

David de Angelis

POWER FLEX STRETCHING

Get MAXIMUM Flexibility in MINIMUM Time

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& MEYER
SPORT

Power-Flex Stretching

David De Angelis

Power-Flex STRETCHING

Get Maximum Flexibility in
Minimum Time

*Super Flexibility and Strength
for Peak Performance*

Power-Flex Stretching – Super Flexibility and Strength for Peak Performance

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Excessive flexibility may have deleterious effects on performance. Apply exercises according to the necessity of the practiced sport and your own health, age and physical preparation level.

Follow this general rule: strengthen what you extend; extend what you strengthen.

Static active stretching exercises may have harmful effects on the cardiovascular system of less trained individuals or those who find themselves in a state of less than excellent health. *Always consult your doctor beforehand.*

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Power-Flex STRETCHING: Super Flexibility and Strength for Peak Performance

- In the theoretical chapter, you will learn principles which regulate flexibility and specific strength development.
- Through the explanations of joint mechanism you can learn about your becoming able to perform splits in the future.
- In the chapter on dynamic stretching, you will discover how to acquire impressive explosive strength.
- In the chapter dealing with isometric PNF, this extraordinary technique will be explained to you in detail, and you will enhance your articular mobility astoundingly, eventually being able to perform complete splits cold.
- In the chapter on static active flexibility, the gymnasts' secret will be revealed to you, and you will learn to challenge the force of gravity.
- In the chapter on specialized equipment, you will be introduced to the latest techniques for use of particular sports apparatus in order to enhance your flexibility.

Replete with detailed training schemes for each level.
professional advice from the author on the internet:
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*“It does not matter how far you are from your objective... start getting closer to it. With the Strength of the drop that pierces the rock, with the Faith that moves mountains, and, above all, with the Passion that burns in the heart...who knows, maybe, one day...
I dedicate POWER-FLEX STRETCHING to all those who can because they believe they can.”*

David De Angelis

To my father Alberto and my mother Teresa who have always let me freely choose the path of my passions

Acknowledgments

I would like to thank all the trainers, choreographers, and instructors who, in all these years, have had the patience to teach a person not genetically endowed with prominent physical qualities, but who have never quit searching, trying, and learning.



The Author

- Former student of M. of Kung-Fu Coo Kang Sing, Lam Kiun Pack Toi style, at Fiamma Yamato Academy (Rome).
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- Rome. June, 1988 Qualified as first place in his weight category at academy sports tournament.
- Rome. 05/06/1988. Second place at Kung-Fu tournament "City of Rome".
- Participant in numerous aerobic competitions at the professional level.
- April, 1997. Salsomaggiore Terme. Third place at Italian National Aerobics Championships F.I.A. 1997 in TEAM category (together with athletes Rinaldo Cacchioni and Emanuele Giromotti).
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David De Angelis'
Coaching/Consulting Program

If you choose to work with me...in a Coaching/Personal Training Program, we will focus on your training goals, how much flexibility, strength and physical fitness/wellness you can reach in 6-12 months.

Save Time and energy for the best results in minimum time.

Please visit my website:

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personal@powerflexsystem.com

The more a man knows about his body and its capacities, the more he is able to understand and embrace that which makes him move.

Any man getting closer to his top physique is approaching endless life essence, embedded in himself.

Train your body to strengthen its spiritual qualities.

The essence of training as well as of body discipline is to allow the body to become a faithful carrier of the truths it embodies.

David De Angelis

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Presentation

by Prof. Maurizio ROMANO ("LA SAPIENZA" University, Rome, Italy)

Throughout my long career in the field of Applied Rehabilitation Kinesiology, I have had the privilege of coming into touch with a great number of people who have helped me to develop and put into practice scientific methods involving activities of both a spiritual and physical nature. Among these activities, I cite several sports and classical dance, all of which entail a great degree of psychophysical discipline. I constantly have emphasized the importance of an exercise and its proper execution and pointed out how it can contribute enormously to our well-being and enable us to face adversity. As a university professor, I have been unceasing in my efforts to persuade doctors, medical specialists, and educators to teach their patients and pupils about the benefits of aerobics, and I have spent years trying to perfect new exercise techniques based on scientifically-tested combinations of stretching, breathing tasks, and both

regionalized and diffused muscular contraction.

I am grateful to David De Angelis for providing the spark to write this long overdue book. After six long years of theoretical lectures and debates, hard bibliographical research, and putting into practice a wide range of exercises and innovative training techniques, my interest in sports and, in particular, the application of stretching as a means of attaining harmony and balance has been enhanced even more.

My collaboration with David De Angelis has been ongoing and I am happy, in the meantime, to present this edition of POWER-FLEX STRETCHING. From one point of view, this volume is a bona-fide testimony to the magic of 'suppleness-stabilization' as tested specifically by the author himself and illustrated in the photos contained herein.

In addition, the book represents an implicit condemnation of the so-

called 'pharmaceutical body-building' based on research indicating that the resulting hypertrophy is ephemeral in nature (and heaven help those who try to stop once they have started!), and leads to a range of aesthetic distortions as well as necessitates ingestion of both medical and dietary supplements of dubious benefit that are, at times, downright dangerous.

Needless to say, stretching is far from being a mere supplementary activity (it is not just a simple warm-up exercise) in sports. A specialized stretching program is an integral part of a sports regimen aimed at enhancing performance and, as pre-

viously hinted at, can prove to be the 'secret weapon' that an athlete needs to make a qualitative jump in his sport. The author sets out to treat the subject thoroughly so that any serious-minded athlete can easily incorporate the author's paradigm into his own training routine.

POWER-FLEX has the dual role of treating the subject from both a theoretical and practical standpoint. No method can be considered valid if it has not been tested on the human body (and, in this case, the author's own body was the tested one!), and I am convinced that the reader will benefit greatly by following the path suggested by David De Angelis.

*Prof. Maurizio Romano
Sports Science Department
University of Rome, La Sapienza (Italy)*

Presentation

by Master Willem Jacob BOS (8th degree Tae Kwon Do)



Dear David,

I've read your book "Power-Flex Stretching" with a great interest and I would like to congratulate you on the quality of the information you've collected, based on your great experience and culture in stretching as well as on your knowledge of human body capabilities.

I'm sure this book will be very useful to all sportsmen who believe in their own capabilities. In particular, as a Taekwon-do Master, a martial art where the legs are used a lot, I suggest "Power-Flex" to all martial arts practitioners because of its precious and detailed information as well as for the certainty the book gives in reaching certain goals, both moral and physical.

Besides, I steady intend to put your text in, as basic information for all F.I.TAE (Italian Taekwon-do Federation) instructors to improve and refine the teaching, practicing and training of stretching.

*Master Willem Jacob Bos
8th Dan Taekwon-do I.T.F.
Technical Director F.I.TAE*

Preface

by Claudio Tozzi, President: Natural Bodybuilding Federation;
Journalist: Olympian's News Magazine

In every text on Sports Physiology, one hears that muscular lengthening is very achievable up until the ages of 10-13. After 13, we are told that it becomes extremely difficult to get noticeable results regardless of how much training one does. Though this may be true to some extent, in this book David De Angelis shows how you may substantially increase your flexibility even if you did not engage in any specific physical exercises as a child. I have read numerous books on stretching but I must say that Power-Flex is the most complete book on the issue that I have come across in the Italian language.

Each page is crammed with useful information: muscle physiology, illustrated exercises with wonderful photos depicting the author himself as mentor-practitioner, thoroughly-detailed tables drawn up by one of Italy's premier draftsmen (Riccardo Federici), illustrated exercises utilizing virtual imagery that are both sim-

ple and crystal clear. Last but not least, there is the dynamic no-nonsense tempo that characterizes De Angelis's style, which makes for thoroughly enjoyable reading.

Unlike other books to be found on the subject in Italy, De Angelis' book includes an extensive and impressive bibliography, which serves as a timely adjunct to the author's personal experience and expertise on flexibility.

After reading this book, everyone will be convinced that it is possible to make tremendous strides in increasing one's articular mobility and flexibility even for those well past their prime. When I read the first draft of this book, I realized right away that I had come upon something that was extremely innovative, if not earth-shattering, and I immediately asked for David De Angelis' permission to include the book as part of the 'required essential reading' for the Natural Bodybuilding Federation. I did it without hesitation, because I

have always tried to provide my students with the most update instructions in Italy. De Angelis is one of the most sought-after instructors at the A.S.N. BBF—his fascinating lessons on stretching have always been a favorite with aspiring trainers and physical education teachers.

Very alluring indeed is the author's offer to allow readers to contact him directly on-line on his

website www.powerflexsystem.com. In short, this book has all the makings of becoming an indispensable point of reference for anyone hoping to obtain optimal results in this highly competitive sport.

Claudio Tozzi

Introduction

“Athletic training does not act upon an object, a body, but rather, it acts upon the spirit and emotions of a human being. To act on such a fragile entity requires great intelligence and power of discernment.”

Bruce Lee

Flexibility and strength are of vital importance in the physical and technical development of every athlete, regardless of the specific sport he is practicing. Whether one is a professional athlete or simply a sports enthusiast, an optimal training program that adheres to sound criteria will undoubtedly bring huge benefits and personal satisfaction. Joint mobility, and by this one means a range of movement at joints in various parts of the body, as well as flexibility and elasticity (or muscles' ability to lengthen without tearing) and resistance, which constitute its principal physical attributes. Being "loose" gives one a sense of psychophysical well-being, prevents lesions of the musculo-tendinous joint apparatus (especially in those sports that involve explosive movements, such as competitive aerobics, martial arts, dance, etc.) and constitutes the so-called 'conditio sine qua non' for achieving the correct and most "econo-

nomical" athletic conditioning.

Throughout my studies on muscular physiology, and throughout my training, which involved a seemingly interminable sequence of trial and error exercises to enhance performance, I was often amazed (and still I am) by the use of certain, very simple concepts. Of paramount importance is the indispensable, though sometimes subtle, interrelationship between the mind, body, and spirit.

An incredible amount of mental fortitude and willpower is often required in maintaining specific static strength-building positions. Mental flexibility, in fact, has proven instrumental in helping to foster a change in a sequence of variables—intensity, frequency, recovery—as well as in enabling me to make subtle changes in the techniques themselves, aimed at finding the right combination to fit my own specific needs regarding strength, resistance, muscle flexibility,

etc. These changes, moreover, have had to take into account the cardinal rules or “secrets” pertaining to flexibility training and strength-building so as to achieve optimal performance. Great strength of mind and resilience is required to move ahead with training during sluggish periods, when even minuscule improvements seem so hard to obtain.

Another concept that intrigued me was that of the contrast between ‘big’ and ‘small’ performance enhancement. In reality, there is no real difference between ‘big’ and ‘small’ in that small is a part of the big and the ‘big’ is a sum of a series of smaller parts.

A practical example of this is the muscle. In the introductory chapter on neurophysiology entitled “The Human Machine,” this big-small dichotomy is fully explained through characterization of the muscle. The research regarding proper physical development and mental attitude (actually, physical development is a direct consequence of a correct attitude and mental approach) is an exciting and very educational endeavor. It should be approached more as a game or form of entertainment than as a test, otherwise one risks becoming a slave to one’s objectives.

You should not fall into the trap of trying to win cups and trophies. The best trophy you will receive will be on the day when someone in the crowd approaches you to ask what your secret is and tries to imitate you. When you can teach him to learn from his own mistakes and imperfections you will already have done him a great service. Most of the others will sit around, telling themselves that you

got where you did only because you were naturally endowed, convincing themselves that there is no way they can get to where you are. You, of course, are fully aware of how important a concerted effort, proper planning, and a positive attitude have been so crucial in allowing you to reach your peak. The most important thing is to get started and lay down that first brick! The rest will follow.

By learning how to put into practice the principles that govern the path to flexibility and strength, you will be buying your ticket to achieving harmony, balance, and control over your body. I cannot find the words to express this idea better than those said by Professor Flavio Daniele in his book, ‘The Three Paths of the Tao’:

“True mastery over the body is born from the ability to pass willfully from passivity to activity and vice-versa. The conscious domain of passivity and inaction, of activity and action allows the body to flow freely from one state to another just like water, which never loses its nature as it changes from a solid to a liquid and then to vapor in a continuous and infinite dynamic process.

This ability to flow from one state to another is called mutability and confers force, energy, and strength. Like fire (Yang), it transforms the apparent inaction of water into the power of vapor—a turbine transforms it into electrical energy and so the conscious domain of passivity and inaction allows hard matter to turn soft, slowness to speed, flab to strength.”

I firmly believe that this book will markedly improve your athletic per-

formance, but that is not all what it will do. Those of you who are particularly attentive will be able to use the advice contained within it to enhance their personal life: the problems and aims may be different but their resolution and realization, respectively, depend on proper application of the same principles cited in the book. Pay close attention and you will surely benefit and learn. Life is full of teachings but only a few take hold. Keep the ‘force’ while pursuing your goals, at the same time remaining flexible and objective about your mistakes and weakpoints. Be ready to make adjustments, but remember to be cautious—use light strokes like the skilled artist, otherwise, you will run the risk of going from one extreme to another. Harmony, I believe, is the right means.

This book is not only a review of a variety of texts and scientifically-based works on flexibility and body-building—gleaned from the most prestigious international scientific journals and reviews—but, above all, it derives from my own personal experience and application of major principles and techniques.

I would like to bring to the avid reader’s attention the fact that, besides providing an exhaustive explanation of the principles of muscle neurophysiology and the associated techniques, I have also sought to elucidate my own personal experience in order to illustrate which results one can expect to obtain from a correct application of the methods described in the text.

It is important to note the degree of joint mobility depicted in the photos of this volume, achieved by an

adult at the ripe old age of 28 years, in addition to the striking flexibility and strength achieved by a person who had not taken up the sport at a young age, which is the norm in gymnastics. I would like to emphasize, therefore, the fact that these results were obtained without having any solid technical athletic base and, more importantly, without any particular genetic endowment or predisposition of a biomechanical nature.

The real strength of this book is not so much the explanation and illustration of the techniques and exercises (which all gymnasts can readily perform), but the demonstration of how marked improvement can be achieved by people who are not naturally gifted and who did not begin their athletic training at a young age. Each one of us, I believe, is capable of becoming a “self-made man,” at least insofar as developing one’s physique is concerned, which is, at the same time, closely related to development of one’s mind and soul.

I sincerely hope and I am confident that the techniques illustrated in this book, which have enabled me to achieve a healthy measure of physical and inner harmony, will allow you, the reader, to maximize your athletic performance.

All you need is to believe and follow through with the suggested training program and you will start seeing the results!



David De Angelis

Power-Flex STRETCHING

Super Flexibility and Body Strength



Italian National Aerobic Championship

Above: David De Angelis.

Below: Rinaldo Cacchioni on the right,
Emanuele Giromotti on the left

Power-Flex: A New Concept on Flexibility, a New Concept on Stretching

Flexibility is a muscular quality inseparable from its *apparently* opposite quality - strength. You can't realize what's the true problem of chronic inflexibility unless you completely understand the *true* concept of muscular flexibility, and eventually even a kind of flexibility, which we could call super-human flexibility, if it might be developed: it's seemingly super-human since, actually, a lack of full flexibility is mostly caused by disuse of one's own body (this works for the people who are defined genetically "normal" and without evident structural problems concerning their joints and their nervous system). Therefore, all (or almost all) people were born with a certain potentiality of super normal muscular flexibility. In the case of flexibility as disuse is meant the use of body at limited joint ranges but not within complete normal motion capacity (see the schedule of joint ranges in appendices). If the muscles are unable to show off their maximum joint motion, the reason is (mostly) in strength and flexibility adapting to limited joint ranges which, with time, have become ordinary. Why should we ask a not specifically trained body to do the complete splits? It's almost impossible unless "the body laws" are understood and applied following and listening to one's own body (adjusting training schedules, which means training loads, frequency and recovery times to one's own physical capabilities at that very training stage).

But, what's, actually, flexibility?

If you are able to understand this *new* concept of flexibility, then you will eventually develop super and so called *super-human* flexibility.

So, what's the greatest secret? I will give you a new definition on flexibility and strength which are like the two sides of the same coin, because they are so connected, correlated and interdependent.

Please, pay attention!

Definitions:

Strength - *How much force can be applied from any given position.*

Flexibility - *The range of motion where force can be applied.*

A remarkable level of flexibility is thought of being able to develop until a certain age and not beyond... This is an old concept, based on the old definition and understanding of flexibility. Whether you are an athlete or not, you know that you can develop a high level of strength even if you are elderly person: so, with the above definitions on strength and flexibility (as complementary) why couldn't you develop also a high (a very high) level of flexibility?

If you develop a *useful* range of motion (ROM) through particular exercises, where the *control* can be extended, you will develop flexibility *naturally*. That's all.

If you are inflexible *now*, it's simply because your body hasn't yet learnt how to apply the force in that particular ROM in question (now you know the reason why you are not able to do full splits at this training stage!).

When your nervous system detects that no controlling force can be applied within an area of ROM, then the muscles involuntarily tense to keep you from going there. It's your body's way of protecting you. It's like trying to make yourself fall forward: try, go ahead. What will happen if you try it sincerely is that right at the moment you attempt to actually do it, every muscle in your body will tense up and prevent you.

The *big secret* is that we don't have great flexibility because we do not practice it and because we do not practice applying force at those further ROMs. We become weaker and the cycle continues until we become what many people call "tight". The entire secret lies in one statement: you become "tight" because your body is trying to keep you from going where you cannot have control.

The secret of "super-human" or functional flexibility (as I've already explained thoroughly in the paragraph above) is to teach your body, little by little, how to apply force and gain the strength and control at larger and larger ranges of motion. There are many ways to do it and we will find them in this book, but keep in mind: at first you must achieve the strength gain at higher ranges of motion and later on flexibility will come by itself.

The way you surely **will not** become flexible is practicing and forcing yourself in painful positions as well as holding them until you are "loosened up".

Without functional strength and control at wide ranges of motion there's just little, useless flexibility: undoubtedly (unless you have developed flexibility ever since you were little and in such case you would be flexible, but weak in those opening positions and, therefore, subjected to muscular injuries).

Body and mind are embedded into each other: how much mental flexibility do you need to understand that the secret of flexibility lies in its apparently opposite muscular quality like strength? Be open to big picture, pick up and consider every aspect of any problem you want to resolve, gaining real and deep understanding. Open your mind - open your body.

The Human Machine

The human body, understood as a “human machine,” may be compared to an engine that develops movement through a complex system of levers.

The skeletal system represents the base structure of the human body and it is made of a set of levers united together by joints, called articulations, which permit a large variety of movements regarding more axes and planes.

Movement is permitted thanks to the muscles’ action, contractile units of which principal characteristic is the possibility of varying their length either by contracting or allowing extension—when sped up by such external forces as the force of contraction of antagonist muscles, the force of gravity, or mechanical action.

By means of this system, in appearance simple, but extraordinary from a biomechanical point of view, it is possible to develop more or less complex motor actions. Such motor actions, through perfect synergy and equilibrium between contraction and relaxation among dozens and dozens of muscles, and through mental acquisition of every single motor coordination, make it possible to carry out tasks like picking up a glass, walking, and doing spectacular exercises in competitive aerobics and other sports.

Muscles, in their entirety, are made of muscular bundles, in turn made of an “under system” (in reference to their size) of contractile units called sarcomeres.

The sarcomeres represent the muscle’s smallest functional units. Knowledge of their structure and potentiality for contraction and extension permits us to apply them for sports purposes like the increase of flexibility and muscular strength.

Sketching very simply the structure of a muscular sarcomere, one understands how its constituents, actin and myosin filaments, precisely allow for length variance and determination of the state of contraction or relaxation by the slipping phenomenon.

This phenomenon is subjected both to a voluntary mechanism, through the "conscious" action of contracting, and to an "involuntary or unconscious" mechanism, determined by the action of nervous system which is responsible for it. In the case of strength development, it is responsible for the number of fibers involved in the motor action; in that of flexibility, for the number of sarcomeres in a series. The sarcomeres, relaxing themselves, permit extensibility and extension degree of the entire muscle (also here, as pointed out in the preface, one understands how "the small makes the big and the big makes the small"). Besides these neuromuscular factors, there is obviously a mechanical action offered by the connective tissue which is present around and inside the muscles.

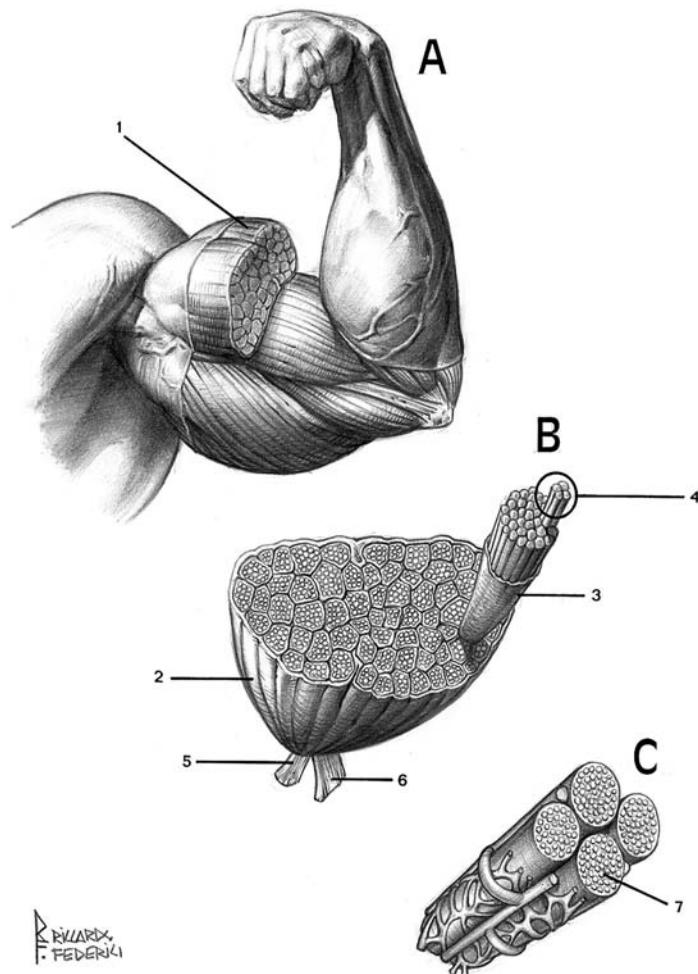


Table I

A Left arm, medial view

1) Sectioned biceps muscle

B Sectioned muscle

2) Sectioned biceps muscle (lower part)

3) Muscular fasciculus (bundle)

4) Fiber group

5) Tendon of the arm's biceps muscle

6) Bicipital aponeurosis

C Muscular fibers group

7) Muscular fiber

Building a Solid Foundation: a High Performance Heart

The concepts of fitness and health are similar in appearance but are actually profoundly different. From personal experience in the field of professional competitive aerobics contests, I can assert that the action of competing and being able to complete a routine combination of technical elements of a given prominence in a nearly anaerobic state (with a highly intense strain), does not mean that people are in good health. Strange, but it is simply so. It is surely not a recommendable path, nor indicative of a state of well-being to achieve our sports objective when our muscles, our ligaments, our immune system, and, above all, our heart, suffer from a state of profound and prolonged stress.

My personal sports event, before having awareness and knowledge of the expressed concepts in this chapter, was identical to that told by P. Maffetone in his books "High Performance Heart" and "In Fitness and in Health, Everyone Is an Athlete." Dr. Maffetone, medical specialist and, most of all, a passionate person, who knows the sport firsthand, had been able to achieve his athletic objective (to finish the New York Marathon), but sacrificed his health in the process (he was recovered in the hospital).

My personal experience and Dr. Maffetone's therefore serve to bear witness to the fact that the concepts of fitness and health do not always go hand in hand, and that before, during, and after your competitive season, you must enjoy good health. That is possible, training in an intelligent and scientific way (following theories and more effective techniques based on scientific criteria), by doing things step by step (or building the right physical qualities following a correct sequence). Nothing, as much as possible, must be left to chance because, as I still have to explain in this book, it is necessary to use our precious time wisely, because no one has unlimited time and energy.

If you want to reach your maximum physical and athletic performance and if you want to extend your competitive career, you must first build up a high performance heart. Let us see why.

Imagine two people, A and B, who are preparing themselves for the same competition; for example, a professional aerobics contest (even if it is for aerobics on an energy metabolism level and there is not a great deal of effort involved) in which the strain is nearly completely anaerobic for around two minutes.

