	125.0	90.6	95.5	89.9	91.2	87.9
13	F	124.3	91.2	122.3	124.5	133.0	127.9	125.8	129.0	126.2	127.8	131.2	122.6
14	F	125.8	87.9	128.8	131.3	129.2	132.5	128.5	128.5	131.9	125.8	128.5	129.2
15	F	91.9	63.9	62.6	86.6	95.2	89.1	90.0	88.6	98.5	89.9	93.9	95.9
16	F	119.2	95.9	132.5	130.8	128.3	136.5	136.3	129.8	133.3	131.3	133.8	124.8
17	F	125.2	86.9	86.4	86.0	86.6	86.6	89.9	88.6	91.2	91.0	89.9	91.9
18	F	85.0	63.6	65.6	61.9	58.9	81.9	81.9	82.6	83.9	80.6	84.0	84.6
19	F	90.6	75.2	79.9	85.7	88.4	91.0	23.0	91.7	93.5	95.7	98.6	96.3
20	F	122.8	101.8	122.8	120.5	129.2	124.3	125.2	124.5	129.5	123.8	123.8	125.2

YOUNG PF ECCENTRIC TPT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	91.2	98.4	96.4	130.8	131.3	129.3	129.8	128.3	130.8	131.3	131.2	129.8
2	M	85.2	59.4	85.4	81.2	85.9	84.6	87.4	88.4	83.9	83.2	81.9	82.4
3	M	61.3	59.9	59.9	92.5	94.5	94.9	93.9	93.4	93.2	92.5	91.2	91.2
4	M	95.2	93.9	92.5	93.2	94.5	96.4	95.9	95.2	94.5	95.2	95.9	94.5
5	M	94.0	95.9	128.3	129.2	133.2	131.8	128.3	132.3	185.5	126.8	130.5	126.8
6	M	76.0	52.3	84.0	84.0	75.2	74.6	80.6	73.9	92.0	75.9	85.9	75.2
7	M	91.9	93.2	90.6	94.5	96.4	94.5	92.5	92.9	93.4	95.9	95.2	92.9
8	M	91.2	88.9	88.3	91.4	92.4	91.9	91.2	91.9	91.4	89.9	87.9	88.9
9	M	93.9	90.6	92.5	95.9	95.9	95.0	95.0	94.5	95.9	92.5	92.4	91.9
10	M	127.8	96.4	93.2	93.2	131.8	129.2	135.2	127.8	130.5	129.2	125.2	127.2
11	F	120.3	111.3	123.8	134.3	123.8	128.3	127.8	99.4	93.9	123.3	124.3	128.3
12	F	103.2	113.8	101.4	111.2	108.5	115.3	111.2	109.2	110.5	115.9	112.3	113.2
13	F	93.9	82.4	93.4	88.9	93.2	93.2	95.9	92.9	91.9	91.1	91.9	90.6
14	F	88.6	75.2	92.8	90.4	93.9	94.9	95.2	91.9	93.9	90.6	93.2	91.9
15	F	88.9	45.2	88.4	89.9	86.0	90.9	86.0	90.9	91.9	88.4	87.2	85.2
16	F	123.8	93.9	93.4	135.2	133.2	123.3	127.6	91.9	92.9	89.4	91.9	92.3
17	F	123.8	75.9	88.6	86.9	87.9	87.4	84.6	82.6	90.6	91.9	87.2	89.9
18	F	59.0	59.9	57.9	59.0	58.9	58.6	59.9	60.6	59.9	59.3	59.3	57.9
19	F	123.2	71.2	87.9	127.8	124.5	125.8	127.8	122.5	127.2	90.6	87.2	90.6
20	F	132.5	111.2	126.5	131.2	129.8	129.8	127.2	130.5	125.8	127.2	130.5	129.8

YOUNG PF ISOMETRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	91.0	84.5	95.2	100.4	98.4	98.5	99.2	96.5	97.9	107.9	89.9	104.5
2	M	102.7	84.9	99.4	106.3	119.8	115.3	116.8	117.3	111.3	111.8	112.3	109.8
3	M	66.9	53.9	57.3	55.4	57.3	87.2	87.9	85.2	85.9	83.9	86.6	84.0
4	M	83.2	64.6	91.9	94.4	92.9	92.9	90.6	90.6	89.4	92.4	88.9	90.6
5	M	89.5	80.8	89.9	82.6	87.9	85.2	86.4	81.0	91.2	95.3	92.1	91.0
6	M	111.2	110.0	103.2	102.0	101.9	99.4	105.5	104.3	103.8	103.7	96.5	100.2
7	M	78.0	67.9	75.4	80.0	89.2	91.2	92.5	93.0	96.5	93.2	92.4	96.0
8	M	80.2	55.7	61.9	72.4	72.6	80.6	80.4	75.9	83.2	76.9	81.2	77.9
9	M	97.6	87.2	97.4	110.3	110.8	108.3	107.9	107.3	103.3	105.3	104.5	103.9
10	M	94.5	107.8	93.4	102.7	108.3	106.7	107.0	103.4	106.7	111.0	104.7	102.0
11	F	73.9	76.0	79.0	73.9	74.6	79.9	71.2	75.2	78.6	77.2	88.5	74.6
12	F	90.3	87.9	100.4	71.9	77.9	71.9	70.6	75.2	70.6	70.6	69.9	74.6
13	F	85.9	81.2	79.2	85.2	90.6	87.2	88.6	85.2	85.2	89.4	89.9	87.2
14	F	86.2	78.4	87.2	93.9	89.9	89.2	91.9	96.4	91.9	87.9	97.2	96.4
15	F	98.4	102.4	66.9	101.4	93.9	97.4	96.4	102.4	95.9	95.9	101.9	99.6
16	F	90.2	83.9	102.9	103.9	106.5	108.8	108.0	94.5	93.9	93.9	93.9	101.2
17	F	100.2	93.4	89.9	96.5	111.7	107.9	110.5	107.9	104.5	100.5	114.5	111.9
18	F	113.2	96.4	108.5	119.8	120.5	121.8	129.8	130.5	124.5	129.4	127.8	128.5
19	F	97.3	90.6	101.9	117.2	109.9	108.8	109.9	106.3	109.9	115.9	122.0	108.8
20	F	84.0	100.0	105.2	110.5	86.6	86.6	85.2	86.9	85.5	85.6	82.6	81.2

YOUNG PF CONCENTRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	104.5	83.9	95.9	101.4	73.9	71.9	71.9	73.4	70.9	72.6	70.9	73.9
2	M	83.9	56.9	78.6	65.2	72.4	73.9	81.1	82.4	86.0	88.5	88.2	90.2
3	M	66.0	63.9	80.9	75.2	84.9	56.4	60.6	6.3	61.3	66.6	62.6	65.2
4	M	72.6	81.9	74.9	78.4	77.9	77.9	79.9	81.4	77.9	80.6	78.4	77.9
5	M	78.0	73.2	77.4	82.9	82.4	83.2	84.6	82.9	82.9	82.9	82.4	81.9
6	M	123.2	121.9	132.5	131.9	131.9	131.2	131.8	129.2	129.3	91.9	132.3	125.2
7	M	91.4	73.5	81.5	85.1	96.7	88.4	91.8	95.7	95.4	96.4	97.7	93.1
8	M	104.8	73.9	81.2	89.9	97.1	103.3	104.8	105.8	107.3	106.8	106.8	103.3
9	M	88.0	65.2	69.2	70.3	71.6	78.5	75.3	79.0	80.3	86.7	86.8	87.5
10	M	95.9	79.9	93.4	103.9	101.2	99.2	104.5	97.2	103.2	97.2	98.5	95.9
11	F	64.4	87.9	63.9	61.9	91.9	71.9	67.9	65.3	74.0	66.6	70.9	70.6
12	F	90.6	90.6	65.3	67.0	67.9	102.5	68.0	103.2	100.5	101.9	98.5	102.5
13	F	85.4	101.2	84.7	99.2	104.0	107.2	105.2	98.0	91.9	91.2	84.6	93.9
14	F	84.6	104.8	80.4	83.9	89.2	89.2	94.5	92.5	92.5	95.2	93.9	95.1
15	F	89.2	105.2	112.5	101.9	95.2	100.7	100.0	102.5	89.9	98.4	93.2	88.6
16	F	83.2	95.2	79.9	89.4	95.4	83.9	83.8	91.9	97.4	93.9	76.4	89.9
17	F	83.2	81.4	92.9	100.2	120.5	121.8	118.5	120.5	117.2	117.0	121.2	117.8
18	F	106.0	113.0	118.5	135.2	140.5	118.5	117.8	121.2	119.8	117.8	120.0	123.8
19	F	113.9	100.2	112.6	113.5	115.5	116.2	113.9	106.3	106.4	109.5	113.5	114.2
20	F	68.4	87.9	72.9	82.6	79.2	81.9	81.9	78.6	73.4	74.4	77.9	66.6