The person A, following his trainer's "precious" instructions, preparing himself for an anaerobic competition, trains in an almost exclusively anaerobic way; thus, brief and intense trainings during which one finds his heart rate almost always alongside his aerobic threshold (precious aerobic threshold).

The person B, either by his own “documentation” or by the fact of having been trained by a person who knows important concepts of sports medicine and has a certain baggage of personal experience, builds up a “high performance” heart, increasing his own aerobic capacity (“anaerobic resistance is built on the basis of aerobic resistance”) (T. Kurz, How to Plan and Control Training for Peak Performance).

The person A, with his repeated anaerobic efforts, overtrains his heart and does not maintain the same musculature level which he has developed as a consequence of that type of high intensity training (you have more muscles, therefore more blood must be pumped in order to satisfy oxygen needs).

The person B, who trains with great commitment and will (fundamental requisites for any successful undertaking, sports-related or not) enjoys optimal health, without going to bed when all “the mortal ordinary folk” are in the peak of their activity, and enjoys his life and relations outside of sports. But that is not all.

His heart rate at rest is rather low—along general lines, this factor indicates not only good health, but also cardiovascular efficiency and range of sports performance—and this makes him arrive less easily or at least after the person A (who has a more stressed and less prepared heart, and therefore a higher heart rate at rest) in the anaerobic state in a competition’s specialized training phase.

This capacity for “aerobic” person B permits, by postponing entrance into the anaerobic region, retarding of anaerobic glucolysis and then lactic acid production (lactic acid is a product of rejection of sugar use for energy purposes, which is the principal energy source in anaerobic efforts), in order to train more over the long run (consequently increasing the technical level), reduce possibilities of injuries, and—a non-negligible factor—maintain social relations.

The first rule is therefore to maintain one’s health and avoid overtraining. This is possible, concentrating on maximization of cardiovascular and respiratory efficiency at the beginning of your training macrocycle.

Now you understand the reason for a chapter on the heart in a book dealing with flexibility and strength development. A high performance heart will enhance your muscular recovery, consequently improving your flexibility and strength.

Cardiovascular Training with a Heart Rate Monitor

Now we understand the importance of excellent cardiovascular efficiency, both for sports performance increase (principally: improvement in muscular recovery speed after intense strength trainings; better resistance in anaerobic engagements; possibility of increasing specific trainings, with consequent

Notes: In the annual macrocycle plan, one must respect the correct sequence in developing his personal physical qualities—premature specialization will reduce his athletic potential. Purely aerobic training, by remaining the annual training period for everyone, should be greater in the conditional, general period of training, and gradually diminish until the moment of specialization in the competitive routine. In this advanced training stage, excessive aerobic training interferes, at the energy and neurophysiological level, with optimal development of specific competitive performance.

technical improvement), and for betterment of our state of well-being and health in general.

The most important physiological adaptation pursued in cardiovascular training is reduction of the heart rate at rest, in which such a rate generally is considered an indication of cardiovascular efficiency. This is clear, in fact, if we consider the “human machine” as a engine which produces movement. If we are able to fulfill a given sequence of movements while maintaining our heart rate within a lower range, a minor energy expenditure and minor engagement of the neuromuscular system will result. In more technical terms, we could achieve a given athletic “task” in a largely aerobic system, greatly exhausting energy reserves supplied by fats, rather than using muscular and hepatic glycogen spares, which represent the energy substrate for brief and intense anaerobic efforts. All this will permit utilization of an energy source of greater duration (just the fats), and as a consequence will bring about less production of lactic acid (which, as already stated, is the direct consequence of anaerobic glucolysis, and therefore of carbohydrate metabolism for energy purposes, stored in the liver and muscles in the form of glycogen).

The efficient training must be based on a correct strategy based over scientific criteria. For correct aerobic training, the heart rate of “work” must be maintained within a certain minimum limit (under which training would not be done) and a maximum limit (over that which would go towards training the anaerobic system, with notably lesser effects on base aerobic resistance).

Monitoring our heart rate during training with a heart rate monitor permits us to check our cardiovascular engagement precisely and to maintain it within threshold limits, (aerobic or anaerobic) which have been chosen in our training plan.

Utilization of an heart rate monitor is very important for monitoring our heart rate in order to avoid overtraining. It allows us to assess actual recovery times between one exercise and another, not calling attention to the imprecise time, but to the real and precise time that the heart takes in order to reach a state of cardiovascular recovery (reaching, for example, a heart rate of recovery previously fixed and brought into line with our training state).

It is important to emphasize the fact that the same athlete may show an increase in his heart rate at rest on any given day because of one or more particularly stressful situations: excessive training, lack of adequate recovery, irregular meals, loss of sleep, etc. The training with a heart rate monitor will give us actual feedback on effort in a given physical state on a certain day. Consequently, we will be able to train with a greater safety margin to avoid excessive training (as could happen if we were to rely on evaluation of recovery times).

Training oneself in this manner means training in a scientific, safe, and intelligent way.

In sports, I think that it is important to move “forward” progressively, and not to retreat (as in overtraining).

Reaching as far as we can is very important in order to achieve the greatest training result, but without going beyond our limits (to avoid injuries and a state of chronic exhaustion, which are harmful for performance).

If you want to make an investment in your health, if you want to achieve exceptional muscular definition, to enhance your recovery, to smile at your adversary or at a panel of judges during an anaerobic effort, train yourselves with a heart rate monitor and you will be amply repaid by it.

Instantaneous and precise knowledge of our heart rate, permitting us to know our effort level exactly, will give us feedback on which type of resistance we are training, and will allow us to remain within the minimum and maximum threshold limits we have established previously (the majority of heart rate monitors on the market are equipped with “threshold” alarms, in addition to times).

As some correctly have declared, *feedback* is the *breakfast* of champions. How would a hundred meters runner or swimmer evaluate his progress in times if he did not have a chronometer? How can you think of assessing your progress in various types of resistance if you do not know the adaptations of your heart to various effort levels?

Elements of Neurophysiology

How the Nervous System Influences Flexibility

The nervous system plays a decisive role in the quality and quantity of body movements, and in particular, in flexibility development. It acts through a complex series of interactions, such as the extension reflex (also called myotatic extension reflex) and the inverse myotatic reflex (autogenic inhibition).

Some sensory organs, also called proprioceptors, are involved in all those movements in which the precision of a movement is required (this also holds true for apparently simple movements like walking or picking up a glass). These proprioceptors are located in the muscles, tendons, and joints, and are stimulated particularly when the muscle is subjected to extension. Proprioceptors interact with the nervous system by dispatching electric signals and signaling variations in muscle length, speed, and strength of extension.

The proprioceptors consist of neuromuscular spindles and corpuscles (Golgi tendon organs).

Neuromuscular Spindles

They are receptors located parallel to muscular fibers and are known as intrafusal fibers. It is very important not to confuse them with extrafusal fibers, which are the muscle's contractile units.

Neuromuscular spindles react to changes in length and to intensity of extension.

Golgi Tendon Organs

These sensorial receptors are located in tendons near muscle-tendon insertions, and respond to the muscle's strength and tension. Their function is princi-

pally inhibitory and of musculature protection. In the case of excessive extensions, they provide an inverse response to contraction, providing that, once exceeded a given stimulation threshold (which is higher in this case), they allow the muscle to relax, avoiding (within certain limits) overstretching and muscular tears.

Nervous System Reflexes Regarding Variations of Muscle Length

Extension Reflex

The extension reflex constitutes a nervous system reaction of which is aimed at maintaining the musculature's tone and preserving it from lesions.

This type of reflex takes place in the moment when a muscle is extended in a rough and uncontrolled manner.

Extending a muscle, both the muscular fibers (also defined "extrafusal fibers"), and neuromuscular spindles undergo a deformation in extension. The extension of the latter causes stimulation of the extension reflex, generating contraction of the extended muscle.

Myotatic Inverse Reflex

This reflex, also known as lengthening reaction and autogenic inhibition, acts when the muscle is subjected to intense muscular contraction or tendon extension (especially to a muscle's isometrically shortening whose extremities are held in a fixed position, as in isometric PNF stretching). Crossing a certain intensity threshold, and then reaching a critical threshold, the Golgi tendon organs cause an immediate inhibition reflex to contract. At this point, the muscle relaxes and muscular tension reduces. This type of reflex is possible because the Golgi tendon organs' impulses are strong enough to overcome (to contract) those of the neuromuscular spindles.

Knowledge of this reflex has allowed for perfection of various stretching techniques. Initially, they were planned for motor rehabilitation noted as "contraction-relaxation" and "contraction-relaxation-contraction," until isometric PNF establishes a further advantage by extension, tensing the muscle in its final position.

Reciprocal Innervation

Generally—when the muscles are not in a state of co-contraction—they act in pairs as agonists and antagonists. When a muscle is the agonist for a given type of movement, (each muscle is either an agonist or antagonist, depending upon the specific type of movement), the antagonist relaxes. This type of coordination between opposite muscular groups is

precisely defined reciprocal innervation. For instance, when we bend our leg, the agonist muscle—the femoral biceps—contracts, while its antagonist—the femoral quadriceps—relaxes, lengthening. This type of inhibition does not happen in all the types of movements because there is a state of simultaneous contraction of the agonist and antagonistic muscles in some postures and exercises.

Exploitation of this principle is at the core of static active stretching, which aims at taking advantage of muscle contraction as opposed to the muscle that wants to extend.

Co-Contraction/Co-Activation

This constitutes an exception to reciprocal innervation. The aims of co-contraction are essentially twofold: firstly, through simultaneous activation of agonist and antagonistic muscles, it is possible to have greater accuracy and precision in movements; secondly, the co-contraction state constitutes an important base for joint stability.

The “All-or-None” Law

Once the signal for the muscle's contraction is stimulated, it contracts to the extent of its capacity. On the contrary, when it does not notice any signal to contract, the muscular fiber remains at its relaxation length. Therefore, there are not gradations in contractile strength of muscular fibers. Contraction strength is characterized by a selective increase and involvement in the number of fibers, which is controlled by the central nervous system.

The law of “all-or-none” may be compared to the action of shooting a gun. When the finger's pressure on the trigger crosses a certain threshold, the gun shoots (the muscular fibers are stimulated). In the contrary case, there is no effect (the rifle does not shoot/ the muscular fibers remain unstimulated in a restful state). Thus, either the stimulus is strong enough or it is not. More intense stimuli do not bring about an increase in strength of the fiber's contraction but, if rather intense, in motor units recruited by the contraction.

Factors that Limit Flexibility

There are various physiological factors that limit flexibility. Those that have a considerable effect are muscular resistance (in the most specific sense, from greater to lesser stretching of the muscular fibers and thus of the sarcomeres), and connective tissue resistance, which covers the individual muscular fibers (endomysium), the muscular bands (perimysium), and finally the whole muscle (epimysium).

Nervous Regulation of Muscular Tension

Strength and Fiber Elasticity

Muscles have a great lengthening capacity because they can be extended at around sixty-seven percent of their resting length without being damaged (Alter, M.J., 1996, p. 31). In general, however, this does not take place because, genetics aside, both the muscular fibers' length and the muscles' capacity to extend (and therefore the nervous system that regulates it) have adapted themselves to the range of articular mobility required for each person in his daily life (see SAID principle, p. 46). Both in daily activities and in the majority of sports, complete joint mobility is not necessary as an essential condition (as happens, for example, in team gymnastics or in the majority of competitive aerobic techniques).

Muscular adaptation may occur both in a positive sense, following, for example, an effective stretching program (in this case, improvement is determined either by neuromuscular adaptation, or by possible muscular fiber growth caused by the increase of sarcomeres in a series), and in a negative sense, as in the cases of a long confinement to bed, "zero gravity," or strength exercises (with weights or free-standing) in which all the joint range is not utilized.

Strength and Elasticity of Connective Tissue

The bands of connective tissue that cover the muscle (epimysium, perimysium, and endomysium) also play a predominant role in a muscle's extension capacity. This is determined by their lesser capacity to lengthen with respect to the muscle, and thus by their lesser degree of deformation before arriving at the breaking point. Because of lesser deformability with respect to muscular fibers, one needs to pay attention while stretching (in particular, in the isometric contraction phase of isometric PNF) not to overstretch the muscle because that could bring microlesions that, healing at a shorter length during the recovery period, "bind" the same muscle.

Such microlesions perceive sensations that range from a small bother in a specific region to a feeling of pain in carrying out certain movements in the following days. As will be explained later, to avoid these results, one needs to rely on his own body awareness in order not to arrive at the pain threshold. Furthermore, he must stick to the "precautions" (regarding time, intensity, and training frequency) indicated in the stretching techniques in order to avoid overstretching (understood in the negative sense as a stretch that goes over the capacity of muscle and connective tissue adaptation, which is not to be confused with overextension, understood as a physiological stimulus for flexibility increases).

Connective tissues may undergo rather considerable adaptations in accordance with the activity or inactivity of the muscle. If on the one hand inactiv-

ity and disuse cause a muscle's atrophy and weakness, on the other hand, specific training can increase its extension capacity and the amount of absorbed energy before its breaking (Stone, 1988). This tends to occur particularly in pliometric exercises, when muscles are subjected to strong, concentric contractions associated with sharp variations of connective tissue length.

One understands, then, the importance of the musculature preparation phase with specific training of low loads-high repetitions resistance before subjecting it to isometric PNF stretching exercises, which could build up excessive stress on an untrained musculature (and therefore on the associated connective tissue).

Just as the strength and extensibility of muscular fibers are specific in individual muscles (and this depends, genetics aside, on the SAID principle of specific adaptation to the imposed demand), also the strength and extensibility of connective tissue may undergo some variations in various muscular groups of the same person. One could find another possible response to the vague, lesser ease of extension in the side split, because adductor muscles—those principally involved in this type of split—and the associated connective tissue, generally have the lesser strength and resistance, merely because of their lesser utilization (see the paragraph entitled "Articular Mechanics of the side split", p. 48, and those dedicated to flexibility specificity and the SAID principle, p. 46-47), and therefore lesser capacity to "reply" and adapt to the stretching.

Ligaments

Ligaments are strong bands of connective tissue and have the principal function of supporting joints and keeping the bones united.

Except for pathological cases in which joints do not allow for normal joint range (but it is very difficult to include them among these cases), ligaments do not constitute an impediment to achieving complete joint mobility, if by complete joint mobility one means reaching the maximum mobility allowed by a normal joint (compare with Appendix 2).

There is no need to lengthen ligaments for two important reasons. In the first place, ligament extension brings joint destabilization, ligamentous laxity, hypermobility, and an increase in the probability of injuries and osteoarthritis (Beighton, et al., 1983). In the second place, it is not necessary to extend ligaments in order to achieve the complete joint mobility and to carry out spectacular exercises in competitive aerobics, team gymnastics, or martial arts.

Physiological Muscular Adaptation Induced by the Isometric PNF Technique (Muscular Hyperplasia)

The results of some scientific studies have shown that progressive overload in extension imposed on the musculature (either as a natural consequence of bone growth, or by artificial blocking procedures of joints) produces longitudinal subdivision of muscular fibers, and therefore can contribute significantly to an increase in the number of sarcomeres in a series (Schiaffino, S. et al., 1970—Williams, P.E. et al., 1973—Goldspink, G., 1971, 1973—Friden, J., 1984—Gonyea, W. J. et al., 1977, 1980, 1986—Antonio, J. A. & Goynea, W. J., 1993, 1994). There are some reservations that exist*, however, on the relevance of such experiments to the human skeletal musculature, because the cited studies have been carried out on birds and rats. On the contrary, Tabary, in a study conducted on cats, has demonstrated that if a muscle is maintained in a shortened position, a forty percent reduction in the number of sarcomeres takes place in three weeks; after four weeks from the removal of the “joint’s failing blocking systems,” he noticed a return to the original number (1972).

Longitudinal muscle increase occurs when muscular fibers’ structure, (thanks to progressive stretching), is mechanically altered. It happens, when the progressive extension overload has caused a marked lengthening of actin and myosin filaments (Table 2).

(*) This is not surprising because discordances and doubts always exist on phenomena that still are not completely known and catalogued by science.

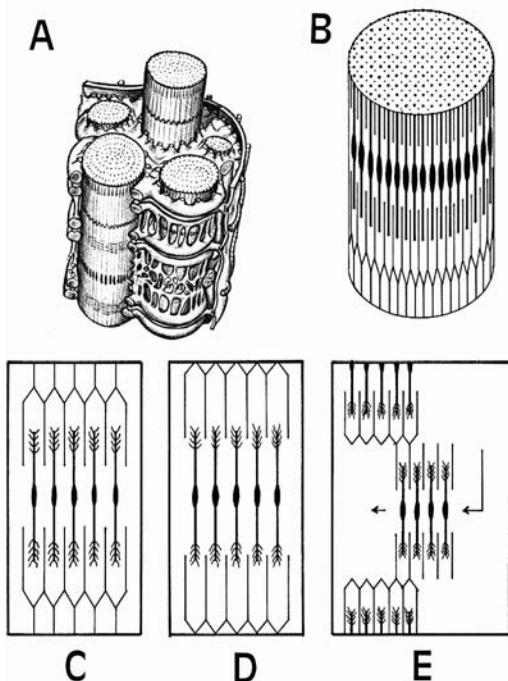


Table 2

Muscular hyperplasia

- A Sectioned muscular fiber
- B Myofibril (note the sarcomeres in a series)

Muscular hyperplasia outline

- C Outline of the muscle in a state of rest. The sarcomere has an optimal superimposition of actin and myosin.
- D Muscle subjected to traction (extension). The actin and myosin myofilaments diminish their superimposition. As the extension increases, strength gradually diminishes until reaching zero.
- E According to the muscular hyperplasia theory, this state of alteration engages the mechanism of physiological overcompensation in extension (muscular hyperplasia) through addition of new sarcomeres in a series. In this way, optimal “physiological” superimposition of actin and myosin myofilaments is re-established.

Such lengthening causes a momentary drop in strength in the specific musculature (a muscle's force of contraction is proportional to the extent of superimposition of actin and myosin filaments – Edman, P.K.A. on Komy PV., p. 103). This is primarily because the optimal length-tension relationship has been momentarily compromised. At this point, like physiological adaptation, a “compensative” mechanism intervenes which permits (thanks to formation of new sarcomeres), and then restores optimal superimposition of actin and myosin, which in turn signals the return of optimal muscle functionality (Gordon, A.M., et al., 1966 a, b – Edman & Reggiani, 1987). The muscle also may return to its optimal length at this point (which is the length at which the muscle develops its maximum strength) (Petrofsky & Phillips, 1986, p. 17).

Contrary to what has been said, one study conducted by Gollnick has not yielded the same results (muscular fiber hyperplasia), the reason for which is pursued in the extent of the applied load to the inadequate tested musculature (Antonio, J. et al., 1994). From this, one deduces the importance of an adequate stimulus to trigger the processes of body adaptation and overcompensation (in the specific case, of the increase of sarcomeres in a series). This explains, in part, the reduced effectiveness of relaxed stretching in comparison with isometric PNF, because the extent of the applied load to the muscle is liable to cause such a compensative mechanism (not counting the fact that in the isometric PNF technique one takes advantage of Proprioceptive Neuromuscular Facilitation and one generates, in the isometric contraction at the end, a stretching of fibers even in the absence of movement).

The importance of the two variables: intensity of isometric contraction to extreme opening, and duration of the same contraction, for the purpose of triggering off the physiological mechanisms cited above, will produce greater gains capable of joint mobility.

Flexibility Specificity

Flexibility, understood in a general sense as joint mobility, is not a general characteristic of the body, but it is specific for each individual joint and movement. This means that a person with a higher range of flexibility in the coxal joint (hip) need not have a certain range of flexibility in the scapulo-humeral cinguli. An athlete who has a higher degree in the side split need not have a certain degree in sagittal splits.

These differences reflect genetic variations, postural positions, and specialized adaptations (in connective tissue and stretching reflexes) that people have imposed on their musculature, brought about by positions required for various sports- and work-related activities (people who often assume a maximum squatting position for work, like mechanics, easily have a greater coxal

mobility). In each case, the body specifically adapts itself to the imposed demand. It does not matter if these positions are caused by sports- or work-related activities, or simply by positions prolonged for long periods of time. This introduces a very important training principle that takes on particular importance in stretching—the SAID principle.



Fig. 1 - Squatting position. Favors extension ad strenghtening of adductor ad groin muscles, responsible for the extent of side opening

The SAID principle

The SAID principle, which literally means Specific Adaptation to the Imposed Demand, generally reflects specific adaptation of the human body to each specific stimulus.

As stated by Wallis and Logan, flexibility training (like strength and resistance training), should be based upon the principle of Specific Adaptation to the Imposed Demand (SAID) (1964). For this purpose, in order to increase sports performance, one needs to choose stretching exercises that specifically correlate to each sports discipline. Applying the SAID principle to stretching, a person should extend himself dynamically (for example, with dynamic kicks—not ballistics, as explained later) at a speed that is not slower than seventy-five percent of his maximum velocity, on the exact plane of movement and at the precise joint angle used, when he demonstrates the specific actions of his practiced sports discipline.

In reference to a fundamental exercise of competitive aerobics, “high leg kicks,” one must train with a maximum opening span of ninety degrees, on the exact plane of movement (side) and at a velocity that respects the rhythm

of the number of bpm (musical beats per minute) anticipated by the high impact (besides respecting the requisite techniques of correct posture and the position of the feet, necessary for the correct execution).

The SAID principle, as one shall see in detail in the chapter on static active flexibility, may be applied to super strength development. Indeed, application of such a principle is a rather fundamental requirement for it. The purpose of the SAID principle as it applies to strength development is that of creating “intelligent” muscles, which act in perfect synergy and with minimal energy expenditure for development of the tasks to which they are called.

Effectiveness, deriving from application of the SAID principle, depends both upon specific physiological adaptations, and upon neuromuscular refining, and therefore upon acquisition of the right technique for the athletic movement.

Principle of Overextension

Extension represents a stimulus induced in the organism for the purpose of inducing a physiological adaptation. In accordance with the SAID principle of specificity, each stimulus brings specific physiological adaptations. Understanding this concept, one may comprehend how the principle of overloading is used for increasing muscular strength, and according to which the muscle must be subjected to still greater loads for strength increases, it differs from the principle of overextension that characterizes increases in muscular extension.

The principle of overextension, or, more appropriately, of “progressive load in extension,” is the cardinal principle in flexibility development and joint mobility. Such a principle fundamentally is characterized by three factors: intensity, duration, and frequency of muscular extensions. For effective stretching (which has a training stimulus but is not excessive and does not cause inflammations and muscular pains), it is advisable to balance these three factors. In spite of the physiological principles’ being equal for everyone, each person, each athlete has his peculiarities (in strength, resistance, and extension of connective tissue), for which the factors of intensity, duration, and frequency must be balanced individually to obtain the best results.

Therefore, one can comprehend the importance of body consciousness (see specific paragraph) for evaluating the presence of muscular aches and pains that represent inadequate physiological recovery, or, in the case of stretching, an error in intensity, duration, or frequency of trainings. In order to avoid risks of chronic muscle overtraining to the maximum, which is one of the causes of lack of progress in training in general, and, more specifically, in stretching, I have prescribed (in the chapter dealing with isometric stretching) times and training frequencies that have a certain safety margin,

to avoid overtraining and lack of progress. In each case, for best results, it is necessary to adjust loads according to one's physical sensations and recovery and adaptation capacities.

Joint Mechanics of the Side Split

The coxal joint (hip) is a type of so-called joint that permits a wide range of movements in three directions. The neck of the femur, of semispherical conformation, is inserted into the pelvis' cavity called acetabulum (see Table 3). This type of joint is characterized by a strong structure supported by the iliumfemoral, pubofemoral, and ischiofemoral ligaments that confer on its great stability. Knowledge of articular mechanics of the coxal joint is of fundamental importance in order to train correctly and carry out splits so as to keep the pelvis in certain positions without any ligamentous and osteoarticular opposition.

If we wanted to fall into a side split, opening our legs laterally and keeping our pelvis retroverted (pushed forward, with our chest upright), that would not be possible because, muscular tension aside in the two compo-

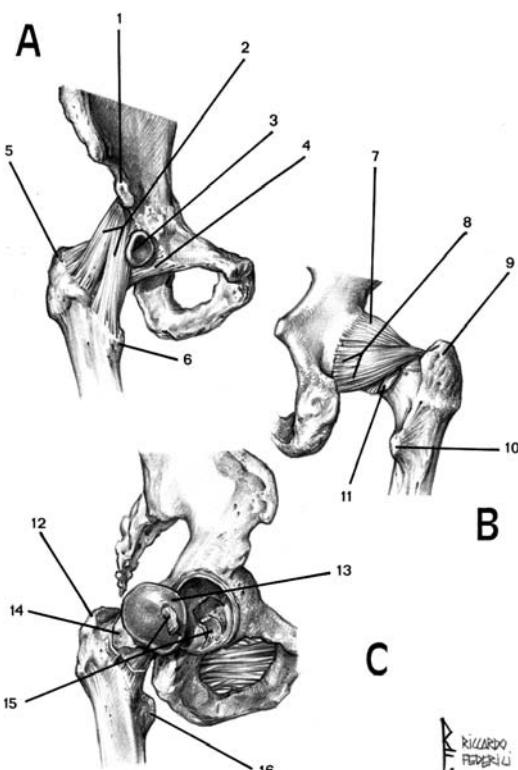


Table 3

A - Hip joint viewed from the front

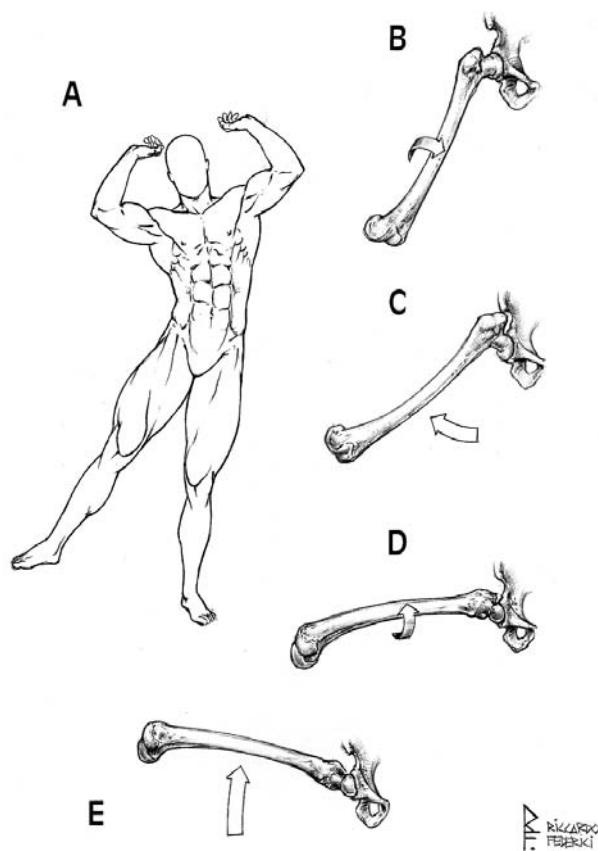
- 1) Antero-inferior iliac spine
- 2) Ilius-femoral ligament ("Bigelow")
- 3) Ilius-pectineus mucous bursa (before an interruption in the ligaments)
- 4) Pubo-femoral ligament
- 5) Large trochanter
- 6) Small trochanter

B - Large hip joint viewed from the back

- 7) Iliac-femoral ligament ("Bigelow")
- 8) Ischio-femoral ligament
- 9) Large trochanter
- 10) Small trochanter
- 11) Synovial membrane protusion

C - Open hip joint viewed laterally

- 12) Large trochanter
- 13) Femur head
- 14) Femur neck
- 15) Round sectioned ligament
- 16) Small trochanter

**Table 4**

- A** Abduction movement
B and C The Large Trochanter enters into touch with the pelvis and does not permit optimal leg abduction
D and E Turning the femur outwards, the Large Trochanter retreats backward, allowing for a greater split

nents of connective tissue resistance and muscular tension regarding fibers, it would be impeded by bone mechanics and resistance of some ligaments.

Carrying out a movement of pure hip abduction (lateral leg opening, Table 4), once arrived at the anticipated physiological limit for a normal coxal joint (forty-five degrees in abduction), we will feel an arrest. This arrest is caused by contact of the large trochanter (bone protuberance located in the femur's upper region) with the pelvis, and by tension of the pubofemoral and iliumfemoral ligaments that resist excessive abduction (Kapandji, 1995).

In order to remedy this problem and thus increase the degree of abduction, it is necessary to turn your leg outwards (and thus the femur) so that the large trochanter recedes backward, "unblocking" the movement, their not being any more contact with the pelvis (Table 4). Moreover, in this position of abduction and hip flexion, the ligaments that were opposing excessive abduction now free themselves.



Fig. a - Side split with feet pointing forward.



Fig. b - Side split with feet pointing upward.

In both positions, the angle of the femur with respect to the pelvis is identical.

In a side split, then, there is no pure abduction, but a movement of femoral abduction and outside rotation or one of abduction and hip flexion which is the same thing, in accordance with your making a side split with your feet pointing upward or forward (Alter, M.J., 1996—Kurz, T., 1994). In both cases, the position of the femur with respect to the pelvis is identical. (Fig. a,b).

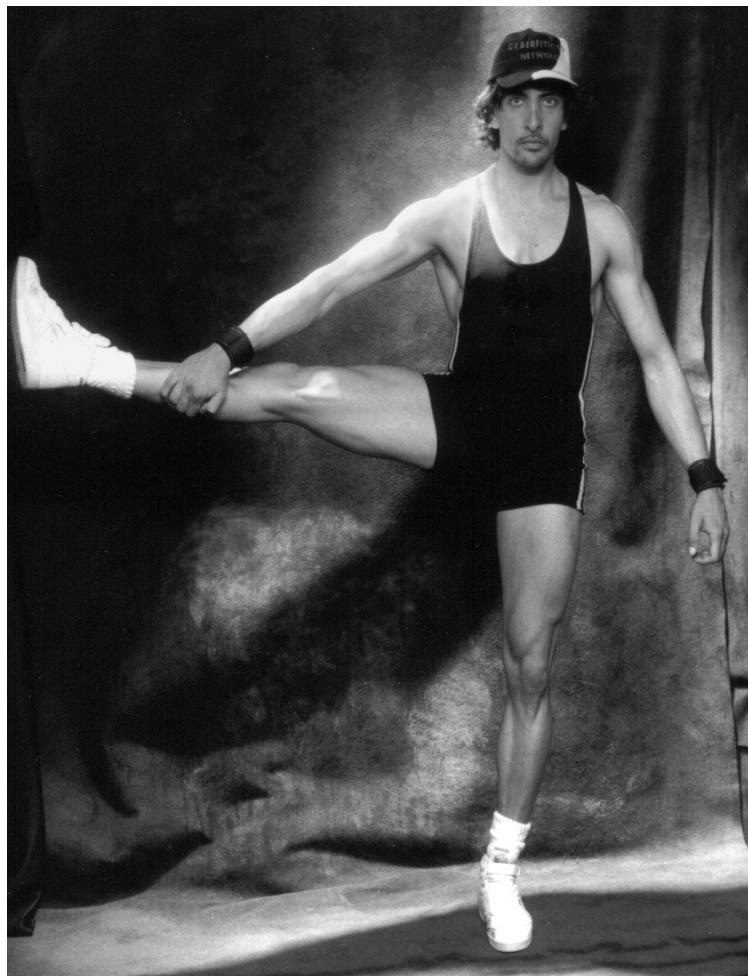
For practical purposes, if you practice the side split in a seated position, this does not create a problem because the joint's position is correct for optimal opening. If you practice it standing up, however, you must bend your hip, inclining your pelvis forward (pushing your buttocks back).

Side Split Test

One's joint mobility, as shall be repeated often in this book, depends on his habitual stretch (degree of extension and *overload* in extension). This understood, it is easy to comprehend the best response to sagittal extension of those muscles that are elongated and naturally strengthened in "common" operations like walking, running, or flexing one's knee. On the other hand, in everyday life, the cases when we stretch muscles involved in a side split contemporaneously, are very rare. This is, in general, the reason why sagittal splits are easier to practice.

In order to check if your coxal mobility will permit you to maximize your side split in the future, try this simple test:

Standing laterally to a chair, lean your leg against it. In this way, one reaches the exact joint movement that the femur should carry out in the acetabulum in order to achieve a perfect side split.



Side Split Test

Even if a person does not have a complete side split because his leg does not come into line with his pelvis until it forms a half split, if he were able to relax his adductor muscles voluntarily (those largely involved in a side split), he could display a perfect split.

One understands, then, how the real factor that influences the opening range is not (save very rare exceptions) the joint itself, but the muscles' resistance.

Except for pathological cases, the normal mobility allowed by the pelvic joint (forty-five degrees in abduction and forty-five degrees in external rotation) is sufficient for achievement of the side split.

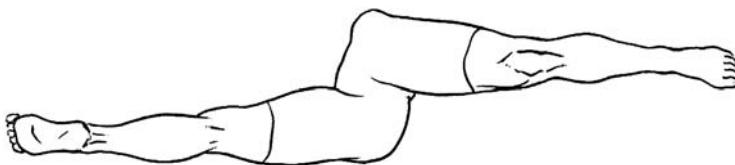


The Sagittal Split

From a technical point of view, in order to complete a correct sagittal split, both legs must be kept tense and the pelvis maintained in a squared position (turned forward rather than rotated), and the front leg's gluteus must be kept in contact with the ground.

In some sports (competitive aerobics and team gymnastics), often the back leg is lightly turned outwards for aesthetic reasons. This external rotation often has excessively contracted and less flexible hip flexors as a result, and in this way (rotating the back leg outward exactly in this position) one may give (to a non-expert's eye) the impression of having a complete sagittal split.

In order to do a correct and complete sagittal split (left and right sides), it is necessary to practice it in its correct position, thereby maintaining one's pelvis in a squared position, without turning one's back leg outwards (fig: sagittal split viewed from below).



Articular Mechanics of the Scapulohumeral Cinguli

The scapulohumeral cinguli joint is made of the clavicle, humeral, and scapula. In perfect synergy, these bone segments allow a wide range of movements for the shoulder-arm complex. Knowledge of articular mechanics of

the scapulohumeral cinguli permits a natural, physiological increase in arm abduction movement and, moreover, allows one to avoid articular positions that, in the long run, could turn out to be damaging for the same joint.

Arm abduction movements are strongly influenced by the type of movement and by humerus rotation.

Active arm abduction is possible up to ninety percent and an additional thirty percent may be achieved passively, if the humerus externally rotates. This overall abduction of 120% is made possible because external arm rotation permits the humerus' "large tuberosity" (a sort of bulge located on the upper external region of the humerus) to pass behind the acromion (Table 5). With the internally rotated arm, the large tuberosity comes into contact with the bone and arrests abduction at sixty percent (Table 6).

A further abduction increase is characterized by movements and rotations of the scapula.

Influence of Humeral Rotation on Abduction Range

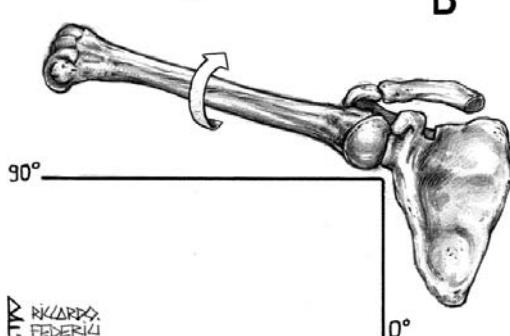
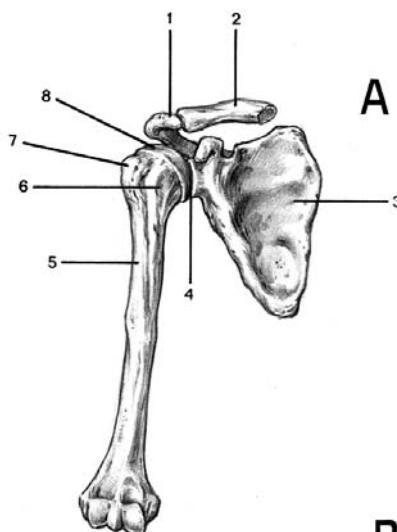


Table 5

A) Scapulohumeral cinguli.

- 1 Acromion.
- 2 Clavicle
- 3 Scapula
- 4 Glenohumeral
- 5 Humerus

B) Active abduction is possible up to ninety degrees, and an additional thirty degrees may be reached passively if the humerus rotates externally at circa ninety degrees of rotation. This abduction range of 120 degrees is possible because rotation permits the large tuberosity to pass behind the acromion.

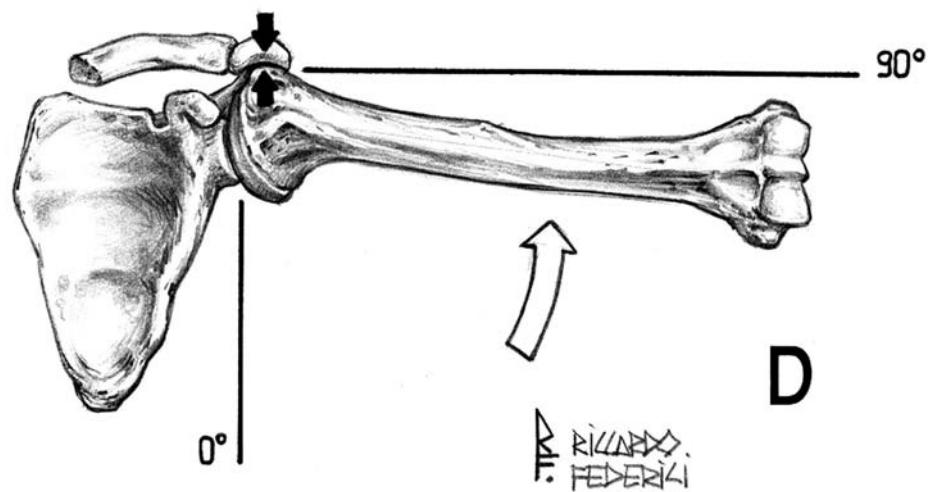
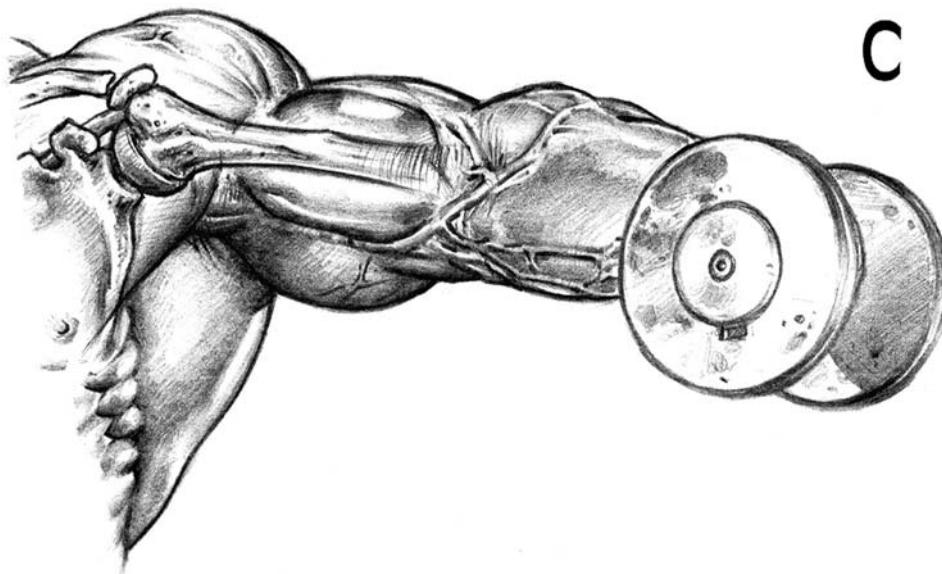


Table 6

C,D) With the internally rotated arm, the large tuberosity goes to touch the coracoacromial arch and arrests the abduction at sixty degrees.

Six Fundamental Elements

Training: the Importance of Technique

As for development of other physical qualities, one of the fundamental elements is training, and by training is meant the technique most suitable for achieving certain results.

Training techniques represent strategies that, tried and tested, have provided proof of bringing about certain physiological changes. A long series of experiments consisting of trials and mistakes has been necessary to find an effective and safe training technique; which is very important as well as the importance of scrupulously adhering to instructions/contra-indications of every single technique. Each person, having his own peculiarities when it comes to strength/ flexibility/ resistance, must adjust his method according to these particular factors that influence adaptation and recovery. One understands, then, how each program and training scheme represent a mixture specially adapted for one's physiological parameters and specific demands.

In this book, individual techniques have some formalities of minimum and maximum execution. I advise you to adjust your specific program according to these parameters, but not to surpass them.

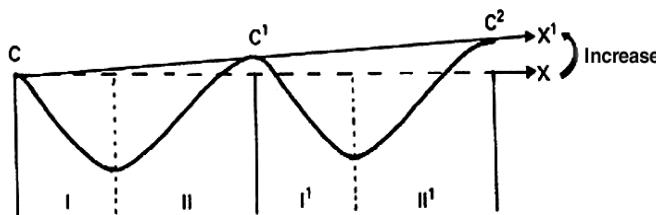
Recovery

The importance of physiological recovery cannot be stressed enough, considering the fact that the most common problems among athletes are overtraining and chronic fatigue accumulated because of consecutive training days, without having waited for the system to have provided for physiological recovery and overcompensation.

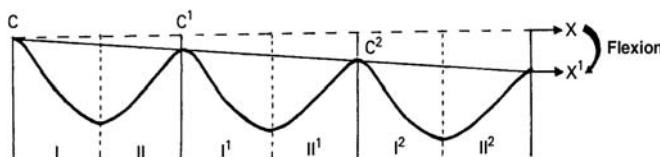
In order to comprehend fully the concept of physiological recovery, one needs to point out the process of body adaptation, or overcompensation, which is one of the cardinal concepts of sports training.

Training represents stress induced in the body to stimulate those physiological processes capable of producing body adaptation, in anticipation of a successive training stimulus. By means of this principle, it is possible to cause functional adaptations and then improvement of individual structures and physiological functionalities. These improvements are none other than the result of the sum of small, imperceptible results of physiological adaptation.

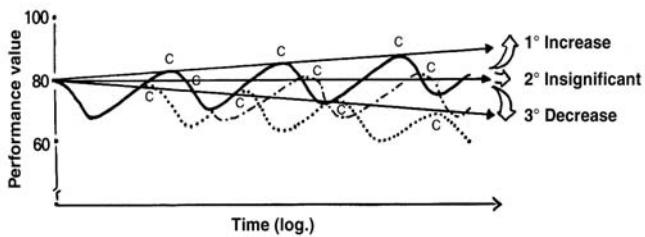
In terms of results, on the other side of adaptation, there is the overtraining and chronic exhaustion when one proceeds to a new training stimulus before the body has recovered fully and overcompensated. In situations of stress (training), the body adapts itself, overcompensating and then passing a state of efficiency and the degree of initial performance, or does not adapt itself, producing a drop in physiological efficiency. To understand this concept fully, it is sufficient to examine graphs 1, 2, and 3 regarding the adaptation process resulting from variations in the ratio between training intensity and recovery duration. As one denotes from graph number 3, if one recovers excessively, he will not benefit from a performance increase.



Graph 1 - Overcompensation cycle with an optimal rest period. When the rest period is optimal (II, II¹, II², etc.), an ideal performance increase (X¹) is obtained when the subsequent load (C, C¹, C², etc.) begins at the peak of the overcompensation phase.



Graph 2 - Overcompensation cycle for an insufficient rest period. One notices that the rest sectors (II, II¹, II²) are brought too close together, and performance capacity (X) suffers a slight fall (X¹).



Graph 3 - Effects of overcompensation on three groups of trained athletes with identical loads, but with different size recovery breaks. One notices the different results in performance: increase (group with straight line); insignificant increase (group with dotted line above); decrease (group with dotted line below). Incomplete regeneration is due to lack of adequate recovery.

Nutrition

Nutrition represents one of the fundamental points that is not to be neglected in order to optimize anabolic and energy processes. In the specific case of stretching, sufficient quantities of high value protein intake proves to be of great importance, as the body can respond adequately to processes of longitudinal muscle growth (stimulated by specific isometric stretching exercises). Insufficient nutrition or incorrect body adaptation will prove to be difficult if not impossible, hence the importance of nutrition, which supplies the body with all the nutrients necessary for its development.

To follow a correct nutritional program does not mean necessarily measuring the grams of everything you eat, but to decide appropriately, according to the type of sports activity practiced and training intensity, daily caloric quantity, and percentages of calories derived from carbohydrates (simple and complex), proteins, and fats.

It is important to emphasize that every single nutrient has a precise purpose in the body, by which one must evaluate his intake carefully, paying particular attention to the practiced sports activity and type of individual metabolism. For instance, a marathon runner or cyclist's daily fat intake surely will be greater than that of a bodybuilder or those who have weight loss as an objective.

Warming Up

One of the major causes of failure in increasing flexibility and joint mobility is caused not by wrong training methods, but by a mistaken concept of body warm-up.

I have often seen athletes begin their warm-up routine lying down in static stretching positions. This represents the most common and maybe most penalizing mistake concerning flexibility increases. In this case, one certainly will have an increase in joint range, but he will not be able to achieve the training result produced by correct application of the overextension principle (bringing the muscle to a beneficial and effective stretch).

It is appropriate to stress the fact that by warming up one causes a consistent increase of body temperature and heartbeats, obtained through hopping-type exercises, light running, and jumping rope, etc. Such light exercises (in terms of intensity) prepare the system for efficiency without, however, jeopardizing that same efficiency in subsequent exercises or contests. A common mistake is too intensive warming-up which jeopardizes subsequent demanding exercises and competitions.

From this point, one understands that warming up does not mean, at least from a sports and physiological point of view, covering up to the neck in heavy garments or, even worse, clinging to a radiator.

Essentially, three types of warm-ups exist, each one with its specific purpose:

- *Cardiovascular warm-up*, of which the aim is to prepare the cardiovascular system for work required by a sports engagement. It may be carried out for ten to fifteen minutes with any light activity that brings the heart to an aerobic range. This type of warm-up increases blood flow in the muscles, in turn increasing viscoelastic properties, and therefore preventing possible injuries that athletes may run into training themselves “cold”.
- *Joint rotations*: by sectorially rotating the individual joints (or at least those that will be involved in movements that we are all set to carry out), we further prepare the muscles for action.
- *Specific warm-up* (reproduction of exercises or competitive movements in this type of warm-up includes dynamic stretching as well). This type of warm-up has as its purpose that of supplying a neuromuscular “reawakening” for each action. If we have a horizontal bench in our training scheme, we will carry out light sequences with a reduced weight. On the other hand, if we must carry out a competitive routine, we will train by mildly reproducing individual movements).

Moreover, warming up has a mental stimulation function for attention, motor coordination, and quick reflexes.

A very common mistake is to warm-up with series which are too heavy and drain energy for real and proper training.

Breathing

Much has been written and much remains to be written about respiration, considering its extreme importance for psychophysical phenomena and its still rather obscure sides.

Breathing is not only a mere physiological act, because correct or incorrect respiration influences not only physiological factors like heart rate, but also and above all emotive state.

One understands, then, how incorrect breathing affects physical and emotive states and, consequently, how it may be refigured as a scale's fulcrum between the mind and body.

In stretching, the purpose of correct respiration is of fundamental importance for the fact that good oxygenization eases someone's state of tension until balancing it with physiological functions, and therefore also with muscular tone (basal tone).

In order to carry out an effective muscular extension, one needs to understand inside out the feelings associated with correct breathing. Trying over and over again, at first mechanically, deep inhalations and, most of all, deep and slow exhalations, one will come, with practice, to perceive that subtle and almost imperceptible state of "abandonment" of the body-mind unit.

The exhalation phase constitutes the most important part (for the sole purpose of relaxation) of the entire respiratory act because it causes, even if brief, body relaxation that one will need to exploit in the muscular extension phase, the moment when the muscle is stretched out to its momentary limit.

Concentration and Body Awareness

These two qualities or, in order to define them better, abilities, represent the foundation for any type of physical improvement in general.

Concentration

As a Zen master would say, "narrow your attention on one point in order to achieve the essence of what you are doing." In few words, "when you do something (train), and in that moment there is that and only that to take care of – then you are sure of doing it to the utmost of your potential", and nothing else.

On the specific subject of acquiring mobility, it means to remove your attention from all distracting elements that could hinder relaxation, in order to focus your attention on those elements that favor it (like breathing and body awareness).

Body Awareness

Body awareness is another ability that, once acquired, brings about rather consistent training benefits, whether you train for strength or flexibility development.

I could define this quality as the ability to reach one's potential limit in a training session without going too far and therefore causing oneself damages or a drop in performance (for having exceeded, for example, the productive intensity stretching limit).