YOUNG PF ECCENTRIC ½ RT

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	119.8	93.4	110.3	80.4	82.4	82.9	80.4	86.4	79.9	80.6	80.6	80.6
2	M	81.4	69.2	69.9	86.6	86.6	87.9	84.4	84.4	87.2	86.6	87.2	86.9
3	M	89.5	63.9	71.9	57.3	63.3	64.9	65.9	64.9	65.3	65.3	66.6	67.9
4	M	77.9	63.9	81.9	81.9	82.6	79.4	79.2	77.9	77.9	76.6	76.6	78.6
5	M	102.0	95.9	80.4	76.6	75.2	73.9	79.4	79.9	78.9	75.9	77.2	78.9
6	M	106.0	94.0	118.0	118.0	126.5	125.8	122.5	126.5	107.0	122.5	116.5	124.5
7	M	84.4	65.3	75.2	81.2	81.9	87.2	91.2	92.4	90.4	87.2	89.2	93.9
8	M	85.2	59.3	63.4	82.9	83.9	87.9	85.9	87.2	85.9	88.5	89.9	87.4
9	M	87.2	78.6	94.5	100.5	103.2	103.0	100.0	98.5	97.2	98.5	98.9	99.9
10	M	85.2	97.4	113.2	114.5	83.9	89.2	83.2	89.2	87.2	89.2	92.5	91.2
11	F	77.9	67.9	73.9	75.9	81.4	75.9	76.9	102.9	119.3	78.9	76.4	75.9
12	F	97.9	115.8	108.3	96.5	103.9	93.9	100.5	104.5	97.2	97.9	98.4	98.4
13	F	82.6	80.4	84.4	95.2	94.5	85.2	91.2	97.9	96.4	97.9	95.2	96.5
14	F	101.2	83.2	98.4	104.3	105.2	106.3	107.9	107.2	106.5	109.9	107.2	107.2
15	F	86.9	86.6	94.1	97.9	101.0	94.9	100.0	93.9	94.5	97.4	99.2	101.2
16	F	74.6	88.9	105.3	71.9	73.2	76.4	77.8	75.2	110.8	108.3	111.3	109.3
17	F	83.9	91.4	95.9	115.3	121.8	118.3	127.2	120.5	120.3	125.8	117.8	111.2
18	F	91.0	74.6	95.9	104.0	102.5	103.9	101.2	103.2	102.5	99.2	105.2	104.5
19	F	81.2	72.3	110.5	77.9	81.2	73.2	70.6	75.9	73.9	109.2	107.9	110.5
20	F	75.2	107.3	86.6	87.2	89.2	89.2	89.9	89.2	91.9	89.9	87.9	87.9

YOUNG PF ISOMETRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.041	0.043	0.042	0.042	0.041	0.042	0.041	0.041	0.042	0.041	0.041	0.043
2	M	0.104	0.108	0.112	0.113	0.113	0.114	0.113	0.111	0.114	0.113	0.114	0.114
3	M	0.013	0.013	0.012	0.012	0.012	0.011	0.011	0.011	0.012	0.012	0.012	0.012
4	M	0.024	0.023	0.023	0.026	0.025	0.026	0.026	0.020	0.026	0.026	0.027	0.025
5	M	0.066	0.066	0.065	0.066	0.066	0.066	0.067	0.066	0.066	0.062	0.065	0.066
6	M	0.032	0.030	0.032	0.035	0.036	0.034	0.032	0.035	0.035	0.034	0.036	0.032
7	M	0.071	0.078	0.078	0.081	0.077	0.076	0.076	0.074	0.074	0.076	0.073	0.076
8	M	0.017	0.019	0.019	0.019	0.020	0.020	0.020	0.079	0.019	0.020	0.020	0.020
9	M	0.048	0.048	0.048	0.047	0.047	0.048	0.048	0.047	0.047	0.047	0.047	0.047
10	M	0.034	0.038	0.037	0.035	0.035	0.034	0.034	0.034	0.034	0.033	0.034	0.034
11	F	0.014	0.016	0.017	0.018	0.020	0.017	0.018	0.018	0.019	0.018	0.020	0.017
12	F	0.014	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.011	0.011
13	F	0.026	0.027	0.022	0.026	0.021	0.021	0.022	0.021	0.021	0.025	0.021	0.022
14	F	0.019	0.021	0.021	0.022	0.023	0.024	0.024	0.023	0.024	0.026	0.024	0.026
15	F	0.056	0.049	0.048	0.047	0.047	0.058	0.047	0.047	0.046	0.046	0.047	0.046
16	F	0.008	0.009	0.009	0.009	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.009
17	F	0.043	0.047	0.048	0.047	0.048	0.047	0.050	0.048	0.047	0.045	0.046	0.045
18	F	0.046	0.048	0.046	0.047	0.047	0.045	0.046	0.046	0.046	0.047	0.046	0.043
19	F	0.035	0.036	0.036	0.035	0.037	0.036	0.035	0.035	0.036	0.036	0.037	0.037
20	F	0.042	0.042	0.046	0.046	0.045	0.046	0.045	0.044	0.045	0.045	0.046	0.046

YOUNG PF CONCENTRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.047	0.052	0.051	0.052	0.050	0.050	0.050	0.051	0.050	0.051	0.050	0.050
2	M	0.084	0.087	0.093	0.096	0.091	0.087	0.096	0.085	0.085	0.085	0.085	0.085
3	M	0.009	0.011	0.011	0.011	0.011	0.010	0.010	0.011	0.011	0.010	0.010	0.010
4	M	0.041	0.046	0.046	0.045	0.044	0.045	0.047	0.044	0.045	0.044	0.045	0.046
5	M	0.068	0.066	0.066	0.068	0.066	0.068	0.068	0.068	0.067	0.068	0.067	0.067
6	M	0.033	0.036	0.035	0.034	0.031	0.030	0.031	0.035	0.031	0.031	0.031	0.034
7	M	0.054	0.083	0.088	0.081	0.089	0.086	0.085	0.083	0.082	0.081	0.079	0.078
8	M	0.036	0.038	0.039	0.038	0.038	0.040	0.038	0.037	0.037	0.037	0.037	0.037
9	M	0.023	0.025	0.032	0.031	0.031	0.031	0.031	0.030	0.030	0.026	0.026	0.003
10	M	0.042	0.042	0.038	0.040	0.038	0.040	0.040	0.040	0.039	0.040	0.041	0.039
11	F	0.041	0.037	0.033	0.039	0.036	0.040	0.039	0.036	0.035	0.036	0.039	0.038
12	F	0.024	0.025	0.024	0.025	0.024	0.024	0.022	0.021	0.023	0.023	0.024	0.026
13	F	0.024	0.024	0.025	0.024	0.027	0.025	0.024	0.027	0.023	0.023	0.022	0.021
14	F	0.054	0.059	0.057	0.056	0.057	0.055	0.056	0.057	0.056	0.058	0.056	0.058
15	F	0.050	0.052	0.053	0.053	0.054	0.052	0.053	0.052	0.052	0.052	0.052	0.051
16	F	0.016	0.017	0.011	0.013	0.010	0.013	0.013	0.010	0.013	0.015	0.014	0.013
17	F	0.045	0.073	0.049	0.049	0.048	0.049	0.047	0.048	0.047	0.047	0.047	0.048
18	F	0.048	0.050	0.051	0.051	0.049	0.050	0.046	0.049	0.049	0.049	0.049	0.049
19	F	0.037	0.034	0.038	0.040	0.041	0.039	0.037	0.038	0.038	0.036	0.035	0.036
20	F	0.072	0.065	0.073	0.071	0.070	0.068	0.072	0.068	0.063	0.069	0.065	0.065