I believe that the bodybuilder who measures training and recovery well possesses this quality (he understands that it is useless and absolutely counterproductive to return to training when his body has not recovered and overcompensated yet). I also think that the athlete, who has perceived having reached momentarily his maximum degree of muscular training, possesses this quality, as it would be risky and counterproductive to go further. In the end, one cannot theorize about increases in weight-lifting or splits without first having listened to his body.

When you have acquired this ability (which, unfortunately, one acquires only by trial and error), your training perhaps will proceed more slowly, but each improvement will be the secure base on which the loads will be respected and you will move, slowly but surely, towards your sports goals.

Strength and Flexibility Training

There still exist various preconceived notions about the relationship and possible antagonism between training for strength and for flexibility. Some athletes and trainers are convinced that strength training may be harmful to flexibility development, while others believe that developing a certain range of flexibility may reduce and jeopardize strength increases. In reality, mass muscular development has very little to do with flexibility. In fact, strength training (body-building or free-standing exercises), if conducted according to certain criteria, may increase muscle extension capacity. This thesis is maintained by various authors (Massey and Chaudet, 1956; Wickstrom, 1963; Wilmore, et. al, 1978).

There are two basic rules for developing strength and flexibility contemporaneously so as not to cause antagonisms:

1. Train muscular groups within every period of movement granted by the specific joint.
2. Always do stretching exercises for various muscular groups (in order that one may be alleviated of fiber hypercontraction caused by training with heavy loads).

Common Errors that Impede Flexibility Enhancement

Absent or Insufficient Warm-up Phase

Pay particular attention on the general warm-up phase (which must cause an increase in heart rate and body temperature) and the specific one (joint rotation, dynamic exercises with controlled kicks or with lower loads/ higher repetitions, developments in every range of movement, which improve blood circulation and regional warm-up).

Overtraining. Chronic Exhaustion of Trained Muscles

Pay attention on the size of training loads of dynamic strength exercises and those of isometric PNF. Allow yourself adequate rest. Do not overcome the advised frequency (maximum three times per week for isometric PNF; minimum interval between training sessions: thirty hours). Relaxed stretching, eventually carried out between isometric PNF sessions, must be such that it is relaxed and not forced. In the contrary case, one may be subjected to regional muscular exhaustion, and therefore to flexibility loss. A common mistake for beginners is not knowing the extent of the training load, and thus the subtle difference that exists between a light extension with isometric PNF and a consistent (in terms of intensity and duration), relaxed extension.

Excessive Rest that Contradicts the Principle of Continuity (Repetition)

Be constant in training. Take utmost advantage of adaptation without waiting for efficiency (extreme strength acquisition) to return to its initial level.

General Training that Is not in Harmony with that of Flexibility (Use Heavy Loads, Utilizing Limited Joint Range)

Even in development exercises not specifically for stretching, use the greater range of movement for each joint. Eventually, reduce your loads.

Too Weak Musculature. Use the Isometric PNF Technique When the Musculature Has not Been Prepared through Development Exercises of Extreme Movement (Dynamic Strength Exercises—Lower Loads/Higher Repetitions)

Do not be in a hurry. Respect the isometric PNF preparation period (from one to three months) by training with dynamic strength exercises. Such exercises produce improvements in capacity for strength and for extension of trained muscles because, even if with small loads, they habituate themselves to working on every specific joint's range of movement.

Mistaken Sequence of Exercises

The wrong sequence of exercises may jeopardize or limit results. This is the correct sequence that guarantees great effectiveness:

- A. Purely dynamic exercises (of controlled kicks).
- B. Dynamic strength exercises.
- C. Isometric PNF exercises.
- D. Relaxed stretching.

For those who are committed to strength training programs, stretching exercises (isometric and/or relaxed) must always follow strength exercises with high loads/ low repetitions or isometric exercises. In this way, one reduces muscular tension and permits quicker recovery. In each case, strength training is inserted between purely dynamic exercises (point A) and dynamic strength exercises (point B).

The Secret of Super Flexibility

The secret of super flexibility is in strength development, which is aimed at getting a trained muscle more capable of relaxing at extreme levels of joint movement, which means to stretch it out.

Stretching the muscle out, its contraction capability lessens to zero, little by little, or actually it becomes incapable of exercising any kind of contraction and, as consequence, incapable of opposing any kind of force.

This phenomenon comes gradually reaching an extreme stretching position. Little by little, reaching the extreme position, as in the splits, the muscles subjected to stretching must stand greater and greater loading (since as the legs widen out the force acting as a lever is increasing), thus they will lose their contraction strength little by little as they undergo stretching.

The muscular components of actin (which belongs to myosin) will lose their optimal and physiological superimposition, losing their contraction capability, and, in the case of stretching, a part of their capability of holding up the load (a body weight in case of the splits).

A secret of developing a high joint mobility level is the one of training the muscles progressively and gradually so as to work in contraction and to hold up the loading at extreme movement levels.

Therefore, a key word is strength growth at extreme movement levels. The strength growth peculiarity is a joint range on which it is being developed: two groups of trained athletes with the same loading but different joint range will develop a higher contraction capability than their usual working is.

As for stretching, it means that training in extreme positions of knee-stretching and respecting correct joint alignment we'll get to value holding up capability in that position, and, as consequence, the muscles will be more capable of relaxing getting the most comfortable position. In "not usual"

positions for a common man (as in the splits for example) it is normal that body, with its ordinary working and holding up capabilities, finds itself in a condition of great discomfort, activating defense neuromuscular mechanisms because of an excessive stretching out (myotatic reflex of strain).

The easiest and the shortest way to develop super flexibility is training the body the way it perceives certain positions as normal, gradually increasing the stabilizing strength in the same very position. It's a big mistake to insist only on stretching out the muscle: if the muscle doesn't feel safe in that position (as it happens when the muscle is weak, thus incapable to hold on the load it's given) it will react contracting chronically. But, if the muscle is strong and used to holding up in that very position, it will allow a higher stretching out level; in the latter case the less fiber are involved in holding up the load, given by the position (gravity, body weight, lever length) the more they will be capable to stretch out. All that means a higher stretching capability.

Chronic Inflexibility: What to Do?

In the case of incapacity of stretching out over a certain limit in one position, the body is sending its message of not being able to hold on the load in such position, what means the message of being unable to stretch out. But in the case when the stretched muscle is strong but incapable of stretching out, it means that neuromuscular reflexes of tension must be put up so as to allow the muscle to stretch out and to find itself in its most comfortable position in that very stretching position. The body considers such muscle position as "unusual" and "strange". The human body is, in a certain way, even wise and its wisdom is often beyond human conscience: for the body an extreme stretching position is perceived as potentially dangerous one for joint safety and, as consequence, the body reacts by not allowing you to go over a certain stretching level.

In the case of chronic stretching incapacity or in the case of "plateau" where we can't go on with isometric PNF, the solution is to increase the strength level in training range when we want to increase the flexibility. It's important to remember that the recovery factor is as important as the training one (see the graphic for loading adaptation): in the case of insufficient recovery the body will react not only with no improvement at all, but even with flexibility decrease. Not by accident, after having recovered a lot, between training sessions, we have a feeling of being stronger and more able to stretch out. If you want quick results in stretching, you must strengthen your muscles in stretching positions you would like to improve in and allow yourself two or three more days of rest.

Stretching and Injury Prevention

Muscular injury risk has always been “the sword of Damocles” to professional athletes and sports amateurs. Is there anybody who has never had a painful and fastidious muscular strain? The painful muscle seems almost not to contract (what it is supposed to do) and consequently to extend.

Having only great flexibility doesn't prevent injuries. You can have muscular strains even without fully stretching out (Garrett, WE. JR. 1996). So, what should we do the stretching for? Why should we look for flexibility development?

There are various kinds of flexibility as well as techniques for its specific developing. For example the kind of flexibility meant as pure muscular capacity of stretching out (in relaxed and passive way) and another one meant as muscular capacity of standing the load what gets it to stretch out (like, for example, the force of gravitation, weights or leg leap). The latter kind of flexibility is the one which can make your body less subjected to muscular injuries and, somehow, it could be considered as a kind of insurance against muscular injuries: it is characterized with stabilizing strength.

A muscle is injured when its structural integrity becomes jeopardized because of too high load in eccentric contractions (muscular stretching out in contraction) as well as in extreme stretching positions. Besides, too high load acts on tension reflexes (Myotatic and inverse reflexes) which can jeopardize connective tissue structural integrity including the muscular one in some “not ordinary” exercises (for which we haven't trained gradually).

Working loads in exercises (with weight and free-standing ones) should be suited gradually taking into account the required stretching out in that very position and exercise.

Such concept should be understood very well so as to remove the doubts about some exercises of which the safety is rather controversial.

Let's take as a clear example of one of the most controversial exercises: *overhead press* with weights or dumbbells. Many famous instructors are wrong demonizing this exercise which, whenever carried-out wisely, could bring about great benefits in shoulder girdle as well as about laxity prevention in many sports disciplines. Besides, it could bring about stability increasing in the very shoulder girdle therefore increasing technical and performance capacities. As I have already said, stretching capacity (just and only) neither protect nor save you from injuries, since, at the same time it can't grant stabilizing strength which prevents from structural alteration of muscular fiber and connective tissue. Opposite, stabilizing strength increase at these “extreme positions” such as overhead press or the splits, makes the muscle stand the required position quite easily (length/muscular tension

relationship). It's necessary to work on two muscular components – strength and flexibility – very gradually so as to be sure of working wisely with "stabilising stretching" and make your body and all its muscles and joints be at theirs easy (granting safety and structural integrity) in all the positions that the practiced sports discipline calls for.

If a bodybuilder is told not to do the *overhead press* exercise, it could be a precautionary solution (as well as comfortable one because he doesn't need any explanation on structural integrity concept concerning length/muscular tension relation).

At the same time it's a limit for developing the whole structural functionality of body and its capacities. It would be the same telling a gymnast not to do a double somersault because he could fall and hurt himself.

Keep in mind: each physical quality must be built gradually, allowing the functional capacity increase very *safely*.

It could be done by just granting *progressive* but *never too high* loads to each athlete. Actually, I mean that the athletes very often keep continuing to use too high loads and working at limited muscular range; therefore, doing the exercise completely the wrong way. Being too high, the load is lifted with little muscular control (jerkily and cheating) instead of using the full range of movement. In such cases, the result is the strength built at limited ranges, with low flexibility, which may bring about injuries in the same very movements, twisting the exercise as taboo or to be avoided.

Numerous scientific studies point out the importance of stretching and suitable muscular flexibility development (suitable and optimized for the task required in each single sports discipline) for injury prevention. You can look up very interesting studies which have singled out the lack of flexibility as one of the factors which brings about muscular injuries as for example the strains. (Garret Wejr – 1996, Gleim GW, Mc Hugh MP – 1997, Van Mechelen W, – 1992, Worrel TW – 1994). Harting and Henderson – 1999 pointed out that one stretching program has lessen the number of muscular injuries of femoral biceps muscle in a sample of soldiers. A recent study carried out by soccer players (Witvrouw E. – 2003) has found out direct relationship between the lack of flexibility and injury incidence. Players' flexibility level in pre-competitive time was meant as a factor for forecasting muscular injury incidence.

Besides, the muscular injury incidence is also estimated on the base of possible imbalances of muscular strength (between agonist and antagonist) as well as the imbalances between the left and the right part of the body (Knapik – 1991). It is one of the reasons why every stretching program must be set down correctly, foreseeing balanced and symmetrical training of strength and flexibility in opposite muscular sections.

STRETCHING WITH WEIGHT STABILIZING STRENGTH INCREASE RESERVE FLEXIBILITY INCREASE

QUESTION: Have you ever seen a gymnast on the rings? Do you have any idea how great of a load each shoulder girdle is able to stand in rotary movements and in holding up? What is granting structural integrity to joints and muscles (muscular fiber and surrounding connective tissue)?

ANSWER: Structural integrity is granted to a joint by the way the relationship length/muscular tension works while training; actually by stabilizing strength. The latter quality, which is a guarantee against injuries, could be developed working with weights that allow “flexibility reserve” development in whichever risky movement in your sports discipline so as not to get the muscle to suffer in a certain position because of a lack of stabilizing strength. When a muscle is stretched out in a certain movement, the strength decreases little by little (obviously as long as the muscle is stretched out). The result is that in extreme positions like the overhead press (for most people who practice their sports discipline in a gym), glenohumeral joint is in a vulnerable position concerning its integrity. Working on such a length/muscular tension relationship, and therefore improving it, as well as working with higher and higher loads at wider and wider ranges, you begin to develop a kind of “reserve flexibility” which embodies stabilizing strength.

Thanks to this training methodology, which I like defining as “Power-Flex,” you can develop a physique that embodies combined characteristics of strength and flexibility. Such kind of physique doesn’t fear any position either the body itself should (both from structural and biomechanical point of view).

Therefore: gradually... and wisely. Neither should you be humpbacked to pick up something from the floor easily, nor you should limit your body at reduced exercises, being afraid of injuries: lessening the loads and working at wide ranges, you can develop a marvellous structural harmony which is less predisposed to injuries.

Power-Flex STRETCHING

Stretching Techniques



Dynamic Stretching

Dynamic stretching is that type of training intended to enhance dynamic flexibility, which consists of moving body parts, such as arms or legs, with notable range and rapidity, without causing muscular lesions like tears or sprains.

This type of stretching particularly tends to enhance the muscle's elastic properties, its capacity for rapid contraction, and the nervous system's reactivity. This last way is largely responsible for the movements' speed, together with the percentage of fibers to contract quickly. From this, one deduces that dynamic stretching is not used to develop joint mobility, as the greater an individual's passive joint range, the greater the range of his movements.

It is of fundamental importance not to confuse dynamic stretching with the so-called ballistic kind. Ballistic stretching utilizes muscular elasticity improperly by means of uncontrolled ballistic flings that exhaust the force of inertia. In dynamic stretching, however, the muscle's reactive and explosive capacity is notably sped up, without using movements on the rebound that exhaust inertial force (as when "preparing" a "dangling throw", or preparing the limb in the opposite position).

The Technique

The technique consists of controlled "throwing" of legs and arms in various directions, without springing, rebounding, or dangling. The movement's velocity must be provided by the muscular contraction's strength, but never by uncontrolled ballistic movements.

The series go from two to four for each leg or arm, in all directions (forward, backward, side); the repetitions from six to ten.

After having warmed up the joints through rotation, proceed gradually in the swings, increasing the range of movement and/or execution speed. Once the

maximum range (in that individual training stage) and speed have been reached, stop doing them.

As for each training type tending towards muscular explosiveness (and this represents a further purpose of dynamic stretching, besides that of greater dynamic flexibility development), one must finish the exercise—the swings—when the speed, and in this case of dynamic stretching, range of movement, tends to diminish because of exhaustion. This therefore accounts for the fact that the so-called “muscular memory” tends to record eventual drops of range and power, being able to cause, in the long run, negative effects on the swings’ quality—range and explosiveness.

As in ballistic stretching, in dynamic stretching specifically, one could risk overtraining (understood in a negative sense as overstretching). In the case of highly explosive kicks, it is advisable to use hands as targets so that kicks do not overcome certain ranges. It is more difficult to run into this risk when passive flexibility is largely developed.

In sports in which “cleanliness” of technical movement is required, as in competitive aerobics and team gymnastics, one needs to pay attention to correct posture and body segment alignment (legs tense and pointed in extension).

Morning Stretching

One type of very light dynamic stretching may be used in the morning, before breakfast, in order to maintain greater flexibility for the rest of the day, and eventually to be able to use it cold, without any warming up.

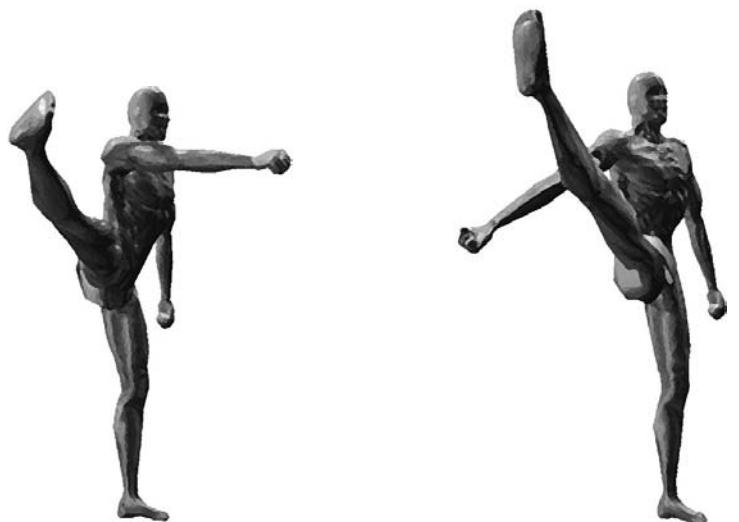


Fig. a - Lateral kick with anteroverted pelvis. Leg is turned inward.

Fig. b - Lateral kick with retroverted pelvis. Leg is turned outward.

Fig. c - Hands are used in order not to overcome certain ranges and to avoid overstressing.



Backward kick



Swings for shoulders and dorsals.

Dynamic swings for pectoral muscles. Throw with palms of hands facing upward.



Dynamic chest rotations seated, which permits trunk isolation.

Dynamic Stretching Summary

- Proceed with a general (cardiovascular) and sectorial warm-up (sectorially rotating the joints: neck, shoulders, elbows, wrists, pelvis, spine, knees, and ankles).
- Begin the swings and kicks slowly, and gradually increase the range and/or speed of execution.
- Do not kick in a ballistic and uncontrolled way. Control movement and eventually “throw it.” Avoid overstretching.
- Conclude the swings and kicks when the first sign of fatigue is being shown by reducing range and speed.
- Do not train with this type of stretching when the muscles are tired: tired muscles are less flexible, slower, and more subjected to trauma.
- For highly technical sports, pay attention to alignment of body parts.

Static Active Stretching

(When flexibility and strength merge)

Those that commonly in sports slang for gymnastics and competitive aerobics are called “trials of strength,” are in reality, at least for half, “trials of joint mobility.”

A higher range of articular mobility, coupled with an equally high degree of isometric strength, permits maintenance of certain positions that take the name of squares and horizontals (planche).

In order to explain the process of static active stretching, one must consider the muscular system as a bundle of muscles, agonist and antagonist which permit movement working in perfect synergy. By perfect synergy, one means the antagonist muscle’s capacity to inhibit its tension when the agonist is active (see principle of Reciprocal Innervation, p. 40). If that were not possible, we would find ourselves caged into a sort of rigid body armor and each movement would be impossible. For instance, when we extend a leg, the agonist muscles (essentially the femoral quadriceps and iliac psoas) carry out their task thanks not only to their strength of contraction, but also to the simultaneous inhibition of the antagonist musculature (femoral biceps). But what would happen if we were to have a less flexible femoral biceps? In spite of the fact that greater contraction of the agonist musculature would prove to be very difficult, it is not impossible to reach the extreme range granted in that specific joint, and thus to maintain certain positions. Developing a certain range of articular mobility (through the isometric PNF technique and relaxed stretching), together with a certain degree of isometric strength of the position’s stabilizing muscles, we will keep the body in those positions called “trials of strength.”

In order to comprehend the concept fully, it is sufficient to consider two people, A and B, with equal isometric strength, in an exercise in which the agonist muscle has 10 for each strength. Considering a particular hypothetical exercise, subject A has a rigid and less flexible antagonist muscle that gives him an oppo-

sition evaluated with factor 4. The total range of strength displayed in that particular exercise will be that which turns out to be between the agonist's strength value, in this case 10, minus the antagonist's degree of opposition, 4 for individual A (factor of strength exhibited, 6).

Person B has greater joint mobility, and the antagonist muscle's degree of opposition (still in reference to the hypothetical exercise) has a factor of 1. In this case, the range of strength exhibited will be 9 (10, agonist strength, minus 1, antagonist opposition, equals 9).

With this example, one wants to demonstrate how, at parity of strength employed between the two people, greater joint mobility allows for more complete and effective utilization of individual strength, in addition to promoting regional resistance of agonist muscles (Tolsma, 1985; Kulakov, 1989).

It appears evident, then, that static active flexibility depends on static passive flexibility, and that the more the latter is developed, the more there will be, on the one hand, a greater economy of strength employed in maintaining a square or planche on tense arms (thanks to the antagonist muscles' minor resistance to movement). On the other hand, from a biomechanical point of view, we will be able to maintain the body barycentric at the most congenial and economic point (still from the point of view of employed strength).

Static Active Flexibility Development

In order to develop this type of flexibility, one must develop before all a certain range of joint mobility through static passive stretching (isometric or relaxed PNF), follow a general strength preparation program (especially concerning abdominal and erector spinal muscles), and lastly develop the specific strength necessary for maintaining positions.

There are two ways to increase the musculature's specific strength:

- 1) Dynamic strength exercises.
- 2) Static strength exercises that emulate the movement in its specific static form (with particular reference to the specific ranges in which one exercises the strength).

Some scientific studies highlight the close relationship existing between isometric strength development and the joint range on which it is practiced. Strength increase occurs in a notably greater size in the specific range where one practices and with the type of specific contraction (Rutherford and Jones, 1986). Hence, now one may appreciate the importance of specific training on those particular positions that specifically reflect certain postures.

Other factors, besides the strictly muscular one, contribute to correct exe-

cution of the static active stretching positions. Two such factors are balance and neuromuscular coordination, which are enhanced through gradual proprioceptive awareness in movements and “passages” from one position to the other. The antagonist muscles, which are needlessly stimulated in an untrained individual or one who is not used to these types of exercises, become less involved as specific training proceeds, allowing for a greater economy of movement.

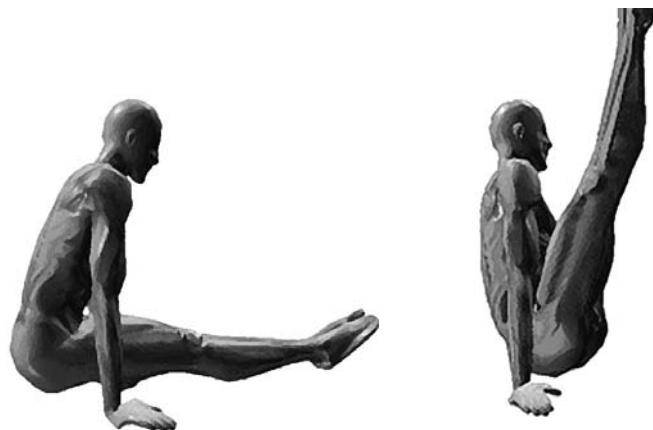


Fig. a - United square (maximum lever)

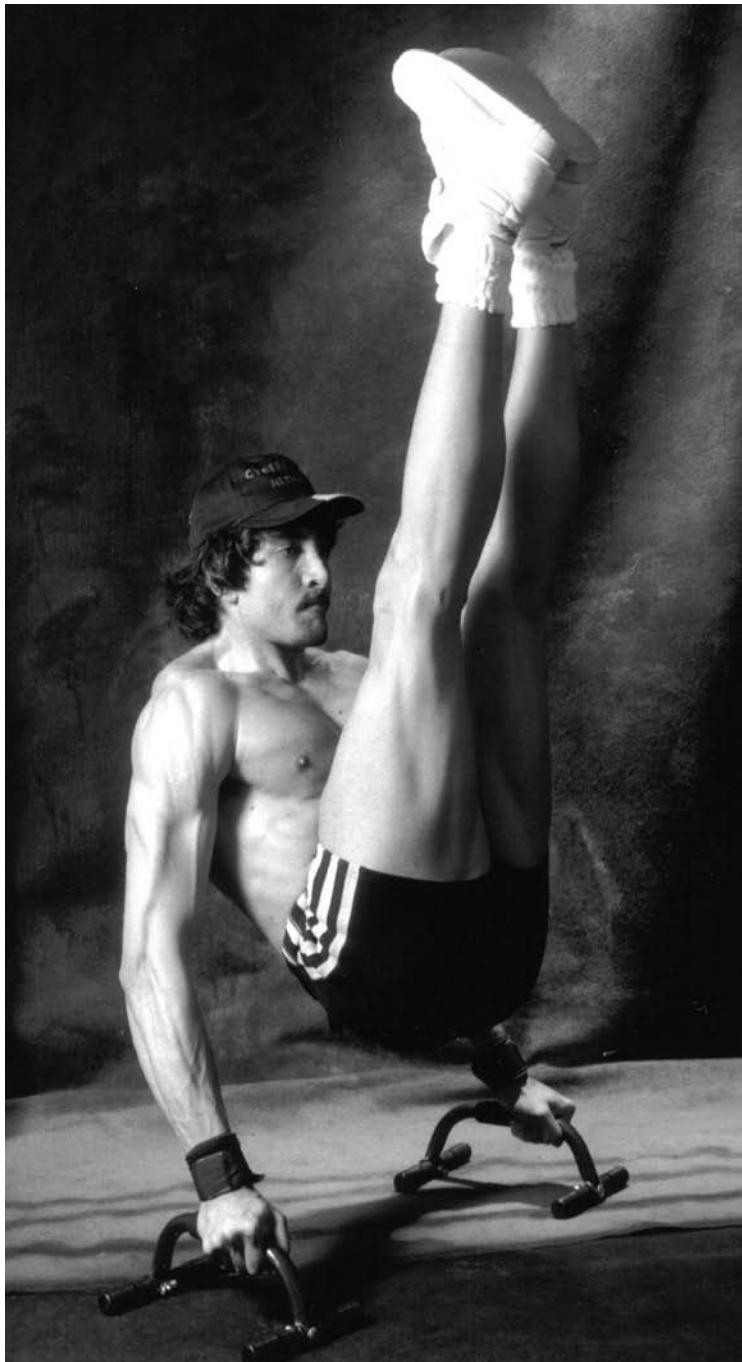
Fig. b - Maximum square (minimum lever)



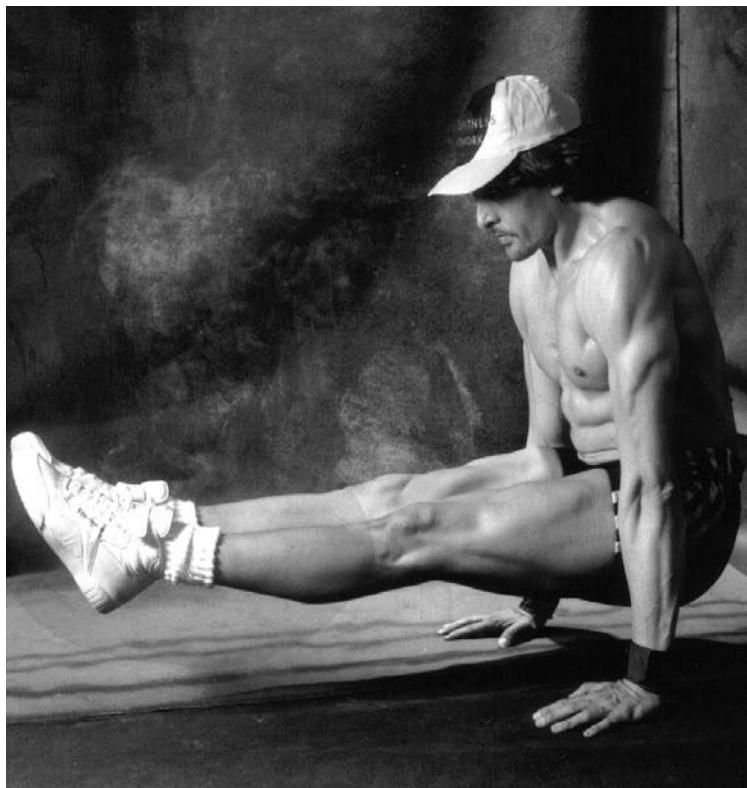
Fig. a - United planche (maximum lever)

Fig. b - Opened planche
(lever is minimal—legs wide open)

Therefore, static active flexibility has both a “physiological” component (joint mobility and isometric strength), and a neuromuscular component (coordination of the agonist and antagonist muscles’ tension).



Maximum square (minimum lever)



United square (maximum lever)

Finally, one needs to point out the biomechanical factor of “levers.”

In biomechanics, a lever is defined as a solid body, crushproof, of any form, mobile around a certain point or a fixed axis called a fulcrum, and subjected to the action of two forces: power (or motor force) and resistance, each of which has its application point on the lever.

The greater the lever’s length to the fulcrum, the greater the necessary strength to contest the force of gravity. This concept understood, it is evident that greater joint mobility permits employed strength to reduce through “shortening” of the lever (which greatly approaches the fulcrum).

In order to hang on to a new element, whether static or dynamic, one must break up the complete movement into many little positions, which are tried separately. Once motor coordination is assimilated and the necessary force in each position is acquired, one may “put back together” the individual movements until the complete exercise is created (especially passages in between the various types of squares and planche).



Vertical split



Strength contraction in opened position



Maximum opened square



Half square



Square with central support

ATTENTION: excessive use of isometric tensions may bring a systolic blood pressure increase caused by the Valsalva maneuver during isometric contractions. In addition, it may have cardiovascular complications for lesser trained individuals and those who are subjected to hypertension. The Valsalva maneuver takes place when one exhales against the closed glottis (when one attempts the feat in a state of strong contraction). This often happens during intense isometric contractions or while lifting heavier loads. This may cause, especially in lesser trained and hypertense individuals, a

blood pressure increase. As Zarchoskji states, such risk may be avoided by checking the duration of isometric contractions (max. 6-10 seconds), the number of exercises in each training session (max. 3-5 exercises), and the frequency of exercises in the weekly microcycle (max. 3-4 times) (1970). Moreover, Zarchoskji advises breathing freely and naturally as much as possible (obviously, that is not always easy with highly intense isometric training exercises like the maximum square and planche on the tense arms).

Blood pressure increase following the excessive isometric tensions is excluded practically from everything in the isometric tensions of isometric PNF stretching, because usually the engaged musculature is less extended and the exercise therefore turns out to be less demanding. When large muscles sustain the isometric contractions for set periods of time, there appears to be a larger blood pressure response than that which is found for small muscles (McCloskey, D.I. and Streatfeild, K.A. 1975 – Mitchell, J.H. 1976 – Mitchel, J.H. et al. 1981. This is also because it is preferable that contractions be less-than-maximal and not maximal in isometric PNF stretching.

It is very useful to place isometric training for static active flexibility and aerobic training (long distance race, jump rope, step climber, aerobics, steps) side by side, because it permits the system to have greater efficiency and cardiovascular and respiratory tolerableness, improving general well-being and extent of recovery.

Static Active Stretching Summary

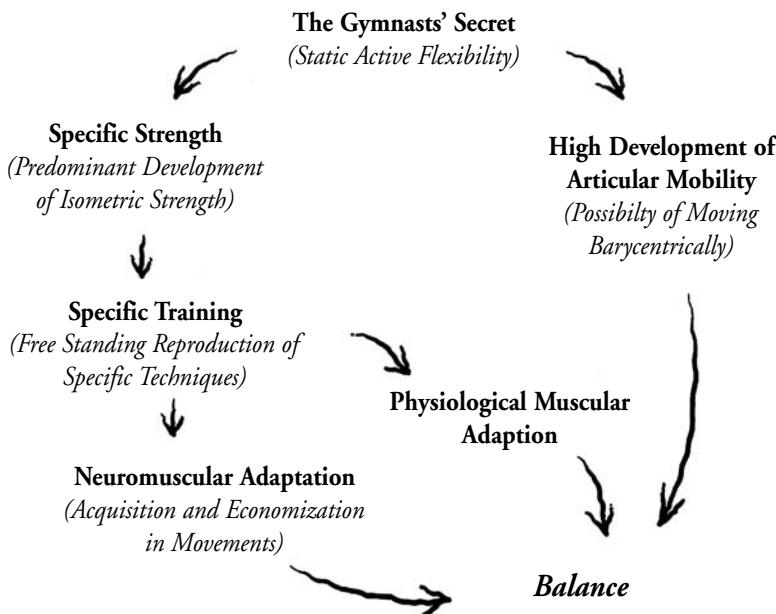
- Develop maximum joint mobility.
- Increase strength and general resistance, and particularly the abdominal and lumbar section, through general exercises (not specific, as with sit-ups, crunches, and back extensions), paying attention to utilizing every range of movement allowed by the joints.
- Exercise the position's stabilized muscles through specific exercises (dynamic and static), paying particular attention to using specific ranges that reflect the "competitive movement." For this purpose, it is useful to break up the movement, exercising strength in the principle positions (angles). Subsequently, once a certain mastery is achieved, it is possible to carry out various crossings between the static active stretching positions (crossings in between various squares and planche).
- In the first attempts, use two supports (leaning supports, steps, chairs), because they allow minor joint range utilization (therefore, they permit compensation of an eventual deficiency in joint mobility).

The Gymnasts' Secret

How can gymnasts show superhuman strength in their static (especially planche on tense arms, maximum united square) and dynamic (especially

square with arm turns) positions?

A detailed explanation is contained in this chapter, but may be sketched in the following manner:



Once, I asked a great athlete, A.V., ex-Olympic gymnast for National Italian Team, several times Competitive Aerobics World Champion, if the planche on tense arms were either more a question of flexibility or strength. He answered—"It is a question of balance." In that moment, I didn't understand because I had not adapted the physical qualities to do these types of exercises yet (specific strength and suitable joint mobility).

When your body (also in reference to the length of your levers, arms, and legs) achieves a perfect balance between flexibility and strength, you will be able to feel (through body sensations) and understand the physical concept of balance.

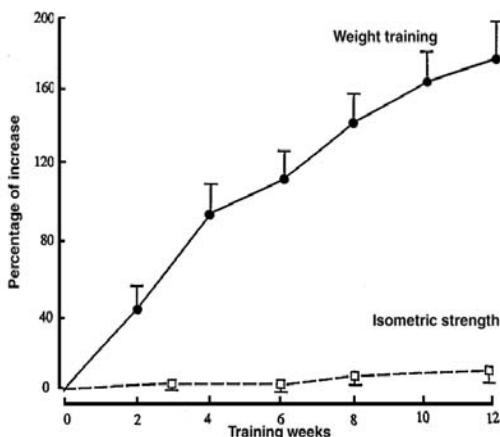
Super - Strength: Analysis and Application of the Gymnasts' Secret to Bodybuilding

Whoever has seen gymnasts at work knows the impressive strength that they are capable of exhibiting in their trials of strength. It is natural to think that these athletes are endowed with supernatural strength or that they are privy to training techniques that are particularly unknown to most. In reality (biomechanics, articular mobility, genetics, and will aside), gymnasts train according to the important concept of specificity.

One of the rather unknown concepts/secrets in the bodybuilding field is the principle of specificity. Why is a gymnast able to do amazing free-standing exercises, but then cuts a poor figure in gym weights, amidst a crowd of people, while you raise double his body weight? The concept is specificity. Why, as surely will have happened to you when changing your training scheme, passing from one exercise like the horizontal bench to another like crosses, did it seem that you had lost a large part of your strength? The concept is still the same: specificity. The muscle (its capacity for contraction, and therefore the strength that one can develop) and the nervous system specifically adapt themselves to the type of the induced stimulus by that certain type of exercise. In practice, it means that, aside from genetic differences regarding the levers' length, one can develop a markedly superior strength, paying attention to those types of exercises that we insert in our training plan and to the exact scientific mode of execution. This concept, put into practice by a bodybuilder, is aimed at developing notably greater strength in certain exercises, and optimizing muscle growth in the regions most lacking for genetic reasons, or because they adapted themselves, in accordance with the principle of specificity, to one or more exercises that simply do not fulfill the athlete's specific demands.

The concept of specificity finds its grounding in various scientific studies.

From one study carried out by Rutherford & Jones, one notices that people subjected to two typologies of different exercises (in this specific case, one group doing leg-extension exercises, another the same movement in static contraction of maximum extension) displayed an adaptation, and thus a strength increase in the joint range and contraction type (dynamic or isometric). One notices in the graph for two trained group A people in dynamic quadriceps extension that a specific strength increase in the dynamic exercise is displayed, but only a slight increase in static resistance. On the other hand, group B developed greater isometric strength in joint range by having trained with static contractions, but only minor dynamic strength in the rest of the range of movement.



This strength increase is caused both by adaptation in the muscular fibers' physiology, and by nervous system adaptation that specifically recruits the fibers, allowing a lesser degree of antagonist muscle cocontraction (which can put up some opposition). This, in turn, permits greater strength utilization and economy in energy.

Static Contractions and Specificity: Training Guidelines for Bodybuilders

STATIC CONTRACTION: literally multiply a repetition's intensity, giving particular emphasis to the moment of maximum muscular contraction (for example, in maximum extension movements in leg-extension, in the bench press, or in the triceps pulley). For this purpose, contract to the utmost, maintaining the position more than you usually would.

Static strength increase to the point of maximum contraction brings in its wake—even if in a small measure—improvements in concentric and eccentric movements. This kind of training, however, has the disadvantage of causing hypercontraction in fibers and the associated connective tissue unless one does not proceed to isometric PNF stretching at the end of training (of which procedure, maximum isometric contractions, constitutes the exact opposite).

SPECIFICITY: choose a basic exercise for each muscular group and train along the lines of “brief, intense, and infrequent” training.

The choice of exercise is made in reference to muscular groups that are the most lacking or to the specific exercise in which one wants to improve.

In the case of bodybuilding, one may concentrate instead on intensity of brief, intense, and infrequent trainings, still taking advantage of the same principles of impressive strength development.

Notes: Often, the static contraction principle does not produce a proportional muscular mass increase parallel to strength increases in people like gymnasts and competitive aerobics athletes. The explanation is in the fact that gymnasts, training themselves free-standing and in exercises that they need for a particular skill, necessarily must find a compromise between their mass (body weight) and their strength. In their highly technical trainings, they must repeat exercise combinations various times (in which often explosive strength, dexterity, and velocity predominate). All this is done to the detriment of muscular mass (even if it is a vantage point in their case).

Isometric PNF Stretching

Isometric PNF stretching represents the most effective and rapid system to reach greater joint mobility and flexibility. The use of this technique permits substantial improvements, even for those who have not trained and prepared their musculature since childhood.

The technique's peculiarity, which justifies the results, is in the fact that, besides acting on nervous regulation of muscular tension through Proprioceptive Neuromuscular Facilitation (PNF), unlike passive static stretching (relaxed), it stimulates the muscle not only to extend, but also to acquire extreme degrees of strength at each joint's opening, and it can also induce increases in the number of muscular units (sarcomeres).

Preparatory Dynamic Strength Exercises

This muscular extension technique is highly intense for the musculature and the associated connective tissue. Therefore, this type of training must be carried out only by the people in excellent physical shape and who have reached a certain degree of muscular training through dynamic strength exercises. **A musculature which has not been trained in advance cannot benefit from isometric PNF stretching because it cannot support (and therefore adapt itself to) heavy loads required by this type of training.**

Preparatory exercises, also called strength dynamics, consist of high repetitions of movements effected by the musculature that one wants to train with isometric PNF in the future, slowly and to the maximum opening range (individual allowed by each joint, *maintaining constant tension*).

For Side Split

Deep Squat: The Secret of Side Split

The Deep Squat (also called Sumo Squat) is surely the most important and fundamental exercise for developing the hip maximum flexibility. One MUST do it if he wants to be able to do side split at any age. The reason for its great efficacy is given by the fact that it intervenes over complete or almost complete lack of strength and flexibility in the muscles responsible for side split (muscles: adductor, pectineal etc.) We have already seen that one characteristic of flexibility is specificity: the characteristics of strength and flexibility are shaped by their usual use.

We are somehow built on the base of our own usual activities, and this works not only for our body but also for our mind. Such muscular and body conformation, despite having a genetic component, may be masterly varied and directed towards a higher functionality and capacity of execution in certain exercises: the execution of such exercises brings about structural modifications throughout time.



In the case of side split, the deep squat is the exercise which allows us to fill “the gap” in usual movements of a “normal” human being (and by normal is meant the one who does “normal” office kind activities which don’t require engagement in the positions of widen legs or squat). Doing a deep squat and gradually increasing both the lifted weight and the level of parting the legs, with time, brings about the adaptation of strength and flexibility characteristics of groin muscles which are responsible for high levels of opening until complete side split and the suspension split (the last one only for the experts).

So, why there are a few people able to do a complete side split? The answer is another question: how many people correctly train this part of their body with sports and work activities? Few, a very few. On the other side, training these muscles correctly, actually, training them with dynamic strength exercis-

es, constant tension, gradual loading (relationship length/tension) you can gradually get at increasing the strength level in stretching out these muscles and, therefore, increasing the level of the legs' parting.

Execution

Put your legs apart wider than the position of your shoulders, then: go down into squat position, without rebounding, but maintaining knee-flex position with constant tension of groin muscles (the times in knee-flex position may vary remarkably depending on someone's training level). Maintain knee-flex position for a while and, however, as long as you feel able to come back up easily. The feet tips must follow the knee opening: the more you open your legs the more the direction of your feet must be open (pointing your feet outward).

Load

The load, meant as a relationship between lifted weight/legs parting is to be progressively (but very gradually) increased. Example: starting from 3 series of complete knee-flex (body weight) per 30 repetitions reach 3 series per 40 repetitions, then 3 series per 50 rep. After some time, with strength increasing, increase also the load (for example: do the same exercise with an unloaded beam going back to the first number of repetitions - 30 repetitions per series). After some time (depending on personal capability of adaptation), once when you're able to do 3 series per 30 repetitions with a certain load executing the exercise perfectly, (complete squat, constant tension, without rebounding), add more weight and/or increase the legs' parting.

Frequency

Recovery period between strength sessions must be abundant. In the opposite case, chronic weariness in the inguinal region would hinder any improvement in opening level, probably causing even regression. See supercompensation curve and load adaptation.

Once or twice a week is more than enough.

Precautions

Start with a very low relationship weight/legs parting. This exercise intervenes over usually little used muscles and, therefore, is characterized by low strength and flexibility level. That's why it's necessary to start only with body weight, without any other additional weight but the body one. Keep in mind that Deep Squat/Squat Sumo is an exercise which is executed for the groin muscles and only indirectly involves quadriceps muscles, which are normally much stronger and trained, even in sedentary people, actually because they are required in "common" exercises like walking and running (and it's a reason why front splits are thought of being easier to practice than side splits).

Load Addition

It's important to pay attention to granting complete recovery between training sessions: some other exercises, specified or unspecified (for example: kicking in martial arts) may interfere with full recovery and, consequently, hinder the expected results of wider opening in split. A drastic situation (which I advise, however) is the one of giving up doing other kinds of exercises and/or other kinds of training so as to concentrate on developing flexibility (in this case the side split). Once you have reached the flexibility level you want, you can go back to practice the other exercises and, you are likely to have much better technical results (you can, for example, kick higher and easier). To reach higher sports qualities both from a functional and technical point of view, it's important to develop fundamental physical dowries (like flexibility and aerobic capacity) in a preparatory period and before becoming an athlete, thus far from the period of specified training for contest. *The better the basic are (higher level of basic qualities), the better results will be obtained in specified training and in contest.*

Adductor Flies

Side opening exercises or for free-standing exercises, effecting openings with one's back to the floor.

The purpose is to increase the number of repetitions progressively, start-



Fig. a - Side openings (initial position)



Fig. b - Side openings (final position)

ing from a minimum of thirty and a maximum of 100, for a total of two-three series. Execution of the movement is very important, and it must be slow and concern the complete angle of opening permitted by the affected joint (in that training stage). In the range of movement, it is necessary to concentrate on the extreme opening range, habituating the musculature to work on ranges that are different from those required for everyday actions.

Gradual use of overloads at the ankles follows. I emphasize the gradualness of load increase because, if not respected, it will bring the affected musculature to chronic exhaustion or to overtraining, which will translate then into extreme strength decreases and, contemporaneously, into an opening drop.

This type of preparation, increasing muscular resistance and the strength of the connective tissue associated with the muscle (perymisium, endymisium, epymisium), reduces risks of overtraining and microlesions that could derive from rash use of isometric tensions.

Deep Squat, Adductor Flies, Adductor Machine: Biomechanics Analysis. Which Is the Best Exercise for the Side Split?

Despite Deep Squat (Sumo), Adductor Flies and Adductor Machine are apparently similar exercises for training the muscles involved in the side split, there are also some remarkable differences in movement's biomechanics. Such differences are reflected on exercise effectiveness or on the obtainable results.

All these three exercises, if executed within complete personal range of movement, intervene over the groin muscles (adductor brevis, adductor longus, adductor magnus, gracilis and pectenius, aiming at adducing and *turning legs inwards*). Each muscle, so as to be effectively trained and stretched out, must work *according to its exact biomechanics*. As it was already explained in the theoretical chapter of this book, there's no pure abduction in a side split, but a movement of femur abduction and turning outward. Such movement of femur is of fundamental importance from biomechanics and muscular point of view if we want to intervene over *those muscles which hinder turning outwards* (already cited groin muscles).

In "adductors flies" exercises (leg opening with the back on the ground) and in adductor machine training, all the muscles involved in turning outward are not being trained correctly, from biomechanical point of view. These muscles, as for their nature, tend to turn the legs inwards hindering opening. Opposite, in deep squat the movement intervenes exactly over turning the femur outward (if the squat is executed as "Sumo" with the legs apart and lowering the pelvis below the knees). Such movement completely satisfies the fundamental principle of stretching the specificity one – which requires stretching out movement not only because of following the correct range of the trained joint but also because of respecting its specific biomechanics: in the case of a side split it means abduction and femur *turning outward*. Besides, Deep Squat (as well as Squat in general) is a so called "fundamental" exercise as it intervenes over the whole leg musculature and in a complete way. The adductor flies and training with adductor machines are the exercises of isolation, thus less effective and with limited effectiveness. The Deep Squat/Sumo is the fundamental exercise for developing the groin muscles in stretching-out, always following the principle of gradual load increasing (relation load/opening) and having abundant recovery between strength training sessions.

For Sagittal Splits

Also in this case, before tackling these specifically isometric exercises, the affected musculature specifically must be reinforced (principally, iliopsoas, femoral quadriceps, and femoral biceps). Such an aim is achieved in this case through:

- “Frontal lunges” with the back in extension, in two-thirds series with repetitions varying according to the individual’s body weight and training degree.
- Curls for the femoral biceps (machine or stiff legged deadlift).
- Leg raises (left and right) in an upright position.



Fig. a - Frontal lunges



Fig. b - Leg raises

The movement also must be carried out slowly for these types of exercises, within every range of movement granted by the joint. It is very important to keep the back leg tense, and to maintain the trunk as vertical as possible and in line with the pelvis in lunging exercises (in order to avoid, as one commonly says, “wearing out” and thus draining the psoas muscle by extension).

Gradually increase the exercises’ difficulty, increasing the number of repetitions, of series, and the load through use of overloads (bars, dumbbells, ankle weights, iron shoes).



Isometric PNF: the Technique

Isometric PNF stretching consists of positions that tend to develop maximum strength of each joint's movement. Strength increase in these "extreme" positions translates into effective muscular training.

Musculature extension is also developed by the use of Proprioceptive Neuromuscular Facilitation (PNF) through previous series of contractions-relaxations, and by taking advantage of the inverse myotatic reflex.

Isometric PNF for Side Split

First Method

After warming up, open your legs sideways until perceiving tension from the whole thigh's muscles (adductors and groin muscles). As soon as this tension tends to diminish, gradually increase the opening until feeling the tension again. Continue until it is no longer possible to open wider without feeling pain. At this point, exercise isometric tension in the adductors for at least ten seconds (as if you wanted to "pluck" the ground by bringing your legs closer). Seek to maintain your chest vertically, without inclining it forward.

Repeat the entire sequence at least twice, at most four times per session.

Second Method

This technique is identical to the preceding one, except that the final position of contraction is achieved by taking advantage of Proprioceptive Neuromuscular Facilitation (PNF) through successive contractions and relaxations of the adductors (as if we wanted to get up, "plucking" the floor with our legs for five to six seconds). Even in this case, when it is no longer possible to open the position without pain occurring, maintain the isometric position of contraction for at least ten seconds.

Repeat the whole sequence at least two, at most four times per session.



Fig. a

Fig. b

Isometric PNF for Sagittal Splits

Do it in a sagittal position with the knee of your back leg on the ground and that of your front leg tense. It is important that the hip's position is in line with your shoulders (avoiding "wearing out" and therefore exhausting the psoas muscle by extension), and that the chest remains upright as long as possible.

First Method

Stretch out in the position described above and wait until tension in the front leg muscles (femoral biceps) and in those of the back leg (femoral quadriceps) diminishes. Then, slide with control, trying to bring your hip as close as possible to the ground, still maintaining the correct posture. Continue in this way until reaching the widest position and isometrically contract the extended musculature for at least ten seconds. In the first attempts, in order to make the exercise easier, lean on two supports (chairs, steps).