YOUNG PF ECCENTRIC M-WAVE AREA

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	0.061	0.055	0.055	0.055	0.046	0.055	0.054	0.045	0.054	0.054	0.048	0.054
2	M	0.097	0.101	0.102	0.101	0.100	0.100	0.101	0.099	0.100	0.098	0.101	0.099
3	M	0.025	0.023	0.022	0.023	0.025	0.025	0.023	0.023	0.024	0.024	0.024	0.025
4	M	0.030	0.032	0.032	0.032	0.031	0.030	0.031	0.030	0.031	0.031	0.030	0.031
5	M	0.057	0.054	0.053	0.053	0.054	0.052	0.053	0.053	0.053	0.050	0.054	0.054
6	M	0.036	0.027	0.026	0.026	0.030	0.030	0.025	0.031	0.023	0.030	0.023	0.030
7	M	0.073	0.078	0.081	0.081	0.081	0.079	0.080	0.079	0.078	0.077	0.078	0.078
8	M	0.048	0.047	0.049	0.049	0.050	0.049	0.049	0.050	0.049	0.049	0.049	0.049
9	M	0.046	0.047	0.048	0.048	0.047	0.046	0.047	0.047	0.046	0.046	0.046	0.046
10	M	0.038	0.036	0.034	0.037	0.035	0.035	0.035	0.035	0.034	0.038	0.037	0.034
11	F	0.021	0.040	0.040	0.039	0.041	0.040	0.041	0.041	0.038	0.041	0.043	0.042
12	F	0.008	0.005	0.006	0.008	0.007	0.007	0.007	0.007	0.008	0.007	0.007	0.007
13	F	0.034	0.039	0.034	0.033	0.033	0.037	0.036	0.033	0.033	0.032	0.032	0.033
14	F	0.022	0.023	0.022	0.023	0.023	0.024	0.022	0.024	0.022	0.023	0.022	0.022
15	F	0.050	0.051	0.054	0.053	0.053	0.052	0.051	0.052	0.052	0.052	0.052	0.052
16	F	0.013	0.013	0.013	0.015	0.012	0.012	0.012	0.013	0.013	0.012	0.013	0.012
17	F	0.034	0.039	0.038	0.038	0.037	0.038	0.037	0.038	0.037	0.037	0.038	0.037
18	F	0.042	0.044	0.046	0.044	0.044	0.043	0.042	0.042	0.042	0.041	0.042	0.042
19	F	0.037	0.040	0.038	0.038	0.036	0.036	0.036	0.036	0.036	0.036	0.037	0.036
20	F	0.014	0.016	0.017	0.019	0.019	0.017	0.018	0.018	0.017	0.016	0.017	0.017

YOUNG PF ISOMETRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	6.76	7.12	6.95	7.02	6.85	6.81	6.82	6.89	6.82	6.95	6.84	6.96
2	M	18.06	18.83	19.12	18.87	19.14	18.94	18.71	18.69	19.08	19.16	18.63	18.55
3	M	2.35	2.34	2.36	2.26	2.31	2.40	2.39	2.27	2.38	2.35	2.34	2.19
4	M	5.77	5.61	5.76	5.85	5.63	5.69	5.58	5.54	5.44	5.58	5.45	5.59
5	M	9.86	9.99	9.68	9.61	9.81	9.88	9.88	9.74	9.83	9.87	9.87	9.88
6	M	5.37	5.08	4.97	5.89	5.92	5.74	5.63	5.73	5.68	5.56	5.56	4.85
7	M	13.54	14.79	14.15	14.17	13.80	13.76	13.66	13.85	13.74	14.02	13.67	14.10
8	M	5.08	5.31	5.38	5.38	5.38	5.16	5.36	5.16	5.18	5.40	5.22	5.27
9	M	7.38	7.61	7.60	7.73	7.65	7.58	7.56	7.57	7.41	7.46	7.51	7.38
10	M	6.99	7.68	7.59	7.35	7.25	7.15	7.21	7.16	7.30	7.09	7.17	7.09
11	F	2.31	2.87	2.33	2.41	2.64	2.52	2.50	2.49	2.70	2.54	2.68	2.33
12	F	3.22	3.17	3.06	3.12	3.03	3.08	2.90	3.02	3.05	2.85	2.77	2.83
13	F	4.39	4.04	3.80	3.94	3.71	3.70	3.64	3.43	3.61	3.94	3.44	3.61
14	F	3.77	3.50	3.44	3.84	3.80	3.89	3.82	3.83	3.90	3.95	3.98	3.90
15	F	9.24	8.14	7.96	7.79	7.76	9.67	7.69	7.74	7.68	7.52	7.83	7.62
16	F	1.78	1.81	1.84	1.84	1.68	1.82	1.70	1.78	1.72	1.83	1.82	1.81
17	F	9.01	9.75	9.80	9.31	9.45	9.43	9.37	9.36	9.34	9.44	9.15	9.25
18	F	7.69	7.94	7.89	7.96	7.95	7.82	7.83	7.87	7.94	7.89	7.68	7.84
19	F	4.35	4.50	4.50	4.46	4.51	4.54	4.40	4.39	4.51	4.35	4.39	4.39
20	F	7.22	7.97	7.76	7.81	7.81	7.79	7.67	7.72	7.66	7.69	7.74	7.74

YOUNG PF CONCENTRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	7.37	7.77	7.61	7.64	7.64	7.67	7.60	7.53	7.51	7.56	7.61	7.70
2	M	15.45	15.67	15.68	15.53	15.64	15.62	15.33	15.49	15.52	15.51	15.47	15.42
3	M	2.05	2.31	2.28	2.23	2.24	2.19	2.16	2.10	2.13	2.11	2.15	2.13
4	M	6.35	6.39	6.79	6.70	6.65	6.63	6.54	6.56	6.61	6.60	6.75	6.70
5	M	9.87	9.90	10.04	10.06	9.99	10.12	10.12	10.19	10.01	10.14	10.01	10.13
6	M	4.76	4.94	4.84	4.96	4.49	4.43	4.45	4.86	4.39	4.50	4.44	4.97
7	M	15.33	15.56	15.82	16.43	16.05	15.69	15.61	15.15	15.25	15.16	15.13	14.93
8	M	8.09	8.42	8.80	8.48	8.58	8.59	8.53	8.69	8.44	8.11	8.44	8.50
9	M	3.65	3.76	3.88	3.82	3.77	3.78	3.62	3.53	3.60	3.52	3.53	3.62
10	M	7.64	7.41	7.04	7.09	6.99	7.04	7.06	7.04	7.02	6.95	6.96	7.11
11	F	5.52	5.03	4.48	5.01	4.84	5.27	4.92	4.95	4.51	4.94	5.32	4.86
12	F	3.39	3.59	3.44	3.27	3.34	3.41	3.29	3.37	3.34	3.44	3.42	3.47
13	F	5.77	5.49	5.61	5.58	5.20	5.41	5.33	5.02	5.31	5.28	5.25	5.20
14	F	9.22	9.81	9.71	9.76	9.63	9.71	9.66	9.76	9.71	9.88	9.84	9.77
15	F	9.35	9.99	9.92	9.89	10.11	9.88	9.88	9.82	9.88	9.81	9.71	9.75
16	F	2.42	2.23	1.39	1.84	1.21	1.60	1.01	1.14	1.55	1.95	1.99	1.58
17	F	8.73	9.96	9.73	9.60	9.56	9.67	9.66	9.71	9.51	9.47	9.57	9.57
18	F	6.44	7.15	6.99	6.97	6.97	6.96	6.77	6.90	6.92	6.86	6.81	6.89
19	F	5.42	5.23	5.57	5.82	5.78	5.79	5.63	5.42	5.56	5.32	5.42	5.33
20	F	10.28	8.11	10.49	10.13	9.98	9.68	10.27	9.65	9.52	9.04	9.91	9.43

YOUNG PF ECCENTRIC M-WAVE AMPLITUDE

SUB	GEN	PRE	POST	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
1	M	8.28	7.26	7.27	7.14	6.08	7.35	7.23	5.87	7.20	7.22	6.35	7.24
2	M	15.71	16.31	16.57	16.42	16.25	16.33	16.30	16.22	16.13	16.27	16.32	16.26
3	M	4.70	5.06	5.01	4.97	5.01	4.90	4.97	4.96	5.02	4.94	4.96	4.92
4	M	4.84	5.32	5.26	4.82	5.49	5.25	5.16	5.05	5.23	5.08	5.11	5.17
5	M	9.55	9.52	9.53	9.35	9.47	9.43	9.31	9.30	9.30	9.30	9.29	9.36
6	M	5.66	3.63	3.57	3.77	4.79	4.61	3.57	4.69	3.33	4.54	3.52	3.26
7	M	12.89	14.11	13.92	14.03	14.07	13.67	13.90	13.80	13.66	13.62	13.75	13.81
8	M	9.62	9.88	9.99	10.07	10.06	10.14	10.19	10.19	10.23	10.07	10.29	10.14
9	M	6.97	6.99	7.09	6.99	7.04	6.85	6.92	6.97	6.95	6.95	6.82	6.91
10	M	7.72	7.56	6.96	7.81	7.26	7.26	7.25	7.15	7.15	7.78	7.81	7.14
11	F	5.04	5.72	5.87	5.93	5.99	5.94	5.82	5.88	5.85	6.15	6.10	6.10
12	F	1.31	0.80	1.31	1.53	1.44	1.62	1.44	1.60	1.68	1.63	1.57	1.55
13	F	6.32	7.16	6.14	6.08	5.99	6.56	6.55	6.10	6.00	5.98	5.97	5.94
14	F	3.80	3.95	4.04	3.95	3.83	3.92	4.05	4.02	3.97	3.93	4.10	3.92
15	F	9.52	9.88	9.82	9.79	9.76	9.76	9.71	9.63	9.67	9.63	9.59	9.56
16	F	1.82	2.09	1.98	1.93	1.94	1.91	1.96	1.79	1.88	1.95	1.88	1.80
17	F	7.78	7.78	8.50	8.40	8.52	8.49	8.47	8.52	8.51	8.37	8.52	8.57
18	F	7.23	7.93	7.83	7.86	7.76	7.82	7.74	7.60	7.71	7.74	7.66	7.64
19	F	5.32	5.78	5.59	5.66	5.58	5.48	5.45	5.41	5.48	5.33	5.40	5.43
20	F	3.00	2.97	3.18	3.18	3.12	3.22	3.17	3.12	3.07	3.05	3.01	3.03

APPENDIX C

ANOVA TABLES

SUBJECT CHARACTERISTICS

HEIGHT

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	1060.9	36	44.29445	23.95108	0.0000208
A	1	3.6	36	44.29445	0.081274	0.7772117
G x A	1	48.4	36	44.29445	1 092688	0.3028448

WEIGHT

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	1885.129	36	95.97561	19.64175	0.000084
A	1	937.024	36	95.97561	9.763147	0.0035091
G x A	1	8.464	36	95.97561	0.088189	0.7681989

AGE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	44.1	36	21.22778	2.077467	0.1581307
A	1	21344.4	36	21.22778	1005.494	0.000066
G x A	1	32.4	36	21 22778	1 526302	0.2246701

ROM

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	878.9063	36	71.65208	12.2663	0.0012508
A	1	1086.806	36	71.65208	15.16782	0.0004096
G x A	1	16.25625	36	71 65208	0.226878	0.6367271

BASELINE TWITCH DF PT

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	8.243153	107	0.804157	10.25068	0.001799
A	1	39.6622	107	0.804157	49.32146	0.000000
C	2	0.352925	107	0.804157	0.438875	0.645917
G x A	1	12.52337	107	0.804157	15.57329	0.000142
G x C	2	0.156706	107	0.804157	0.19487	0.823233
A x C	2	0.061236	107	0.804157	0.076149	0.926728
G x A x C	2	0.000413	107	0.804157	0.000513	0.999487

BASELINE TWITCH DF MRTD

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	22342.84	107	1293.822	17.26887	0.00006
A	1	5215.422	107	1293.822	4.03102	0.047191
C	2	96.84718	107	1293.822	0.074854	0.927928
G x A	1	1150.363	107	1293.822	0.88912	0.34784
G x C	2	300.556	107	1293.822	0.232301	0.793106
A x C	2	1915.005	107	1293.822	1 480115	0.232234
G x A x C	2	299.9051	107	1293.822	0.231798	0.793504

BASELINE TWITCH DF HRT

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	7294.314	107	741.1861	9.841407	0.002204
A	1	10138.97	107	741.1861	13.67939	0.000344
C	2	132.9406	107	741.1861	0.179362	0.836054
G x A	1	1497 543	107	741 1861	2.020468	0.158099
G x C	2	298.1274	107	741 1861	0.40223	0.669834
A x C	2	195.3695	107	741 1861	0.26359	0.768786
G x A x C	2	682.5848	107	741 1861	0.920936	0.401279

BASELINE TWITCH DF TPT

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	2325.303	107	1090.655	2.132025	0.14718
A	1	17331.82	107	1090.655	15.89121	0.000123
C	2	657 8235	107	1090.655	0.603145	0.548937
G x A	1	77 17548	107	1090.655	0.070761	0.790744
G x C	2	2359.572	107	1090.655	2.163445	0.11993
A x C	2	329 9485	107	1090.655	0.302523	0.739581
G x A x C	2	1813.685	107	1090.655	1 662932	0.194444

BASELINE DF M-WAVE AREA

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	5.33E-05	107	0.000264	0.202113	0.65393
A	1	0.181274	107	0.000264	686.9044	0.000000
C	2	9.57E-06	107	0.000264	0.03628	0.964382
G x A	1	0.000722	107	0.000264	2.734011	0.101163
G x C	2	0.000189	107	0.000264	0.715186	0.491424
A x C	2	0.000282	107	0.000264	1 068311	0.347224
G x A x C	2	2.06E-05	107	0.000264	0.078103	0.924922