Repeat the entire sequence at least two, at most four times per session.

Second Method

This technique is identical to the preceding one, except that the final position of contraction is reached by taking advantage of Proprioceptive Neuromuscular Facilitation (PNF) through successive contractions and relaxations of the elongated musculature (as if we wanted to get up, "plucking" the floor with our legs for five to six seconds). Even in this case, when it is no longer possible to open the position without pain occurring, maintain the position of isometric contraction for at least ten seconds.

Repeat the whole sequence at least two, at most four times per session.





Isometric Sagittal Lunge

Another type of position for frontal split improvement is the isometric sagittal lunge. This position is identical to that which one must maintain in dynamic sagittal strength exercises, only that in this case the position is static (chest erect, back leg tense, knee of front leg in line with foot, pelvis in line with shoulders). Maintain the position in isometric contraction for thirty seconds per side, going up to as much as two minutes for trained people.



Suspension Splits

Much attention must be paid to these types of positions because they require complete flexibility of the joint concerned, a high degree of musculature strength, and great sturdiness and stability of the knee ligaments.

Before doing suspension splits, it is necessary to develop the openings completely on the floor, and then, having acquired some strength in those positions, to use two supports (chairs, steps, etc.). In the first attempts, the supports must be based so as to let you unload the weight on your arm, if you need it.

It is advisable, however, before doing suspension splits, to be sure of the appropriate range of flexibility and strength in the extreme opening and extreme stability of knee ligaments.

Isometric PNF Stretching Exercises

Isometric PNF stretching may be used for any part of the musculature. It is necessary to extend the muscular region and to subject it to successive series of contractions-relaxations until the final position, which is held for a minimum of ten seconds.

DO NOT USE MORE THAN ONE EXERCISE PER MUSCULAR GROUP. DO NOT OVERCOME THE NUMBER OF REPETITIONS (TWO TO FOUR SERIES) AND WEEKLY FREQUENCY (TWO TO THREE TIMES).

Here are some examples of exercises for various muscular groups:

Dorsals

Push your chest downward until you feel tension. Proceed as described in the first or second method.



Shoulders

Push your chest downward until you feel tension. Proceed as described in the first or second method.



Chest

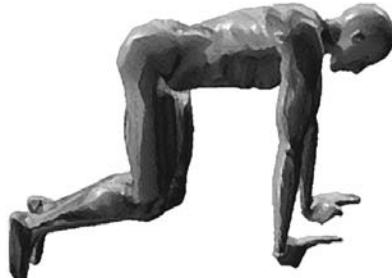
Lean your hand against the floor and rotate your chest until you feel tension. Proceed as described in the first or second method. Change sides.



Forearms

With your hands leaning against the floor, rotate your chest until you feel tension. Proceed as described in the first or second method.

With the back of your hands rested against the ground, rotate your chest until you feel tension. Proceed as described in the first or second methods.



Neck

Laterally pull your neck until you feel tension. Proceed as described in the first or second method. Repeat the exercise on the opposite side.



Rotate your head with your hand until you feel tension. Proceed as described in the first or second method. Repeat the exercise turning on the opposite side.

Chest Closing/Lower Limbs (Lumbar and Femoral Biceps)

Hug your legs and exercise tension on your lumbar muscles as if you wanted to separate yourself from your legs. Carry out this exercise with much caution. Limit the isometric tensions to one or two.



Hug your legs and exercise tension on your back thigh muscles. Proceed as described in the first or second method, pushing your buttocks backward and trying to make your chest join your legs without bending your back.



Side Split

Pancake position:

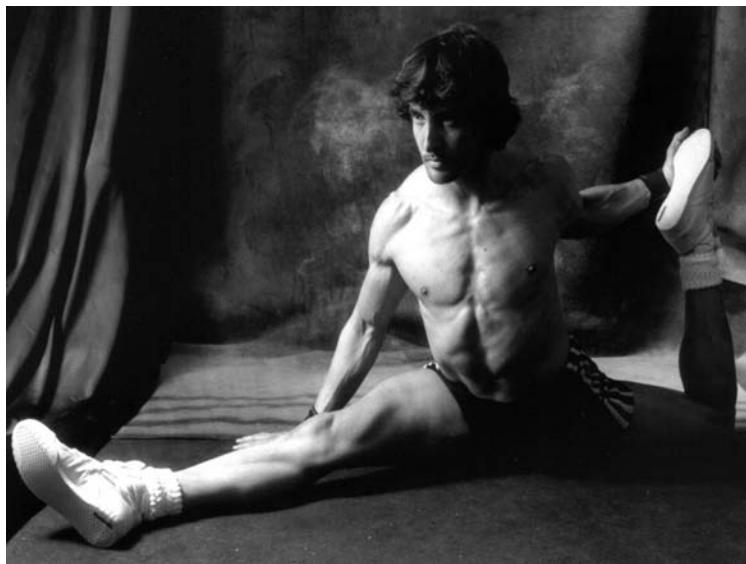


Open your legs wide, keeping your hip in contact with the ground until you feel tension. Proceed as described in the first or second method. Eventually, touch the ground with the points of your feet.

Sagittal Splits



Maintain the position, gradually increasing the load (removing your hands from the floor and keeping some dumbbells in your hands).



For well-trained subjects, it is possible to increase extension by bending your back leg. Maintain the correct hip position (to avoid wearing out).

Isometric PNF and Bodybuilding

For decades, antiquated training techniques and false conceptions have rendered the bodybuilder an athlete of less flexible excellence. Today, with advances in medicine and scientific experimentation, as well as knowledge of some physiological mechanisms and the nervous system, it is possible, respecting certain rules and techniques, to develop notable mass without penalizing flexibility. Surely, from the point of view of the practiced sports discipline, the bodybuilder need not effect splits but, on the other hand,

forms for himself an obligation to associate isometric PNF strength exercises with his trainings (at the moment, the most effective technique for flexibility development and maintenance). And this is principally for the following two reasons:

- From an aesthetic point of view, a program of few exercises based on isometric PNF will permit you to maintain a balanced muscular typography, thereby avoiding paramorphisms that, also from an aesthetic point of view, may nullify the general impact of a muscularly well-developed physique.
- From a strictly functional point of view, by increasing joint ranges, one will be able to benefit from a greater safety margin concerning more or less grave lesions in certain movements in which one finds his muscle under strain near its maximum range of movement. It is important to emphasize that as a muscle increases its length (stretching it in an exercise, for instance), its strength gradually diminishes until it reaches zero (in the maximum range of movement). It means that increasing a muscle's length (through an effective stretching program) will increase its strength as well. A practical example would be the following: in the "overhead press" exercise, an originally less flexible individual in the scapula-humeral cinguli will have difficulty maintaining his weight in a "low" position behind the neck's nape, while still maintaining the correct position. After an isometric PNF program, he will have greater joint range of the muscular region in question and, consequently, greater strength (capacity for muscular contraction) in that position.

The modern bodybuilder must build up an expression of physical harmony, and, as always, by harmony one means balance of opposites: simply, strength and flexibility.

Isometric PNF Stretching Summary

- 1- Isometric PNF stretching is not suitable for children under sixteen and for those people who have serious joint problems, such as those who have undergone surgical operations (at the joint level), or the people who have suffered, because of accidents, grave joint or muscular damages.
- 2- Isometric stretching is training that is particularly demanding on the affected musculature, and it is necessary that the principles which regulate strength training are respected (amount and gradual load increase, correct execution of exercises, *adequate rest between training sessions*).
- 3- BEFORE starting training with the isometric PNF technique, it is necessary to increase muscular resistance of the specific muscula-

ture through dynamic strength exercises (the period may vary from one to three months). Fundamental elements: correct execution (slow and controlled work to the maximum joint range possible in that training stage); use of light loads/ high number of repetitions. These exercises strengthen the connective tissue associated with the muscular fibers, and represent the greatest prevention against muscular injuries (tears, sprains, muscular aches that could derive from rash and improper use of isometric tensions).

- 4- Adequate rest between isometric training sessions (at least thirty hours). If recovery between trainings is not sufficient, one will have a drop in strength of maximum openings and then in general openings. Advised frequency: minimum two, maximum three times per week.
- 5- In the case of muscular aches and pains in the following days, suspend isometric training, wait until the pains disappear, and gradually begin the dynamic strength exercises again. Then reinsert isometric tensions. **When training is calibrated, or balanced, there are no muscular pains or bothers.**
- 6- It is preferable that the intensity of isometric contractions is less-than-maximal because maximal intensity is potentially less safe in long training and body adaptation processes (McAtee, R.E., 1993).
- 7- Improvements in isometric stretching, as in general improvements in any athletic field, have a cyclic trend similar to a wave. Usually, improvements in muscular extensibility are preceded by the moments of "stasis" in which everything seems to have stabilized. After a given period, the training stimulus will translate into a strength and flexibility increase.

I advise you to have patience and to concentrate on extreme strength increases of the trained joints, by means of progressively stronger and/or longer contractions. After a given period, this stimulus will translate into an increase in joint mobility.

ATTENTION: Increasing training sessions for the purpose of speeding up improvements constitutes a grave error. Musculature overtraining in isometric stretching—through excessive loads and/or excessive stretching—brings inflammations and muscular pains that automatically reduce opening.

Tired muscles are less strong and elastic

Keep in mind that it is better to proceed without regressions (one step at a time) than to proceed hurriedly just to regress afterwards (three steps forward and two back). Do not be in a rush, for the method, if respected in all its parts, it works for everyone and for all ages. The physiological and neuromuscular principles that are at its base, are the same and valid for all.

Fundamental Principles of Isometric PNF

First Fundamental Principle of Isometric PNF

EACH JOINT RANGE INCREASE MUST BE PRECEDED BY A MAXIMUM STRENGTH INCREASE.

Ignore this principle and you will spend years asking yourself why you did not enhance even a millimeter of your flexibility.

Respect this principle and you will acquire incredible gains and speeds in all the joints in which you apply isometric PNF.

Explanation of the Principle:

The purpose of isometric PNF is the one of increasing strength to the joint's maximum individual range, as a strong muscle possesses stronger muscular fibers. In order to support a certain load (for example, imposed on the musculature when extensive stretches are carried out, as in splits), a strong muscle trained according to isometric PNF recruits a lesser number of fibers to the contraction (and consequently the remaining fibers can extend themselves). In the case of an untrained person, when one gears up on a nearly maximum joint position, the number of fibers recruited for the load's support is notably greater (and, as a consequence, the muscle is not able to express its extensibility fully).

As for this first principle, *it is a great mistake if you want to impose greater length on your muscle (and therefore a great load) than the one it is actually able to stand in a certain training stage.*

In order to cause a muscular extensibility increase, one must at FIRST increase strength to the joint's maximum range (this objective is achieved by way of periodical strength recalls with lunges and openings with low loads/high repetitions, deep squat and with contractions in isometry).

Second Fundamental Principle of Isometric PNF

BE GENEROUS IN RECOVERY TIMES

With respect to the first principle, it is ABSOLUTELY necessary to allow the trained muscle adequate and abundant recovery. This principle proves to be in full accordance with the overcompensation theory and with strength increases in general.

Third Fundamental Principle of Isometric PNF

ABSOLUTELY RESPECT STRETCH RANGE AND DAILY STRENGTH

Flexibility degree (and strength) is regulated by circadian rhythms and numerous physiological and psychological factors that may vary from day to day and even from hour to hour.

It may happen that on certain days one will not be able to reach the extension degree of the preceding days for various reasons (inadequate recovery, inadequate warm-up, physical and psychological stress, etc.). When this happens, never force the position, but respect it. It will be easy to notice that in a subsequent training, one will be able to "get down" in a much more open joint position than the previously reached one.

To disrespect this rule means to cause excessive training/microlesions of the connective tissue that, as explained, once scarred, causes a huge decrease of muscular training degree. Violation of this third principle brings in its wake a strength decrease to the maximum articular range with a consequent extensibility drop.

Relaxed Stretching

Relaxed stretching is the most common and well-known muscular extension technique. Its benefits are undisputed, but in terms of effectiveness and results, it cannot be compared to isometric PNF stretching. The result of muscular extension is achieved thanks to progressive relaxation of muscular contractile units, and, unlike the isometric PNF stretching technique and the static active stretching, it is not used for muscular strength. For this reason, it may be practiced every day and even several times a day, because it does not stress the musculature (if done correctly, in a state of relaxation, it is not subjugated to the muscular recovery rule).

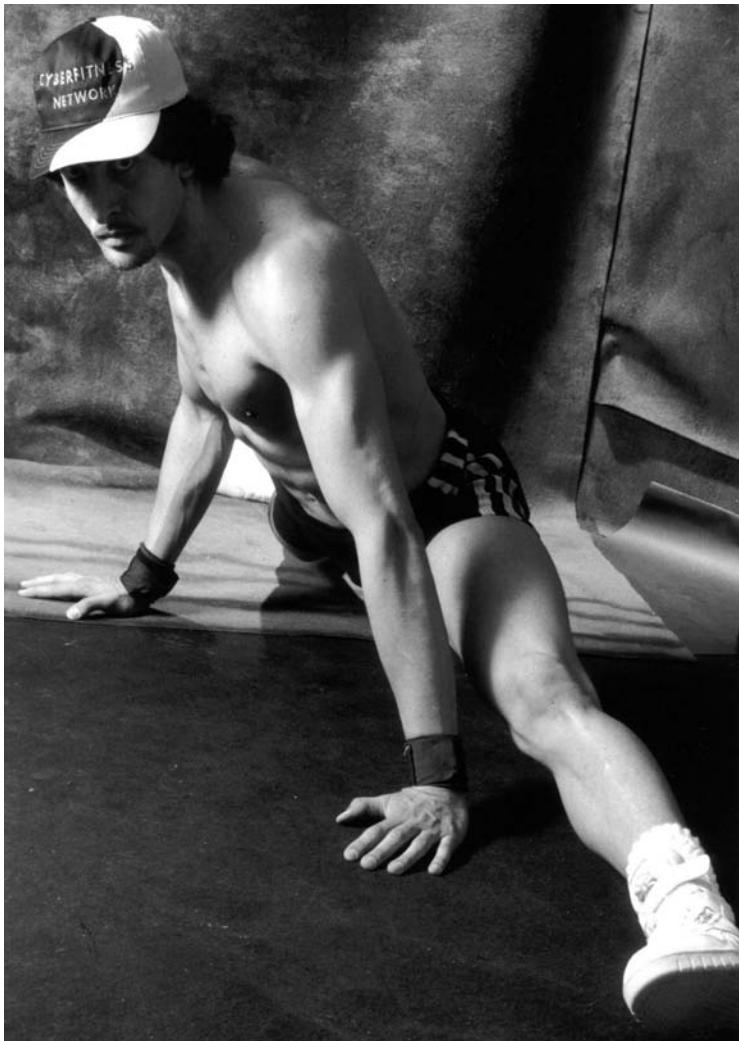
Perfection of correct breathing and development of “body awareness” is of fundamental importance for benefit optimization, in order to feel the state of tension, and consequently to seize the moment of “abandonment” and muscular relaxation.

The execution positions are identical to those of isometric PNF. The fundamental difference nonetheless resides in the manner of execution. Muscular engagement must not exist and one must achieve progressive psychophysical relaxation.

It is inadvisable to arrive at the pain threshold in this technique as well. Extension must occur within physiological limits and respect the principle of gradualness. Relaxed stretching may be carried out without any base muscular preparation even for untrained people, because hardly ever it produces problems.

It should be done at the end of a training session, but one may proceed to this type of extension even between one strength exercise and the other in order to give relief to the hypercontracted musculature.

Considering the calming effect even on the nervous system, it is not advisable to use it at the beginning of training when full concentration is necessary for psychophysical resources.



Relaxed Stretching Exercises

Relaxed stretching may be used on any part of the musculature. It is necessary to extend the muscular region until feeling light tension. Gradually, this tension will tend to diminish. In the case it does not happen, reduce the extension until bringing the muscle into a state of "relaxed tension." Once the tension has been diminished, subject it to a successive extension series until it is no longer possible to extend the muscle without feeling pain. Then, slowly come out of the position.

For this type of stretching, there are no particular precautions to follow

because, considering its low intensity, it may be used comfortably every day, each time that one desires it during the day.

Here are some examples of exercises for various muscular groups (exercises, when possible, are carried out on both sides, left and right):

For Side Splits



With your legs leaning against the wall, gradually relax your adductor muscles, trying to make your legs slide into a more opened position.

Relax them in the sitting position, gradually trying to bring them closer to your knee on the floor. Variation: bring your chest close to the floor, doing a lever on your hips (without bending your back).



Progressively enlarge the opening and incline your chest towards the floor, pivoting on your hips (without bending your back).



For Sagittal Splits



“Crush” the position on the floor, progressively increasing your legs’ opening and maintaining the correct hip alignment. Beginners can facilitate the position by leaning on a support.



Incline your chest forward, looking to relax yourself in the position. The greatest experts can make their chest stick to their leg without bending their back.



Incline your chest backward until increasing tension in your quadriceps muscles. Proceed gradually, bringing them ever closer, with your back on the ground.



Bring your leg close to your chest, eventually touching the floor with the point (without removing the heel of your other leg from the floor). Beginners can make the grip easier with a towel or rope.

Shoulders



With your arms retroverted, progressively bring your back closer to the floor.



With your hand behind your elbow, pull until feeling tension in the deltoid muscles. Relax yourself in that position, and progressively increase the stretch.

Dorsals

Pull your arm back, eventually inclining yourself towards the side opposite your arm.



Bring your chest progressively closer to the floor, seeking to relax yourself in that position.



Chest



Rotate your chest until feeling tension in the pectoral muscles. Relax yourself in that position and increase the stretch. This exercise may be carried out standing up as well, doing levers on the walls.

Forearms



With the palm of your hands on the floor, leaning forward, throw your weight forward until feeling tension in your forearm muscles. Relax yourself in that position and increase the stretch.



With the back of your hands on the floor, throw your weight back until feeling tension. Relax yourself in that position and increase the stretch.

Lumbars

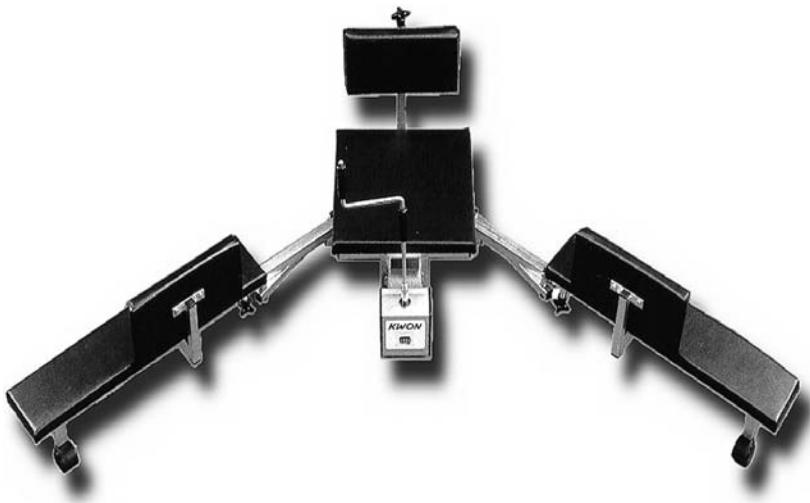


Bring your chest close to your knees, trying to arch your lumbar region as much as possible.



Arch your lumbar region as much as possible and relax yourself in that position.

The Stretching Machine



Stretching machines represent valid help for progressive loosening of the coxal joint and allow for controlled, safe, and effective extension without using the training companions (save some exception, I believe that this is a dangerous practice), nor forcing the knee's ligamentous region (this is indicated by those who suffer from knee problems and have ligamentous laxity problems in this joint).

Stretching machines are the machines that are essentially constituted of a seat, two adjustable arms according to the legs' length (and therefore to the athlete's stature), and a mechanical, hydraulic, electric (the most sophisticated models), or manual movement that permit an abduction increase, often in addition to normal physiological limits and 180 degrees of opening. Often,

they are equipped with measuring systems in degrees, thereby permitting measurement in the opening-load relationship in a micrometric, and therefore very controlled manner.

The peculiarities of such apparatus is that, in the majority of models, they permit one to train his adductor musculature with the strength development method to extreme ranges (isometric PNF). Another extremely important characteristic is the fact that arm regulation according to the length of the athlete's legs, permits that the strength of closing never excite the knee's ligaments.

Notes: In the case when someone wants to practice a side suspension split, his legs should be gradually habituated to the load through specific exercises that stabilize the joint (leg extensions, squats, leg curls), and through the method of isometric PNF training from a standing position. For these reasons, stretching machine use is recommended particularly for those who have knee problems, or those, like ballerinas, who do not need such a demonstration of strength-joint mobility (as happens in suspension splits).

Techniques for Stretching Machine Utilization

Control the stretching machine's back and arms so that knee joints find themselves at the panels' center (this allows for uniform distribution of traction force on the legs' inner surfaces, avoiding loading on the knees).

Isometric PNF Stretching with Stretching Machine

First Method

After an initial warm-up, start the traction in abduction (opened) through the appropriate hand-grip (some models are equipped with levers) until the point when you feel a certain tension in the inguinal, or groin area, and then wait for the tension to diminish.

Increase extension through use of Proprioceptive Neuromuscular Facilitation (PNF), by means of previous isometric contractions in adduction (closing) and subsequent relaxations, time after time looking to increase the opening with the hand-grip. Once the maximum opening has been reached (for that training stage), isometrically contract in closing for at least thirty seconds, seeking in that time to increase isometric strength to the maximum opening.

Repeat the entire procedure for a maximum of two to three times per session. Frequency: minimum two, maximum three training sessions per week, spaced out by an appropriate recovery period.

Second Method

After the warm-up phase, use Proprioceptive Neuromuscular Facilitation (PNF), previously through contractions in closing and subsequently increasing the opening through the appropriate hand-grip.

Proceed to the contraction-relaxation-opening phases until reaching maximum opening (for that training stage), and isometrically hold the position, seeking to close your legs for at least thirty seconds.

Repeat the entire procedure two to three times per session. Frequency: minimum two, maximum three times per week, spaced out by an appropriate recovery period.

Relaxed Stretching with Stretching Machine

The stretching machine may be used in order to passively extend the adductor musculature, but one must have excellent body sensitivity because incorrect use of the load in opening (in excess) easily may transform relaxed stretching into isometric stretching, with the possibility, in case one were to have trained isometrically in the thirty hours preceding the adductor musculature, of overtraining it (with a consequent extreme loss of strength and therefore of opening).

PNF Isometric Stretching Summary with Stretching Machine

The same methodological principles are valid for the use of the isometric PNF stretching technique through a stretching machine that are valid for free-standing utilization of this technique.

- 1- Isometric stretching is not suitable for children who have not passed the development phase and for all those people who have serious articular problems, as well as for those who have undergone surgical operations (muscular and articular), and people who have suffered, as a result of accidents, grave joint and muscular damages.
- 2- Isometric PNF stretching through a stretching machine is a type of training that engages the adductor musculature (large adductor, brief adductor, long adductor, gracilis, pectineal), and it is necessary to respect the principles which regulate strength training (amount and gradual increase of opening loads, adequate rest between training sessions).
- 3- Before beginning isometric training with a stretching machine, it is necessary to increase specific musculature resistance (adductor) through dynamic strength exercises (high repetitions, low loads; see the chapter dedicated to isometric PNF). The period may vary from one to three months.

ATTENTION: Even if muscular resistance training is greater in the initial months, it must not be eliminated totally (otherwise, one would have a drop in strength and resistance of the connective tissue with consequent greater possibilities of strains and muscular tears).