BASELINE DF M-WAVE AMP

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.154441	107	2.151193	0.071793	0.789259
A	1	2338.803	107	2.151193	1087.212	0.000000
C	2	0.064414	107	2.151193	0.029944	0.970508
G x A	1	1.406275	107	2.151193	0.653719	0.42058
G x C	2	0.043282	107	2.151193	0.02012	0.980085
A x C	2	0.174584	107	2.151193	0.081157	0.922106
G x A x C	2	0.024169	107	2.151193	0.011235	0.988829

BASELINE TWITCH PF PT

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	415.8659	107	17.24462	24.1157	0.000003
A	1	322.7563	107	17.24462	18.71635	0.000034
C	2	0.01084	107	17.24462	0.000629	0.999372
G x A	1	20.66175	107	17.24462	1 198156	0.276148
G x C	2	0.279751	107	17.24462	0.016223	0.983911
A x C	2	3.180668	107	17.24462	0.184444	0.83183
G x A x C	2	1 508651	107	17.24462	0.087485	0.916298

BASELINE TWITCH PF MRTD

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	191818.9	107	12385.68	15.48715	0.000148
A	1	394310.1	107	12385.68	31.83596	0.000000
C	2	134.2764	107	12385.68	0.010841	0.989218
G x A	1	20272.01	107	12385.68	1 636729	0.203542
G x C	2	3383.548	107	12385.68	0.273182	0.761483
A x C	2	12725.38	107	12385.68	1 027427	0.36143
G x A x C	2	5504.515	107	12385.68	0.444426	0.642371

BASELINE TWITCH PF HRT

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.248944	107	311 158	0.0008	0.977487
A	1	14600.56	107	311.158	46.92331	0.000000
C	2	57.20898	107	311 158	0.183858	0.832316
G x A	1	148.9049	107	311 158	0.478551	0.490578
G x C	2	4.638019	107	311 158	0.014906	0.985207
A x C	2	1 576075	107	311 158	0.005065	0.994948
G x A x C	2	126.1195	107	311 158	0.405323	0.667781

BASELINE TWITCH PF TPT

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	5937.385	107	486.9986	12.19179	0.000699
A	1	28884.98	107	486.9986	59.31224	0.000000
C	2	702.3607	107	486.9986	1.442223	0.24096
G x A	1	582.5217	107	486.9986	1 196146	0.276549
G x C	2	196.8448	107	486 9986	0.4042	0.668526
A x C	2	114.5628	107	486.9986	0.235243	0.790787
G x A x C	2	394.833	107	486.9986	0.810748	0.447237

BASELINE PF M-WAVE AREA

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.003617	107	0.000358	10.1053	0.001934
A	1	0.000868	107	0 000358	2.426013	0.122289
C	2	4.52E-05	107	0.000358	0.126312	0.881471
G x A	1	0.000133	107	0.000358	0.372132	0.543138
G x C	2	0.000615	107	0.000358	1 719199	0.184123
A x C	2	6.28E-05	107	0.000358	0.175568	0.839222
G x A x C	2	2.92E-05	107	0.000358	0.0817	0.921606

BASELINE PF M-WAVE AMP

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	203.1355	107	10.40318	19.52629	0.000024
A	1	0.749922	107	10 40318	0.072086	0.788841
C	2	0.34911	107	10 40318	0.033558	0.967009
G x A	1	0.469398	107	10 40318	0.045121	0.832187
G x C	2	1 50659	107	10.40318	0.14482	0.865347
A x C	2	2.533173	107	10 40318	0.2435	0.784313
G x A x C	2	3.387253	107	10.40318	0.325598	0.722808

DF MVC

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	897.0906	36	67.94392	13.2034	0.000865
A	1	452.5132	36	67.94392	6.660099	0.014083
C	2	13638.98	72	36.69533	371.6817	0.000000
G x A	1	1 937532	36	67 94392	0.028517	0.866845
G x C	2	17.29438	72	36.69533	0.471296	0.626104
A x C	2	612.3208	72	36.69533	16.68661	0.000001
G x A x C	2	98.52858	72	36 69533	2.685044	0.075048

PF MVC

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	21981.63	36	2421.516	9.07763	0.004715
A	1	53963.88	36	2421.516	22.28517	0.000035
C	2	24599.77	72	478.5397	51.4059	0.000000
G x A	1	255.4096	36	2421 516	0.105475	0.747235
G x C	2	997 9227	72	478.5397	2.08535	0.131705
A x C	2	241.4186	72	478 5397	0.50449	0.605932
G x A x C	2	666.3285	72	478.5397	1 39242	0.255083

DF AEMG (5s)

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.203191	36	0.049122	4.136468	0.049389
A	1	4.460964	36	0.049122	90.81411	0.000000
C	2	0.107533	72	0.009225	11.65723	0.000041
G x A	1	0.126055	36	0.049122	2.566162	0.117912
G x C	2	0.005414	72	0.009225	0.586945	0.558661
A x C	2	0.058589	72	0.009225	6.351419	0.002882
G x A x C	2	0.007178	72	0 009225	0.778138	0.463084

PF AEMG (5s)

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.227786	36	0.05319	4.282521	0.045742
A	1	1.002635	36	0.05319	18.85013	0.00011
C	2	0.039344	72	0.025072	1 569264	0.215235
G x A	1	0.020158	36	0.05319	0.378986	0.542019
G x C	2	0.037825	72	0.025072	1 508683	0.22811
A x C	2	0.034156	72	0 025072	1 362361	0.262576
G x A x C	2	0.028546	72	0.025072	1 138569	0.325975

DF ECC/CON RATIO

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	1 141034	36	1 626101	0.701699	0.40774
A	1	22.83437	36	1.626101	14.04241	0.000626
G x A	1	3.981809	36	1 626101	2.448685	0.126372

PF ECC/CON RATIO

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.020774	36	0.712406	0.029161	0.865365
A	1	2.956698	36	0.712406	4.150298	0.04903
G x A	1	0.675374	36	0.712406	0.948017	0.336722

DF PT ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	160.8474	36	42 77919	3.759945	0.060364
A	1	776.4967	36	42.77919	18.15127	0.00014
C	2	7.167308	72	2.317244	3.093031	0.051442
T	11	17.23481	396	0.188656	91.35587	0.000000
G x A	1	235.24	36	42.77919	5.498937	0.02466
G x C	2	0.918502	72	2.317244	0.396377	0.674212
A x C	2	4.084332	72	2.317244	1 762582	0.178924
G x T	11	0.521657	396	0.188656	2.765128	0.001808
A x T	11	1.408546	396	0.188656	7.466225	0.000000
C x T	22	0.214828	792	0.0587	3.659785	0.000000
G x A x C	2	1 151647	72	2.317244	0.49699	0.610431
G x A x T	11	0.450618	396	0.188656	2.388574	0.007127
G x C x T	22	0.028616	792	0 0587	0.487496	0.977657
A x C x T	22	0.118907	792	0.0587	2.02568	0.00365
G x A x C x T	22	0.039578	792	0 0587	0.674255	0.867285

DF PT NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.994603	36	1 316021	0.755765	0.390417
A	1	0.477821	36	1 316021	0.36308	0.550578
C	2	0.612493	72	0.920449	0.665428	0.517186
T	10	4.265267	360	0.045464	93.81572	0.000000
G x A	1	0.732455	36	1 316021	0.556568	0.46049
G x C	2	0.144842	72	0.920449	0.15736	0.85469
A x C	2	4.292409	72	0.920449	4.663386	0.012461
G x T	10	0.029469	360	0.045464	0.64818	0.772084
A x T	10	0.107017	360	0.045464	2.353866	0.010555
C x T	20	0.032241	720	0 026408	1.220872	0.229067
G x A x C	2	0.020797	72	0.920449	0.022595	0.977666
G x A x T	10	0.015491	360	0.045464	0.340721	0.969463
G x C x T	20	0.009904	720	0 026408	0.37502	0.994429
A x C x T	20	0.027496	720	0.026408	1 041178	0.409975
G x A x C x T	20	0.022832	720	0.026408	0.864556	0.633457