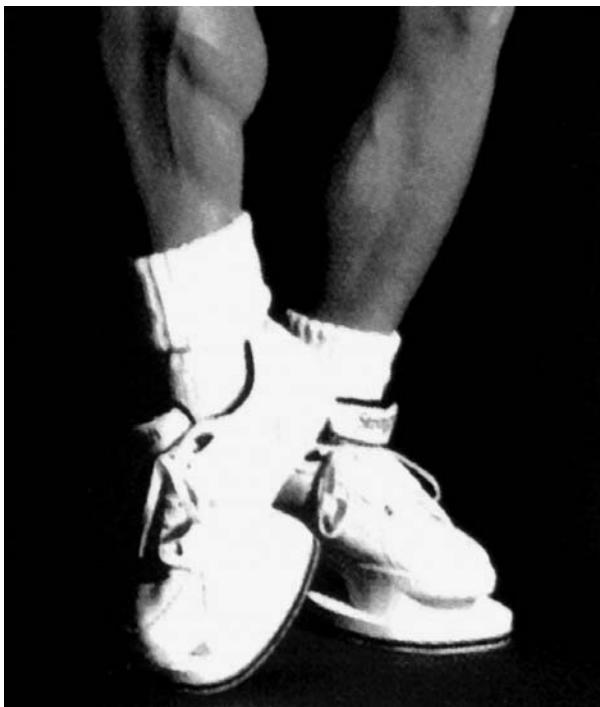
- 4- Rest adequately between isometric training sessions (at least thirty hours). If recovery between trainings is not sufficient, one will have a drop in strength in the maximum joint opening, and therefore a drop in the range of side opening (easily noticeable in stretching machine models equipped with degree-counts).
Frequency: minimum two, maximum three times per week, with at least thirty-six hours recovery time between sessions.
- 5- In case of muscular aches and pains in the following days, suspend isometric training, wait for the pains to go away, and gradually begin the dynamic strength exercises again. Then reinsert isometric tensions. When training is calibrated, or balanced, there are no muscular bothers.
- 6- It is preferable that the contractions' intensity be less-than-maximal because the maximal ones are potentially less safe in the long process of training and body adaptation in stretching.
- 7- Improvements are not constant and progressive. Usually, improvements in opening range are preceded by moments of "stasis," when everything seems to have been stabilized and further improvement seems impossible. This is due to the cyclic course of strength increases, and generally to body adaptation.

I advise to have trust and patience and to concentrate on extreme strength increases, through stronger and/or longer contractions. After a given period of time, this stimulus will translate into an increase in the opening range.

ATTENTION: Increasing training sessions in order to speed up the improvements constitutes a grave error. Musculature overtraining in isometric stretching brings inflammations and muscular pains that automatically reduce opening range.

8. Remember: it is better to proceed without regressions (one step at a time), than to proceed hurriedly and then regress (three steps forward and two back). Do not be in a hurry, for the isometric PNF method, if respected in all its parts, works for everyone and for all ages.

Strength Shoes



STRENGTH SHOES

Strength shoes represent the last frontier in explosive training of lower limbs and, specifically, of the kinetic foot/calf chain.

The human foot's anatomic conformation is such that the majority of body weight is supported by the heel, and that's why man, unlike felines, has developed a shorter and less powerful forefoot.

Strength shoes permit, thanks to their particular conformation (heel located on the forefoot), the foot's geometry to change, and then to unload the weight

that he puts on them totally onto the lower part of his foot. This takes on a particular importance if we calculate the fact that in the normal upright position, the vast majority of body weight (circa seventy percent) is supported by the heel, and only the remaining thirty percent by the forefoot.

After jumping, the impact's force on the floor becomes six times greater than body weight (this factor depends on the jump's height). An athlete who weighs seventy-five kilograms (165 pounds) will develop a force of impact of around 450 kilograms (1010 pounds). With use of strength shoes, this impact is redirected to the forefoot.

Calf Flexibility Development

As noted, the greater the range of movement in the muscle's work, the greater is the flexibility that one will be able to develop.

With strength shoes, thanks to the heel's being located on the forefoot, the angle of movement of the foot/calf kinetic chain proves to be greater, and it brings about better working of the involved muscles (gastrocnemius, soleus, Achilles tendon), with consequent improvement of flexibility.

Thanks to the improvement of flexibility of these muscular groups (through greater movement range), to their development (thanks to the load's movement onto the forefoot), and to specific pliometric exercises (which exploit the muscle's elastic capacities), there turns out to be a sharp improvement in reactivity and explosiveness, and, as a consequence, a greater lift in jumps and greater explosiveness and speed in sprints. These results, above all, derive from better recruitment and from specific development of muscular fibers to quick contraction.

Advice on Strength Shoes Utilization

- 1- Gradually habituate yourself to workloads. Training with strength shoes entails a consistent load increase onto the calf muscles. Gradual training load augmentation is advised (intensity, duration, training typology, and recovery duration).
- 2- Before specific training, always proceed to warm-up your ankles and the affected muscles, as well as their passive extension (not isometric).
- 3- after specific training, cool-down the musculature through isometric and/or relaxed stretching.
- 4- In the specific case of pursuing explosiveness in jumps, the "explosion" velocity of the last repetition must be equal to the first one. This means that it is necessary to stop at the moment when muscular reactivity and elevation diminish because of fatigue.

Power-Flex STRETCHING

Super Flexibility and Strength of the Mind



The body is one of the best examples of reality as a mirror, even if it's necessary to understand that the aspects mirrored by physique, depict their high level qualities in the soul.

HILARION
Source "Sulla soglia"

Maximum Individual Performance

Maximum performance, in sports as in any undertaking, represents the culmination of our talents.

Each one of us has some base qualities that, if appropriately developed and linked with others, potentially could make up part of our human repertoire. They may bring us, if utilized, to the attainment of goals defined, by some, as impossible. The concept of possibility in life is a fascinating one, which determines the sharp line of demarcation that distinguishes the “free” individual from “apparent” constrictions, from “impossibilities,” from the “slave,” condemned to writhe in his limits—physical, mental, or spiritual—all fruits of the same mentality.

The “free” person is the person endowed with mental strength, imagination, hope, burning motivation, perseverance, and an unshakeable faith, ability to go beyond; without them, it is impossible to be truly free.

To experiment with peak performance in life is one of the most beautiful, gratifying, and formative experiences. It represents the result of all the good qualities that a “free” spirit should possess. It is the coin with which one pays with faith, the attainment of personal miracles.

All this, however, is not the end in and of itself.

Your personal miracle, other than possible “intrinsic” benefits in terms of personal satisfaction, social recognition, and material benefits, possesses in itself a much greater value. For you, for your miracles, are given the power of attracting in a positive spiral even those who, despite their “aiming low,” do not recognize human potential, or at least, do not have the strength to put their talents into action. If people, friends, relatives, or strangers recognize greatness in you, who, until just the day before, was “elbow to elbow,” dripping with sweat in struggling with doubts and attainment of “impossible” desires and who proved pitiful at

first, you will cry out with joy for having broken the wall of the impossible. You, free creators, you will have granted trust and hope, you will have laid the foundation for a better world.

For everyone is given the power and the possibility of creating something big, whether a physique endowed with certain potential and strong aesthetic impact, or any other undertaking that you have chosen to embark upon or pursue.

Be among those who make it happen.

Motivation

Motivation is that strength that permits a small man to climb high mountains, to cross stormy seas, and to push his limits as far as possible in order to pass them.

In sports, motivation is one of the most important mental qualities because it constitutes that element without which one could not put forth a great deal of physical effort over an extended period of time. Often, we feel mental frustration that derives from our failures, "rage" caused by the fact of having taken one or more steps backward in training speed because of injuries, and motivation helps us to overcome this feeling. This incredible strength, simply-motivation, distinguishes the athlete equipped with interior strength, that incredible strength that permits him to watch his training system with objective and critical spirit, and, as often happens on the long and bumpy path to improvement, to note important errors in training programs and objectively assess goals (which sometimes, especially in sports, must follow rigorous logic where priority takes precedence), and to regroup from his errors.

Which motivation pushes a man, an athlete, to try his hand at more difficult undertakings? The answers may be complex and vary from individual to individual but, as specified in literature on sports psychology, they can be narrowed down to two large classes: the "externally" motivated athlete and the "internally" motivated one.

Even if they sometimes find themselves (I see and feel it every day from my colleagues) an inchoate amalgam of external and internal motivations, usually one or the other type prevails.

External is that motivation that pushes the individual to act according to anticipated and probable gratifications that derive from the external, or social sphere. Among a wide range of possibilities, we have the desire for social recognition in the family sphere, as well as that of friends, trainers (and the latter is never missing), and many other things which give us an exterior motivation. The athlete who acts on the basis of this type of motivation wants to show the others his own skill and avidly, and sometimes even neurotically, waits for "the lump of sugar" of the "You are strong, Sam" or, to an

even greater extreme, a medal. To have a motivation of this type explains inevitable frustrations and disappointments deriving from the fact that you have “sacrificed” your self-esteem to people who will tell you in a moment when you feel down “What have you done Sam, have you quit training? I see that you have lost so much weight!” Or they may say something to the following effect: “I am certain that you were more flexible once!” Of course, all this will take place when you have reached levels of unthinkable demotivation.

As you will have understood, especially the people “not employed in jobs” in the sports sector do not know the principle of periodization (according to which a phase of “unloading” will bring us to levels of greater productivity) and, above all, they do not know the “devastating” force of their words that unfortunately strikes the motivation of the externally motivated athlete in a fatal way.

On the other hand, there is the internally motivated athlete.

The internally motivated athlete knows that the problems that one tackles in sports are problems that, in large or small measures, the other people face in their lives sooner or later. For him, each occasion is reason enough for reflection, each victory could be a defeat and each defeat a victory. The real challenge is against oneself, the others make up part of the game, but he does not see them because he is too engaged in searching for new solutions to overcome his own physical, mental, and spiritual limits. He does not have adversaries if they are not those present inside of him. It is only him, armed with his faith against his physical limitations, his doubts, his fears, and his strength from awareness that sooner or later he will find the right road in order to become a stronger, wiser, and more mature person. The internally motivated athlete does not entrust his own motivation and self-esteem to a group of judges who will decide to whom that evanescent symbol of power called the medal will be given. He knows very well that maybe one day he will win the real medals in life, and they will be the fruit of his incessant search for enhancement of every single interior/exterior quality. In this sense, the athlete is a warrior who—both in sports and in life—seeks out his personal teacher. Each step forward is gratification, each step backward reason for reflection.

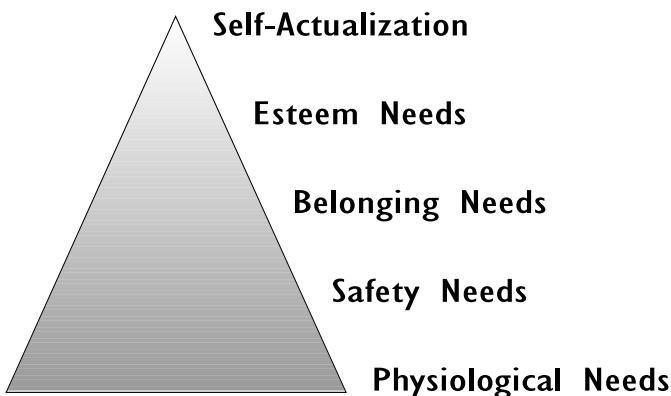
But there is much more.

The internally motivated athlete has found strength inside himself. This strength, which is not easily assimilated either to physical or mental strength, confers upon him the power to have a different, universal perspective, and in addition to this, responsibility as well, which the athlete/warrior accepts with great honor. He knows that one day all his efforts will have a positive outcome, and people will recognize in him the one who once was a small man, sullied with mud, many people will search for the road to improvement and will find a real purpose for which to live.

The athlete motivated precisely in this way is not afraid of exterior defeat. Even if he comes in last in the competition, one day he will be able to look back on the example that he has set and be proud.

Given that motivations tend to satisfy an individual's intimate needs, along theoretical lines, analyzing an athlete/individual's motivations, in reference to the values scale of noted psychologist A. Maslow, one may know also the degree of an individual's interior maturity.

According to Maslow, as one sees in his values scale, each individual seeks to satisfy "superior" needs always, following a linear consequentiality: each scale of satisfied needs represents the base for that which is superior.



Planning

Once objective strategies are set, that is, those objectives that represent the foundation on which other objectives lean, in order to permit attainment of the final purpose, it is appropriate to outline a plan of action.

The plan is one of the fundamental elements for attainment of predetermined goals. It permits us, after having selected the place or places to bring ourselves (thanks to the "goal setting" technique, the setting of objectives), to outline the road that we must follow (to choose the most suitable strategies and techniques). This power of choice allows us to leave little or nothing to chance, to plan the possible prospectives in advance, and to manage better the appropriate resources of time and energy.

Manage your energy and time resources as if you were a manager of a big company.

Remember that in order to achieve maximum results in terms of physical and mental development, you cannot allow yourself to leave anything to chance.

You do not have unlimited time and infinite energy. Choose one or more technical training strategies that fill in your weak points and further develop your strong points, and put them into practice with confidence and perseverance. Sooner or later you will be amazed at the results.

By planning, you will have benefits in terms of time management (when you know which actions to carry out and when to save time by excluding uncertainty).

Planning will allow you greater efficiency in concentrating on the objectives at hand. When you know each little step that will lead you to success, you will not have time to lose yourself in hesitation and in trivial exercises that do not give you any results.

To know your path means to know where you are going and how to make it there. When you know what to do and why, your determination grows enormously. Be careful, however, because determination does not consist of splitting one's head open to achieve one's objective, but of persevering on a given path even in the absence of immediate results and of seeking to utilize (showing mental flexibility) all possible alternatives that may lead to success. In this regard, one needs a mind opened to all possible solutions, even those apparently less logical, which Edward De Bono calls the power of creativity, of "lateral" thought. Pass and "double" people bridled in their rock logic and teach them that "two plus two makes four," just as "one plus one plus one plus one" also makes four.

And as Final Advice

Take all these techniques into consideration, but do not become a slave to them. To have success and control over one's objectives and strategies means also to allow oneself some tears as a rule, but such occurrences must be occasional. Whoever makes exceptions to his own rules shows his personal security, not being afraid of losing the predetermined way, and at the same time, allowing himself some mental and physical "holidays" which then permit him to renew his desire for success and enthusiasm, fundamental elements for anyone who is destined to a positive outcome.

Show your freedom of thought and action by making exceptions to the rules, but do not abuse them, because it could hurt you...

Final notes on planning

Each man has the power to determine his own victory or his own defeat. Everything depends on one's interior attitude, on awareness of one's limits and one's potential, and on correct management of one's resources. Leave chance and fortune to the others, to those who do not believe in their personal power and who do not place their trust exclusively in themselves. You

know, in any case, that sooner or later they will be on their own, because chance and fortune only help the bold.

You are the one responsible for making success happen. Decide now, once and for all, that your right to improve is a right that is up to you, and by your very nature, the same nature of man and of the world...you will succeed!

You will be rewarded according to how much self-confidence you will employ in your undertakings, according to how much perseverance you will demonstrate in waiting for "the dawn of results."

Put your faith in your work and know that however it goes, it will be a success.

Periodization

To comprehend the general principle of periodization means to understand the concept of "cyclicity" for all things; that is, to alternate between reciprocal situations and opposing conditions in perfect harmony. We may observe this concept in nearly every manifestation of life: in day and night, seasonal patterns and breathing cycles... In physical training, the concept is identical. It is sufficient to observe the graph for overcompensation and for body adaptation to workloads. One understands how, in the curves' alternation, the principle of cyclicity conceals itself.

In the most general training contest, we find this very important concept in programming or in annual training periodization. Physical qualities are trained in such a way that peak performance takes place at the same time as the contest period. This occurs through correct and intelligent energy management. It is highly counterproductive to train oneself with maximum intensity for long periods. Ignorance of this principle may bring the athlete to a state of psychophysical exhaustion and, in more grave cases, to injuries. When injuries become too frequent, it means that the moment has come to reduce training loads or to give oneself a resting period.

To know and apply the principle of periodization of loads means to understand that, in light of a competition, it is necessary to impose a gradual increase of training intensity, reaching its highest point on the day of the contest. Athletes who train themselves forcedly and very intensely all year round, make bad use of their psychophysical energies and damage their health and performance.

The Power of Mind and Emotions

Mind possibilities are enchanting: their development and use may determine "miraculous" changes in someone's life and the environment which is under his sphere of influence. Besides the mind, even the world of emotions may do the same. One emotion is as much real as the force which pushes us towards our goal, it is as real as the muscle block it's imprisoned in.

If our body is the expression of our mind, then each body and behavioral scheme is the result of our emotions and our thoughts.

The understanding and the use of certain mental schemes can determine the difference between the victory and defeat in sport; between richness and the poverty in economic issues; between love and loneliness in human relations; between happiness, the feeling of being fulfilled and being helpless.

If we were so able to get into mental schemes and, broadly speaking, into the great champion's mind, apart from genetic differences, how much should we put to get our own greatest performance?

If we were able to seize a great business-strategist mind, how long would it take us to find and invest in great business opportunities, invisible for the others, and become very rich? I believe that whichever situation we get in, whichever basic capital we have - it could happen in a very short time.

The examples could be endless, as many as productive and winning aspects of mind and thought are.

As for what I've just said about mental potentiality and development, it could be, and actually it is, one of possible solutions for lacking love, money or athletic results as well as for happiness in general, if by happiness we mean reaching our targets and fulfilling our most important needs.

But how many people are able to search for their own way of personal improvement and fulfillment? How many people are able to push their own thoughts beyond themselves losing control over their own present limits, to search for greatness in the example of those who have proved to have these specific abilities?

The answer is: very, very few people. Unfortunately, a feeling of mistrust is reigning among people, a feeling of being helpless, above all caused by their own lack of self-confidence and unknown possible potentiality of a very concentrated and disciplined mind for reaching their strategic targets. Another reason is the lack in strength of a heart, free and open to expect – such heart would make them immune to a danger of probable defeat.

Everyone's true way is his own heart's one, the way which goes beyond money, power and competition. Everyone is as much satisfied as his own heart is. No compliment we are paid will find its place in us, once we get off the race-stage or go away from a field, unless we feel and we are completely sure we have done our best during the training and competition. The mind can be deceived but not the heart. Knowledge is close to all those who are willing and ready to look for it: in someone's personal example, in a book, in an apparently causal and natural phenomenon...

The issue would be too large to talk about completely in a book like this one, referring also to all its possible and probable usage in any human-life field. To me, it's enough to believe I have lit a spark of self-confidence in a reader, in his athletic and human potentiality.

It's important to point out that knowledge is the power only when "the right thought" is followed by "the right action". Whichever kind of knowledge we speak about, if it's without opportunity to be used, it desperately stays imprisoned in a crystal ball... we are never the masters of anything unless we are masters of ourselves, and this is the sport "test desk": to become the masters of our own bodies and minds, through faith, discipline, perseverance and defeat, at the same time, letting our own heart be always in perfect harmony with its own deepest emotions and aspirations. This is the warrior's way in sport.

"The Being is the life state of our body. The more the body is alive, the greater is the being. The Being potentiality is cut down, is completely reduced in all that chronic tensions which limit body motility, decrease the respiration and block the expressiveness, as well as the same very Being potentiality is increasing each time we allow ourselves to feel deeply and express our sensations properly."

Alexander Lowen

Body, Mind, Spirit

According to Alexander Lowen, the father of Bioenergetics, the physical body is the sum, the result, the expression of our interior, our character, our intimate way of being, our fears, and our most intimate desires.

Our physique, in a certain sense, is our principle way of presenting ourselves, our topographic map, and not only physical scars showing signs of our past.

Fears, desires, and mental and spiritual qualities are expressed by the body. Little by little, these initial sporadic physical manifestations consolidate into physical attitudes that gradually are materialized in one's body, creating distinctive personal marks, personal expressions of our character, of our way of being. In this sense, our body is "the map" of our soul.

In a certain sense, considering the intimate body-mind connection, our mental attitudes create and modify our body, giving it its own imprint. In much the same respect, comprehending and modifying certain body attitudes, one can come to modify an individual soul. This is the reason for psychoanalytical techniques based on Bioenergetics, for the most noble purpose of sports that is to overcome one's psychophysical barriers, to raise one's spirit to higher degrees of consciousness, to toughen oneself in the fire of defeat and victory, in physical pain, and in the highest expression of our personality—synthesis of spiritual and mental qualities.

Accepting the Bioenergetics theory as valid broadens horizons; "working" on the body, one, literally, can mold a person's soul.

The athlete who finds his point of equilibrium in the planche on tense arms or in a square, is also likely to find balance in his life. A disabled per-

son who is able to balance and better his muscular topography does not only improve his relations with the world by acquiring greater independence, but also enhances his way of interacting with himself. Above all, however, he can acquire the awareness that improvement in life is a gift given to all, even and above all, to those who suffer from physical limitations. These people, as lesser endowed athletes, in comparison to millions of people who stand up on their own legs, would have an incentive for enormously greater improvement. One beautiful day someone could say, even with a pinch of healthy exhibitionism, "what you have not done standing I have done sitting!". That day, those "normal" people will understand a bit better a person who has always remained seated. It will be a beautiful lesson on life.

Show your "small-big" world, the creative force of your personal example, transmit the force, and expand the limited horizons of those who do not take advantage of their talents. One day there will be a better world thanks to you. Of course, it is not easy, but it can be done. Put yourself to work today and put into action that decision that will make you and your world better and will give more meaning to your life and to that of those who will see and listen to you. Find a purpose in life that satisfies you and makes you better. Everyone can do something great and significant. It is enough to have faith in one's dreams and perseverance to give the maximum every day. A journey of a thousand miles begins with the first step.

Muscular Training, Bioenergetics, and Personality Development

The body and its muscular structure are influenced by emotions, and it is therefore very important to comprehend the mechanisms of action and reaction. Comprehending such mechanisms, one may produce variations in the muscular tensions/psychic blocks relationship. As a consequence, such mechanisms may be free to act and "flow" in a person, thereby altering his relationship with the environment, and causing development of his own personality.

Emotions are bodily events because they represent internal body movements that become one or more external actions. Such external actions, being repeated over time, create habits and body behavior that become imprinted on muscular chains, influencing muscular range of strength and specific flexibility. Such materializations subliminally influence a person's character and his behavior and interaction with the surrounding environment.

The body represents, then, the crystallized representation of an individual's sentiments, sensations, and physical experiences.

"Training does not work on an object, but on a human being's spirit and emotions. In order to act on such delicate spheres, intelligence and discernment are needed."

Bruce Lee

This observation reveals a profound reality.

Working on muscular blocks (which determine certain behavioral patterns with the environment), one can free his way of behaving in favor of greater spontaneity and lesser energy expenditure. Such energy expenditure is remarkably caused by mental and physical blocks that literally split the individual's action, notably modifying the effectiveness and fluidity of it.

Choosing a topic familiar to those practicing sports, let us consider any movement: we have greater economy from an energy point of view and greater effectiveness in the movement when contraction of the agonist muscle is rendered fluid by release of the antagonist muscle. The action appears fluid and resolute, without strength dispersions.

Liberating a person, then, from chronic muscular tensions, gives back to him the harmony of a body without physical blocks and interior contrasts, and the beauty and grace of a body without conflicts, like that of a baby. Observing a baby, one notices how his movements are similar to a lake's waves, fluid and natural. With advancement of age, as motility tends to diminish, unresolved interior conflicts can gain ground on the person and become more rigid and structured, with consequent energy reduction.

Elimination of the blocked muscles increases the energy available for a person. Such an energy increase may cause personality development.

When a body is exhausted, stressed by more or less unconscious muscular tensions, it loses part of its vitality and, as often happens when one feels exhausted, he withdraws from the world.

On the other hand, when one has full energy potential at his disposal, he imprints on his own existence greater creative motion, effectiveness in actions, development, cultivation of new interests, and, perhaps the most important, greater and more satisfying interaction with the environment (consequently generating greater and more satisfying human and social contacts).

Muscular training may be viewed from outside competitive aims, and considered through the increase of functional capacities of flexibility, strength, and resistance, and through overcoming muscular arrests. Such arrests may be considered as unconscious personality blocks that may set up an opportunity for one to "win back" himself and to maintain physical and mental harmony. This predominantly results in a strong personality, yet at the same time one that is sweet and vibrant. A body and per-

sonality of this type rightly may define their own little expression of the harmony of the cosmos.

Psychophysical Integration and New Borders of Stretching - Body, Mind, and Spirit Harmony

Considering someone's body, mind and spirit as inseparably united where each aspect and experience influences the others, we can understand the importance of stretching as a true and real therapy for the deepest levels of a being.

Bionergy sees the body as a soul's picture in a mirror. The body with its muscular qualities of strength, flexibility, resistance and its organic functions (respiration, sight, hearing and the others) is the somatization of the way we perceive ourselves and the world around us, as well as the way we relate with it.

Each organ and muscular structure reflects our real-life, which has changed into present body reality: the muscular tensions of a certain part of body can reflect real and typical derangement at someone's mental and emotional level.

Therefore, we can easily understand how stretching, meant as a work over psycho-bodily tensions, can, really, have therapeutic aims, at very deep levels where the sight can't get easily.