PF PT ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	7432.03	36	600.491	12.37659	0.001197
A	1	3748.483	36	600.491	6.242364	0.017177
C	2	43.08869	72	60.78955	0.708817	0.495628
T	11	32.8299	396	1.035241	31.71231	0.000000
G x A	1	207 6397	36	600.491	0.345783	0.560181
G x C	2	25.55325	72	60.78955	0.420356	0.658414
A x C	2	2.786088	72	60 78955	0 045832	0.955231
G x T	11	11.14407	396	1.035241	10.76471	0.000000
A x T	11	12.24204	396	1.035241	11.8253	0.000000
C x T	22	0.650266	792	0 497096	1 308129	0.155934
G x A x C	2	1 776947	72	60.78955	0.029231	0.971204
G x A x T	11	0.936049	396	1 035241	0.904184	0.536309
G x C x T	22	0.600849	792	0.497096	1.208717	0.231498
A x C x T	22	0.451846	792	0.497096	0.908971	0.583209
G x A x C x T	22	0.588067	792	0 497096	1 183005	0.25473

PF PT NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.419828	36	0 209658	2.002437	0.165639
A	1	0.376952	36	0.209658	1 797935	0.188362
C	2	0.148466	72	0.082479	1 800046	0.17265
T	10	0.064834	360	0.005725	11.32439	0.000000
G x A	1	0.027082	36	0.209658	0.129174	0.72139
G x C	2	0.094894	72	0.082479	1 150523	0.32222
A x C	2	0.170295	72	0 082479	2.064705	0.134302
G x T	10	0.040788	360	0.005725	7.124324	0.000000
A x T	10	0.06322	360	0.005725	11.04252	0.000000
C x T	20	0.002729	720	0 00263	1 037559	0.41424
G x A x C	2	0.309591	72	0.082479	3.753565	0.028142
G x A x T	10	0.001509	360	0 005725	0.263566	0.988417
G x C x T	20	0.0026	720	0 00263	0.988858	0.473465
A x C x T	20	0.002467	720	0 00263	0.938212	0.53784
G x A x C x T	20	0.002979	720	0 00263	1 132705	0.309761

DF PEAK POTENTIATION NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.040317	36	0.48529	0.083079	0.774821
A	1	0.628689	36	0 48529	1.295493	0.262556
C	2	0.748302	72	0.140192	5.337681	0.006893
G x A	1	0.029632	36	0 48529	0.061061	0.80623
G x C	2	0.116492	72	0.140192	0.830945	0.439771
A x C	2	0.182569	72	0.140192	1 302274	0.27824
G x A x C	2	0.157815	72	0.140192	1 1257	0.330067

PF PEAK POTENTIATION NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.420754	36	0.042189	9.973144	0.003209
A	1	0.257347	36	0.042189	6.099903	0.018394
C	2	0.005572	72	0.017114	0.325593	0.723157
G x A	1	0.004189	36	0 042189	0.099284	0.754509
G x C	2	0.008114	72	0.017114	0.474131	0.624355
A x C	2	0.011884	72	0.017114	0.694388	0.502693
G x A x C	2	0.014416	72	0 017114	0.842339	0.434902

DF MRTD ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	463926.4	36	37558.68	12.35204	0.001209
A	1	117856.1	36	37558.68	3.13792	0.084957
C	2	711.5989	72	13362.11	0.053255	0.948176
T	11	19773.81	396	270.9363	72.98325	0.000000
G x A	1	9485.51	36	37558.68	0.252552	0.618344
G x C	2	11067 37	72	13362.11	0.828265	0.440925
A x C	2	23083.93	72	13362 11	1 727566	0.185001
G x T	11	3245.438	396	270.9363	11.9786	0.000000
A x T	11	343.4559	396	270.9363	1.267663	0.240879
C x T	22	181 1798	792	132.2933	1 369531	0.119881
G x A x C	2	9253.142	72	13362 11	0.692491	0.503629
G x A x T	11	628.36	396	270.9363	2.319217	0.00911
G x C x T	22	87 80845	792	132.2933	0.663741	0.876764
A x C x T	22	178.0423	792	132.2933	1 345815	0.132912
G x A x C x T	22	91 10618	792	132.2933	0.688668	0.853676

DF MRTD NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	1 537441	36	1 04177	1 475796	0.232342
A	1	0.199406	36	1 04177	0.191411	0.664358
C	2	0.506511	72	0.678823	0.746161	0.477814
T	10	2.87632	360	0.028307	101.6101	0.000000
G x A	1	0.638979	36	1 04177	0.613359	0.438648
G x C	2	0.743852	72	0.678823	1 095797	0.339782
A x C	2	2.91379	72	0.678823	4.292417	0.017332
G x T	10	0.146064	360	0.028307	5.159925	0.000000
A x T	10	0.010595	360	0.028307	0.37429	0.957334
C x T	20	0.043947	720	0.018256	2.407307	0.000553
G x A x C	2	0.080058	72	0.678823	0.117937	0.888924
G x A x T	10	0.140188	360	0.028307	4.952352	0.000000
G x C x T	20	0.013802	720	0.018256	0.756055	0.767716
A x C x T	20	0.030228	720	0.018256	1.655817	0.035668
G x A x C x T	20	0.010398	720	0.018256	0.56959	0.933905

PF MRTD ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	3748607	36	484367.1	7.739186	0.008547
A	1	4871298	36	484367.1	10.05704	0.003097
C	2	121657 9	72	58864.05	2.06676	0.134041
T	11	138008	396	1762.444	78.30487	0.000000
G x A	1	127389.6	36	484367 1	0.263002	0.611198
G x C	2	100600.5	72	58864.05	1 709031	0.188303
A x C	2	57004.98	72	58864.05	0.968418	0.384573
G x T	11	17712.5	396	1762.444	10.04997	0.000000
A x T	11	19798.64	396	1762.444	11.23363	0.000000
C x T	22	2731.345	792	959.1345	2.847718	0.000015
G x A x C	2	1070.11	72	58864.05	0.018179	0.981989
G x A x T	11	594.3485	396	1762.444	0.33723	0.97706
G x C x T	22	479.1052	792	959 1345	0.499518	0.974011
A x C x T	22	822.4063	792	959 1345	0.857446	0.65291
G x A x C x T	22	1428.255	792	959.1345	1.489108	0.069202

PF MRTD NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.19341	36	0.563389	0.343297	0.561588
A	1	0.712269	36	0.563389	1.264258	0.268288
C	2	1 089117	72	0.39577	2.751895	0.070525
T	10	0.95946	360	0.014433	66.47652	0.000000
G x A	1	0.798785	36	0.563389	1.417821	0.241555
G x C	2	0.035288	72	0.39577	0.089163	0.914797
A x C	2	1.395962	72	0.39577	3.527208	0.034564
G x T	10	0.097041	360	0.014433	6.723484	0.000000
A x T	10	0.105639	360	0.014433	7.319252	0.000000
C x T	20	0.022864	720	0.009135	2.502827	0.000308
G x A x C	2	1.634604	72	0.39577	4.130188	0.020041
G x A x T	10	0.006127	360	0.014433	0.424499	0.934506
G x C x T	20	0.005541	720	0.009135	0.606519	0.909773
A x C x T	20	0.007075	720	0 009135	0.774507	0.746124
G x A x C x T	20	0.005176	720	0.009135	0.566597	0.935659

DF TPT ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	29166.93	36	16521 54	1 765388	0.192315
A	1	162682.6	36	16521.54	9.846696	0.003386
C	2	10021 6	72	6529.862	1 534734	0.222479
T	11	1611.355	396	161.369	9.985534	0.000000
G x A	1	3733.815	36	16521 54	0.225997	0.63738
G x C	2	11429.43	72	6529 862	1 750333	0.181026
A x C	2	10518.21	72	6529 862	1 610786	0.206844
G x T	11	167 7247	396	161 369	1 039386	0.410488
A x T	11	88.23293	396	161 369	0.546778	0.870891
C x T	22	155.7648	792	116.0051	1 342742	0.134681
G x A x C	2	9475.143	72	6529.862	1.451048	0.241094
G x A x T	11	236.271	396	161 369	1.464166	0.142426
G x C x T	22	140.1581	792	116.0051	1.208207	0.231944
A x C x T	22	126.4655	792	116.0051	1 090172	0.351191
G x A x C x T	22	121 8539	792	116.0051	1 050419	0.398085

DF TPT NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.216596	36	0.45871	0.472185	0.496387
A	1	0.103833	36	0.45871	0.226358	0.637112
C	2	0.856207	72	0.357813	2.39289	0.098596
T	10	0.212682	360	0.025695	8.277249	0.000000
G x A	1	0.010356	36	0.45871	0.022577	0.881401
G x C	2	0.458485	72	0.357813	1.281353	0.283916
A x C	2	0.138408	72	0.357813	0.386815	0.68062
G x T	10	0.049021	360	0.025695	1 907806	0.042948
A x T	10	0.007199	360	0.025695	0.280176	0.985312
C x T	20	0.017691	720	0 019446	0.909724	0.574764
G x A x C	2	0.159962	72	0.357813	0.447056	0.641271
G x A x T	10	0.078325	360	0.025695	3.048288	0.001002
G x C x T	20	0.022697	720	0.019446	1 167164	0.276279
A x C x T	20	0.016255	720	0.019446	0.835894	0.670274
G x A x C x T	20	0.021274	720	0.019446	1 093966	0.350272

PT TPT ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	63497.79	36	10901.63	5.824617	0.021018
A	1	202556.5	36	10901.63	18.58039	0.000121
C	2	3717 135	72	2511 38	1.480116	0.234453
T	11	4017.72	396	115.474	34.79329	0.000000
G x A	1	30548.65	36	10901 63	2.802211	0.102803
G x C	2	7589.345	72	2511 38	3.021982	0.054923
A x C	2	1575.132	72	2511 38	0.627198	0.536979
G x T	11	141 501	396	115.474	1.225393	0.267694
A x T	11	438.6231	396	115.474	3.798458	0.000335
C x T	22	81.46338	792	103.5563	0.786658	0.744589
G x A x C	2	541.6144	72	2511 38	0.215664	0.806525
G x A x T	11	153.1367	396	115.474	1 326157	0.207191
G x C x T	22	68.57738	792	103.5563	0.662223	0.8781
A x C x T	22	75.81898	792	103.5563	0.732152	0.808562
G x A x C x T	22	115.3434	792	103.5563	1 113823	0.324805

PF TPT NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.1317	36	0.272948	0.482507	0.491748
A	1	1.221931	36	0.272948	4.476782	0.041342
C	2	0.076786	72	0.096199	0.798199	0.454082
T	10	0.313967	360	0.007204	43.58025	0.000000
G x A	1	0.988251	36	0.272948	3.620651	0.065088
G x C	2	0.251756	72	0.096199	2.617045	0.079955
A x C	2	0.125852	72	0.096199	1 308251	0.276639
G x T	10	0.008132	360	0.007204	1 128702	0.33939
A x T	10	0.029582	360	0.007204	4.10614	0.0000224
C x T	20	0.006192	720	0.009172	0.675131	0.852838
G x A x C	2	0.29661	72	0.096199	3.083308	0.051904
G x A x T	10	0.004501	360	0.007204	0.62476	0.792745
G x C x T	20	0.003786	720	0.009172	0.412776	0.989604
A x C x T	20	0.005213	720	0.009172	0.568326	0.934649
G x A x C x T	20	0.009383	720	0.009172	1 022946	0.431666

DF ½ RT ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	24476.77	36	15013.75	1 63029	0.209838
A	1	113956.3	36	15013.75	7.590133	0.009148
C	2	3551 748	72	1899.386	1 869945	0.161541
T	11	1953.666	396	141.1789	13.83823	0.000000
G x A	1	1816.565	36	15013.75	0.120993	0.729985
G x C	2	387 9051	72	1899 386	0.204227	0.815748
A x C	2	4770.148	72	1899 386	2.511415	0.088241
G x T	11	285.6019	396	141.1789	2.022978	0.025206
A x T	11	72.84002	396	141 1789	0.515941	0.892683
C x T	22	92.73282	792	98.83093	0.938298	0.543431
G x A x C	2	851 7057	72	1899 386	0.448411	0.640413
G x A x T	11	280.2035	396	141.1789	1.98474	0.028624
G x C x T	22	100.8358	792	98.83093	1 020286	0.435527
A x C x T	22	92.36907	792	98.83093	0.934617	0.548408
G x A x C x T	22	83.54133	792	98.83093	0.845295	0.669113

DF ½ RT NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	3.474877	36	1 043033	3.331512	0.07627
A	1	0.171036	36	1 043033	0.16398	0.687915
C	2	0.184186	72	1 274067	0.144566	0.865649
T	10	0.310306	360	0.037572	8.258905	0.000000
G x A	1	0.01644	36	1 043033	0.015762	0.900789
G x C	2	0.460471	72	1.274067	0.361418	0.697945
A x C	2	0.526098	72	1 274067	0.412928	0.663267
G x T	10	0.05315	360	0.037572	1.414618	0.171692
A x T	10	0.021082	360	0.037572	0.5611	0.845385
C x T	20	0.011238	720	0.025624	0.43859	0.984822
G x A x C	2	0.979549	72	1.274067	0.768836	0.46732
G x A x T	10	0.043508	360	0.037572	1 157975	0.31822
G x C x T	20	0.050197	720	0.025624	1.958972	0.007422
A x C x T	20	0.021147	720	0 025624	0.825277	0.68374
G x A x C x T	20	0.030192	720	0.025624	1 178264	0.266021

PF ½ RT ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	3845.044	36	7559 391	0.508645	0.480324
A	1	216163.4	36	7559.391	28.59534	0.000005
C	2	1598.86	72	1413.499	1 131137	0.328332
T	11	682.6423	396	132.883	5.137167	0.000000
G x A	1	2600.785	36	7559 391	0.344047	0.561163
G x C	2	151 8291	72	1413 499	0.107414	0.898298
A x C	2	331 5819	72	1413.499	0.234582	0.791503
G x T	11	176.8368	396	132 883	1 33077	0.204699
A x T	11	161 6997	396	132 883	1.216858	0.273364
C x T	22	59 48568	792	89 17441	0.667071	0.873803
G x A x C	2	670.6246	72	1413.499	0.474443	0.624163
G x A x T	11	136.1377	396	132 883	1 024493	0.423571
G x C x T	22	123.2533	792	89 17441	1 38216	0.11338
A x C x T	22	48.98235	792	89 17441	0.549287	0.954335
G x A x C x T	22	119.181	792	89 17441	1 336493	0.138336

PF ½ RT NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.747209	36	0 286231	2.610507	0.114889
A	1	0.130792	36	0.286231	0.456943	0.503376
C	2	0.247269	72	0 120912	2.045035	0.136824
T	10	0.051434	360	0.014448	3.560036	0.000163
G x A	1	1.406295	36	0.286231	4.913141	0.033059
G x C	2	0.050326	72	0 120912	0.416221	0.661111
A x C	2	0.022051	72	0.120912	0.182369	0.833677
G x T	10	0.017885	360	0.014448	1.237902	0.265135
A x T	10	0.02868	360	0.014448	1.985106	0.033957
C x T	20	0.008767	720	0.010705	0.818919	0.691747
G x A x C	2	0.503549	72	0.120912	4.164593	0.019433
G x A x T	10	0.006356	360	0.014448	0.439939	0.926356
G x C x T	20	0.01657	720	0 010705	1 547868	0.059462
A x C x T	20	0.009125	720	0 010705	0.852401	0.649139
G x A x C x T	20	0.011581	720	0 010705	1 081848	0.363539

DF M-WAVE AREA ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.0028	36	0 007577	0.369542	0.54707
A	1	2.607225	36	0.007577	344.0847	0.000000
C	2	0.00064	72	0 00143	0.447198	0.641181
T	11	0.000551	396	4.33E-05	12.73205	0.000000
G x A	1	0.002943	36	0 007577	0.388388	0.537076
G x C	2	0.006493	72	0.00143	4.539515	0.013908
A x C	2	0.000643	72	0 00143	0.449754	0.639565
G x T	11	0.000116	396	4.33E-05	2.67456	0.002528
A x T	11	0.000303	396	4.33E-05	6.996225	0.000000
C x T	22	4.25E-05	792	4 32E-05	0.984683	0.481506
G x A x C	2	0.000688	72	0 00143	0.48096	0.620161
G x A x T	11	4.74E-05	396	4 33E-05	1 09318	0.365154
G x C x T	22	4.77E-05	792	4 32E-05	1 104233	0.335361
A x C x T	22	3.71E-05	792	4 32E-05	0.859683	0.649913
G x A x C x T	22	4.04E-05	792	4 32E-05	0.936347	0.546069

DF M-WAVE AREA NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.134833	36	0 628662	0.214476	0.646069
A	1	0.232338	36	0 628662	0.369575	0.547052
C	2	0.737685	72	0 762922	0.96692	0.385135
T	10	0.501369	360	0.231814	2.162809	0.019514
G x A	1	0.212318	36	0 628662	0.33773	0.564763
G x C	2	2.674764	72	0.762922	3.505945	0.03524
A x C	2	0.044975	72	0 762922	0.058951	0.942798
G x T	10	0.237336	360	0 231814	1 023821	0.42253
A x T	10	0.263232	360	0 231814	1 135533	0.334368
C x T	20	0.222773	720	0 245725	0.906597	0.578831
G x A x C	2	0.808141	72	0 762922	1 05927	0.352049
G x A x T	10	0.160269	360	0 231814	0.691368	0.73261
G x C x T	20	0.265792	720	0 245725	1 081664	0.363742
A x C x T	20	0.234836	720	0 245725	0.955685	0.515393
G x A x C x T	20	0.233381	720	0.245725	0.949763	0.522978

PF M-WAVE AREA ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.061205	36	0.012079	5.067162	0.030584
A	1	0.013377	36	0 012079	1 107469	0.299645
C	2	0.001198	72	0 001015	1 179821	0.313204
T	11	4.54E-05	396	1.89E-05	2.398049	0.00689
G x A	1	0.000599	36	0 012079	0.049558	0.825092
G x C	2	0.003148	72	0 001015	3.101028	0.051064
A x C	2	0.001007	72	0.001015	0.992523	0.375654
G x T	11	1 8E-05	396	1 89E-05	0.951408	0.490736
A x T	11	4.85E-05	396	1.89E-05	2.560473	0.003839
C x T	22	1.49E-05	792	1 58E-05	0.943519	0.536382
G x A x C	2	0.00085	72	0 001015	0.837493	0.436966
G x A x T	11	1 23E-05	396	1 89E-05	0.64791	0.787341
G x C x T	22	2.54E-05	792	1.58E-05	1.607105	0.038523
A x C x T	22	1.47E-05	792	1 58E-05	0.931496	0.552633
G x A x C x T	22	2E-05	792	1 58E-05	1.264326	0.186488

PF M-WAVE AREA NORMALIZED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.201092	36	0 278032	0.723269	0.400695
A	1	0.078065	36	0 278032	0.280776	0.599446
C	2	0 020904	72	0 164009	0.127456	0.88053
T	10	0.012168	360	0 009752	1.247835	0.259021
G x A	1	0.001965	36	0 278032	0.007069	0.933461
G x C	2	0.152068	72	0 164009	0.927192	0.400335
A x C	2	0.057084	72	0 164009	0.348058	0.70724
G x T	10	0.003171	360	0 009752	0.325221	0.974237
A x T	10	0.027426	360	0.009752	2.812474	0.002268
C x T	20	0.011386	720	0 008514	1 337345	0.147242
G x A x C	2	0.665007	72	0.164009	4.054706	0.021447
G x A x T	10	0.009138	360	0 009752	0.93711	0.498916
G x C x T	20	0.009071	720	0 008514	1 065383	0.381995
A x C x T	20	0.00864	720	0 008514	1 014742	0.441586
G x A x C x T	20	0.011338	720	0 008514	1.331687	0.150597

DF M-WAVE AMP ABSOLUTE

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	5.452285	36	56 3536	0.096751	0.757558
A	1	29311.83	36	56.3536	520.1413	0.000000
C	2	0.197723	72	9 832466	0.020109	0.980097
T	11	0.360476	396	0.060835	5.925486	0.000000
G x A	1	3.507236	36	56.3536	0.062236	0.804414
G x C	2	5.482926	72	9 832466	0.557635	0.575014
A x C	2	3.509197	72	9 832466	0.356899	0.701074
G x T	11	0.078351	396	0 060835	1.287932	0.228762
A x T	11	0.162333	396	0.060835	2.668416	0.002586
C x T	22	0.031956	792	0 034822	0.917698	0.571351
G x A x C	2	2.392488	72	9 832466	0.243325	0.784658
G x A x T	11	0.099359	396	0 060835	1.63326	0.087107
G x C x T	22	0.085116	792	0.034822	2.444301	0.000252
A x C x T	22	0.038741	792	0 034822	1 112525	0.326222
G x A x C x T	22	0.052563	792	0 034822	1 509459	0.062736

DF M-WAVE AMP NORMALZIED

	DF Effect	MS Effect	DF Error	MS Error	F Ratio	p Value
G	1	0.300211	35	0.200199	1.499565	0.228917
A	1	0.090105	35	0 200199	0.45008	0.5067
C	2	0.126077	70	0 11867	1 062419	0.351125
T	10	0.007306	350	0 004986	1.465365	0.150638
G x A	1	0.802605	35	0.200199	4.009046	0.053053
G x C	2	0.160273	70	0 11867	1 350581	0.265756
A x C	2	0.230255	70	0 11867	1 9403	0.15131
G x T	10	0.003744	350	0.004986	0.751015	0.676071
A x T	10	0.001121	350	0.004986	0.224762	0.993866
C x T	20	0.001947	700	0.004877	0.399204	0.991596
G x A x C	2	0.090439	70	0 11867	0.762105	0.470516
G x A x T	10	0.003455	350	0.004986	0.692883	0.731172
G x C x T	20	0.002464	700	0.004877	0.505149	0.965192
A x C x T	20	0.002093	700	0.004877	0.429175	0.986708
G x A x C x T	20	0.001093	700	0 004877	0.224101	0.999874