Concerning this, it's enough to give as a clear example, a close existing relationship between muscular tensions of eye extrinsic muscles and refractive defects: such muscular tensions, reflecting over saccadic movements of the eyes, provoke a central fixation quality decay and inevitably, the same very focusing capacity is worsening.*

Working specifically over such muscular blocks and imbalances we can clearly improve the sight and focusing qualities, being the sight also emotional and mental phenomenon besides the physiologic one. We can understand how acting "mechanically" over the strength and flexibility we can influence also very fine mental, emotional and even "relational" functions, crystallized and contained in a certain organ or muscular structure. As the new Optometry branches testimony (like the Behavioral one)– improving functional sight capacities through different techniques on someone's body, his mind and his emotions, we can get positive results not only with his sight quality levels but also with his personality.

The above mentioned let us understand the importance of stretching beyond the sports and competitive purposes, but in the context of psychophysical spiritual healing.

Such an aim can be depicted in "Scheme of Proportions" by Leonardo da Vinci, which, to the careful eye, visibly reveals the healing movement, as well as human evolution and growth by acquiring his entire physical functionality.

It happens due to joints unblocking from tensions which drive someone away from his whole physical, mental and emotional expressions. We can see someone's birth and development – the one who is completely integrated with himself and the world around him, the one who has resolved his internal conflicts and has completely thrown himself into full expression of his own.

Undoubtedly, this is a very tough aim but it is justified and stimulated by a possibility which everyone has – to overcome his own present limits and reach a higher level of his being beyond "showing off".

This is the prospective of growth, evolution and healing, the prospective of a conscious and specific work on the body through stretching exercises and muscle re-balancing.

Beyond Physiology

When an organ's functionality reaches its extreme limits, given by its physiology and organic structure, new possibilities are being offered.

The new horizons of perception and use.

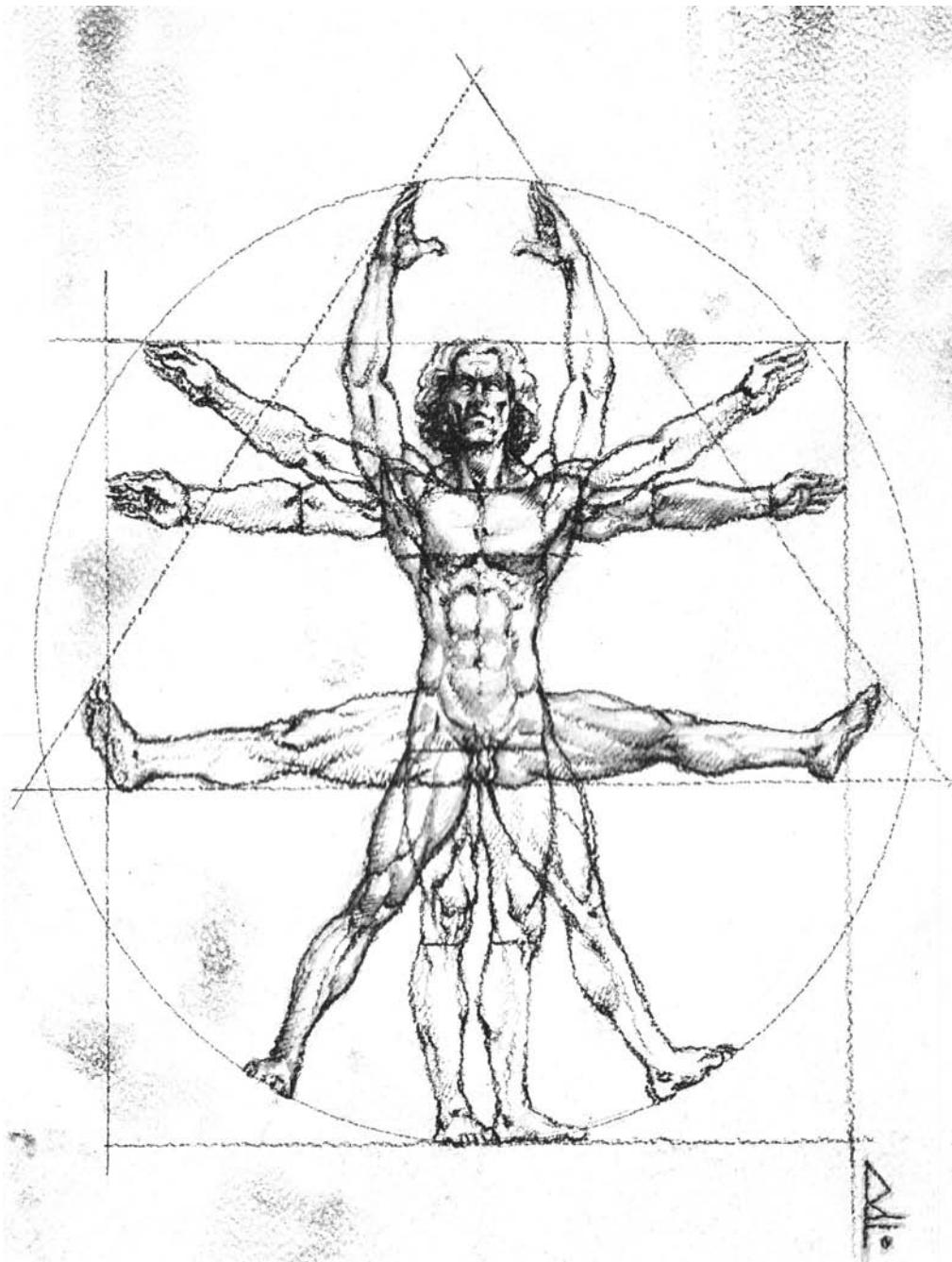
Psycho-bodily integration leads the physiology of body to its highest expressive potentiality and efficiency.

The mind and the spirit as well, born again into a new life, free to flow along the river without obstacles, where everything slides without hindrance.

The energy flows as well as the thoughts and emotions, without physical or emotional blocks any more.

So, a person becomes physically complete, pure in his divine essence, ready to reach the new dimensions sharpening his sensory organs which extend towards the new dimensions of being and perceiving.

Note: For thorough knowledge on Visual Training look for Power Vision System – The Secret of Perfect Vision, David De Angelis in Bibliography



Psychophysical integration – Human evolution – The Master

To Free the Body - to Heal the Spirit

A body, free from muscular blocks, is the body free to exist and ready to show its highest expressiveness.

When someone is gradually getting free from his muscular armor, from all that unnecessary muscular tension becoming healthy body from bioenergetic point of view, he discovers the “fluency” in his own being and in all his movements, not only in sport, as well as in his feeling and integration with the environment. Such fluency may be compared to river water flowing without obstacles: such a quality belongs to a body which has reached very high muscular ability levels working on joint unblocking, to the body which has been released from all that repressing emotions, which are crystallized in muscular blocks.

On the other side, a body more or less blocked in its muscular armor, may be compared to a sludgy river water crowded with debris, the river of which the full and free flowing is obstructed by the “rigidity” of its own elements.

To take the body to its highest joint range, freeing it from its limits, means also to take it back to its natural state of grace, where it is completely free to exist, perceive and express itself.

Being understood such way, stretching means not only a way for athletic improvements, but also a way to heal someone's personality.

A conscious work on your own body may lead you, throughout time, to psycho-bodily integration which means body-freeing and spirit-healing.

Message for Those Who Suffer from Physical Limitations

Show what the apotheosis of the personal example is: devise a focused and specific training plan according to your needs and keep in mind that physical strength begins in the mind. Have faith in improvement and open up the eyes of those who, even if crafty on their feet and endowed with more favorable genetic baggage, without your personal example of faith and perseverance, will be compelled for all their life to remain “seated,” chained to their mental limitations.

This is the real Olympiad of human capacity: to create the miracle of personal development starting from a disadvantaged condition.

Appendix I

Plan for Static Active Flexibility Development (Free-standing Trials of Strength)

The effectiveness of these training plans for strength development is proven by the fact that they respect the correct physiological principles for development of an “intelligent” muscle; that is, one trained in order to carry out determined, specific movements. These principles consist of the following:

Load progression (gradual load and training intensity increase). The number of repetitions and times in isometric “contractions” must be increased gradually.

Specificity: particular emphasis is given to the joint ranges that reflect the athletic movement that one wants to acquire.

Before undertaking specific and highly intense exercises such as the following, it is necessary to construct a strength “base” through imprecise trainings with weights.

An untrained musculature may be subjected to trauma if not appropriately prepared.

Consult your sports physician before embarking upon any type of physical activity.

Scheme for Beginner Athletes

Repeat the sequence at least two times per week, appropriately spaced out.

Exercise 1—Elbow Hold

Maintain position for thirty seconds for a total of three times.

Maintain position, tightening buttocks and abdomen and keeping hip retroverted.

Recommendation: Do not bend back's lumbar region.



Exercise 2 - Elbow Hold in Prone Position

Maintain position for thirty seconds for a total of three times.

Maintain position, tightening buttocks and abdomen and keeping hip retroverted.

Recommendation: Do not bend back's lumbar region.



Exercise 3 - Raise Opened Legs

Ten repetitions for three series, plus ten seconds stopping in the maximum closing.

Recommendation: Do not rotate backward and keep chest inclined forward. Avoid bending lower back.



Exercise 4 - Hip Raise

Ten repetitions and ten seconds stopping at the maximum closing; one or two series.

Pushing forward with arms, raise hip as high as possible.

Recommendations: Keep arms tense and utilize all the range of movement granted by the joint. Do not bend lumbar region.



Scheme for Average Athletic Strength

Repeat the sequence at least two times per week with appropriately spaced out intervals.

Exercise 1 - Elbow Hold

Maintain position for thirty seconds for a total of three times.

Maintain position, stiffening buttocks and abdomen and keeping hip retroverted.

Recommendation: Do not bend back's lumbar region.



Exercise 2 - Elbow Hold in Prone Position

Maintain position for thirty seconds for a total of three times.

Maintain position, stiffening buttocks and abdomen and keeping hip retroverted.

Recommendation: Do not bend back's lumbar region.



Exercise 3 - Raise Opened Legs

Ten repetitions for three series, plus ten seconds stopping at the maximum closing.

Recommendation: Do not rotate backward and keep chest inclined forward. Avoid bending lower back.



Exercise 4 - Hip Raise

Ten repetitions and ten seconds stopping at the maximum closing; one or two series.

Pushing forward with arms, raise hip as much as possible.

Recommendations: Keep arms tense and utilize all the period of movement allowed by the joint. Do not bend lumbar region.



Exercise 5 - Opened Square

Five repetitions for two series.

Maintain position as much as possible, looking to raise your legs.

With enhancement of the range of coxal flexibility and strength, bring your legs into a maximum square position.



Exercise 6 - "Shoulders Forward"

Maintain position twenty seconds for three times.

With your body stretched out in the back, maintain position pushing your shoulders forward as much as possible.

Recommendation: Progressively increase your forward thrust and/or holding time; maintain your abdomen and gluteus contracted. Avoid bending lower back.



Scheme for Advanced Athlete Strength

Repeat the sequence at least twice per week, appropriately spacing out breaks.

Exercise 1 - Elbow Hold

Maintain position for thirty seconds for a total of three times.

Maintain position, tightening buttocks and abdomen and keeping hip retroverted.

Recommendation: Do not bend back's lumbar region.



Exercise 2 - Elbow Hold in Prone Position

Maintain position for thirty seconds for a total of three times.

Maintain position, tightening buttocks and abdomen and maintaining hip retroverted.

Recommendation: Do not bend back's lumbar region.



Exercise 3 - Raise your Legs Together

Ten repetitions for three series, plus ten seconds stopping in the maximum closing.

Recommendation: Do not rotate backward and keep chest inclined forward. Eventually, one can make the exercise less difficult by alternating repetitions, first on one leg and then on the other. Avoid bending lower back.



Exercise 4 - Raise Opened Legs

Ten repetitions for three series, plus ten seconds stopping in the maximum closing.

Recommendation: Do not rotate backward and keep chest inclined forward. Avoid bending lower back.

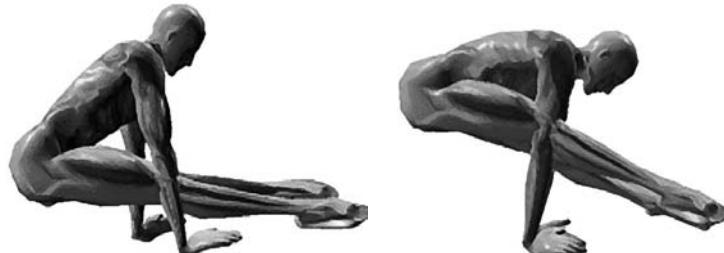


Exercise 5 - Hip Raise

Ten repetitions and ten seconds stopping in the maximum closing; one or two series.

Pushing forward with your arms, raise hip as much as possible.

Recommendations: Keep arms tense and utilize all the range of movement granted by the joint. Do not bend lumbar region.



Exercise 6 - Square Legs Together

Maintain position ten seconds, fifteen seconds, twenty seconds, for a total of three repetitions.

Recommendations: Keep legs removed from the ground without bending back's lumbar region.

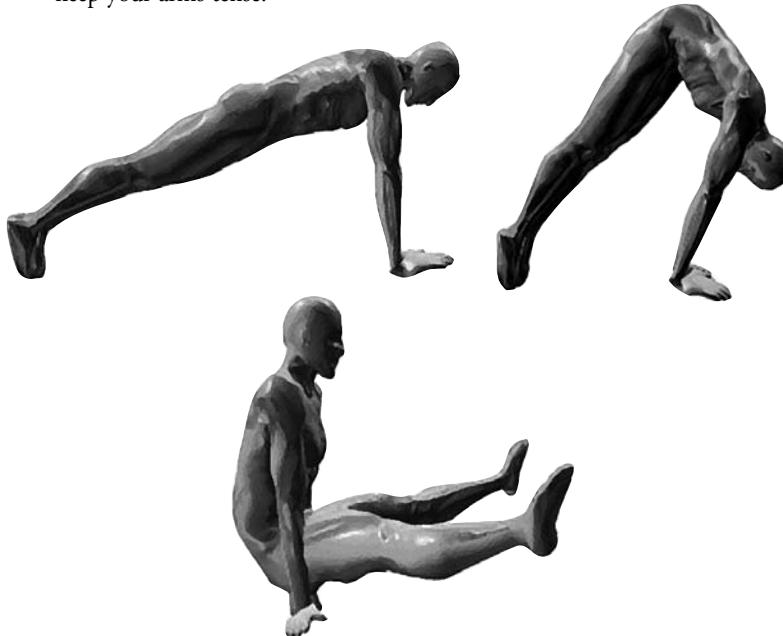


Exercise 7 - Between Arms Passage

Five repetitions for two series.

With your body stretched backward and keeping your arms tense, raise your buttocks and cross your legs. Then, raise your legs between your arms, finishing the exercise in a square position. With enhancement of the range of coxal flexibility and strength, bring your legs into a maximum square position.

Recommendation: In order to facilitate the passage, cross your feet and keep your arms tense.



Exercise 8 - Half Square, Both Left and Right

Maintain position thirty seconds for three series for each part.

Recommendations: Keep your legs removed from the floor; knees and points in extension.



Exercise 9 - Opened Legs Square

Maintain position for as long as possible.

Legs may be parallel to the ground or in a maximum square position.

Recommendations: Knees and points in extension.

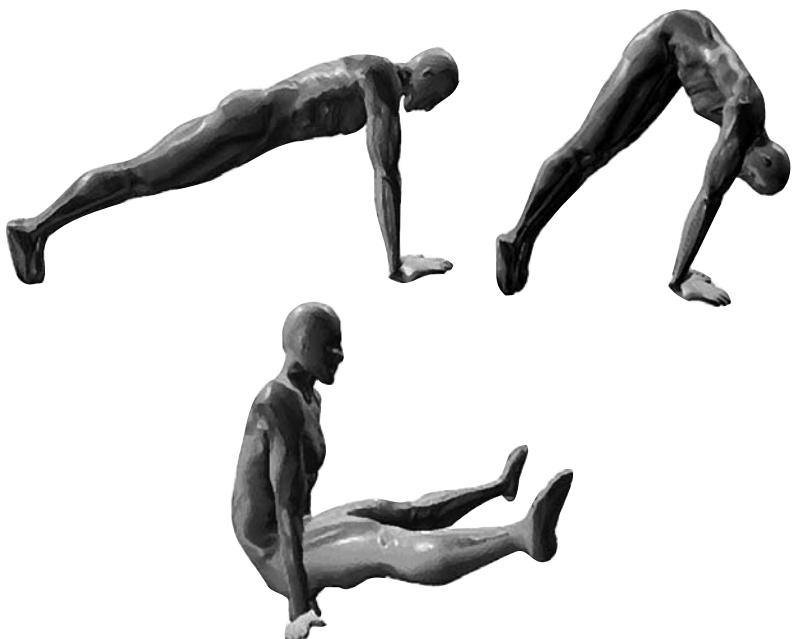


Exercise 10 - Passage from a Stretched Body at the Back to a Square with Central Support

Five repetitions for two series.

From a stretched out body at the back, keep your legs together and tense until bringing your pelvis to its maximum height. Then open your legs and arrive in the square position with central support.

Recommendation: Keep your arms tense.



Exercise 11 - Maintain Position

Maintain position twenty seconds for three times.

Leaning against two supports or two steps, maintain position trying to raise your hip and remove your feet from the ground.

Recommendation: Pay much attention to not bending your back.



Exercise 12 - "Shoulders Forward"

Maintain position twenty seconds for three times.

With your body stretched out at the back, maintain position pushing your shoulders forward as much as possible.

Recommendation: Progressively increase the forward thrust and/or the holding time.



Exercise 13 - Thrusting Your Feet, Reach the Planche Position

Ten repetitions for two series.

Recommendation: Do not bend your back's lumbar region in the final position.

Seek to carry out the exercise in a controlled manner, without kicking.



Exercise 14 - Maintain Position

Maintain position ten seconds for three times.

Maintain position grouped together, looking to raise your pelvis and remove your legs from the floor.

Recommendation: Keep your arms tense as much as possible.



Exercise 15 - "Bar Closings"

Ten repetitions for three series (also with legs bent).

For the back, raise your legs until bringing them into a vertical position.

Recommendation: Finish the exercise when your back's lumbar region begins to bend.

One may decrease the exercise's difficulty by doing it with legs bent. In order to make this exercise effective, one must insist on hip retroversion (bend your hip upward).



Exercise 16 - Lumbars on Bench

Ten repetitions for three series, plus ten seconds extension hold.

Raise your legs, keeping your chest on a bench.

Recommendation: Carry out the exercise in a controlled manner, without wildly kicking your legs.

The exercise turns out to be made easier if done with your legs wide open (the lever's arm proves to be shorter).



Appendix 2

Normal Movement Ranges of the Joints

Neck	
Flexion 40°	Touch your sternum with your chin
Extension 55°	Try to point up with your chin
Lateral bending 35°	Bring your ear close to your shoulder
Lateral rotation 70°	Turn your head far to the left, then to the right

Lumbar Spine	
Flexion 60°	Bend forward to the level of the waist
Extension 30°	Bend backward
Lateral bending 20°	Bend laterally

Shoulder	
Abduction 180°	Bring your arm laterally upward
Abduction 30-45°	Bring your arm toward the midline of your body
Horizontal extension 45°	Swing your arm horizontally backward
Horizontal flexion 130°	Swing your arm horizontally forward
Vertical extension 60°	Raise your arm straight backward
Vertical flexion 180°	Raise your arm straight forward

Elbow	
Extension 180°	Extend your arm
Flexion 150°	Bring your lower arm close to your biceps
Supination 90°	Turn your forearm so that your palm points up
Pronation 85°	Turn your forearm so that your palm points down

Wrist	
Flexion 80-90°	Bend your wrist so that your palm comes closer to your forearm
Extension 70°	Bend your wrist in the opposite direction
Radial deviation 20°	Bend your wrist so that your thumb comes closer to your radius
Ulnar deviation 30-50°	Bend your wrist so that your little finger comes closer to your ulna

Hip	
Flexion 110-130°	Flex your knee and bring your thigh close to your abdomen
Extension 30°	Shift your thigh backward without moving your pelvis
Abduction 45°	Move your thigh away from the midline
Adduction 30°	Bring your thigh toward and across the midline
Internal rotation 40°	Flex your knee and move your lower leg away from the midline
External rotation 45°	Flex your knee and move your lower leg toward the midline

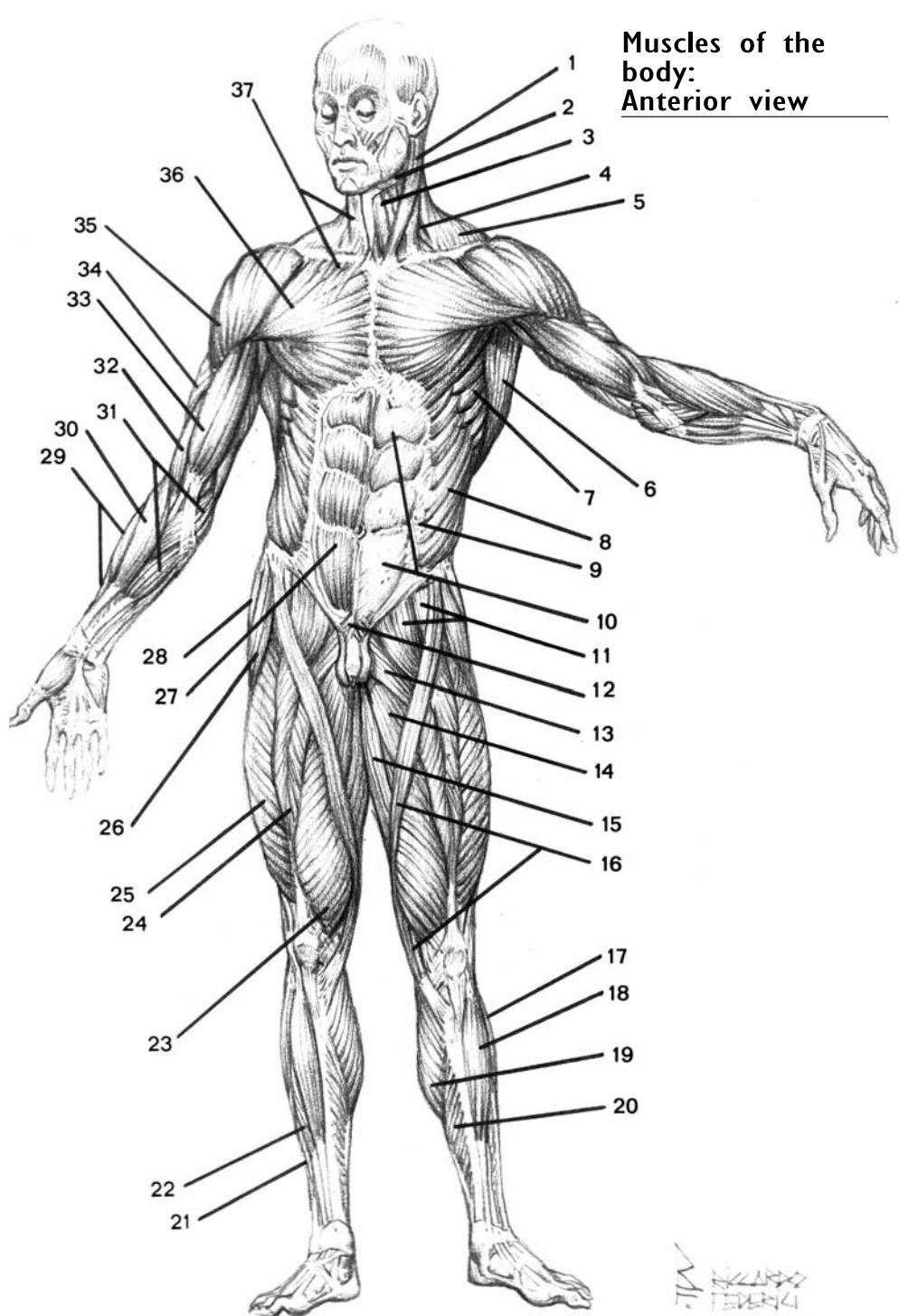
Knee	
Flexion 160°	Touch your femoral biceps to your calf
Extension 5°	Extend your knee as much as possible
Internal rotation 10°	Rotate your lower leg toward the midline

Ankle	
Extension 20°(dorsiflexion)	Bend your ankle so that your toes point up
Flexion 45°(plantar flexion)	Bend your ankle so that your toes point down
Inversion 30°	Turn your foot so that the sole is turned to the inside
Eversion 20°	Turn your foot so that the sole is turned to the outside

Appendix 3

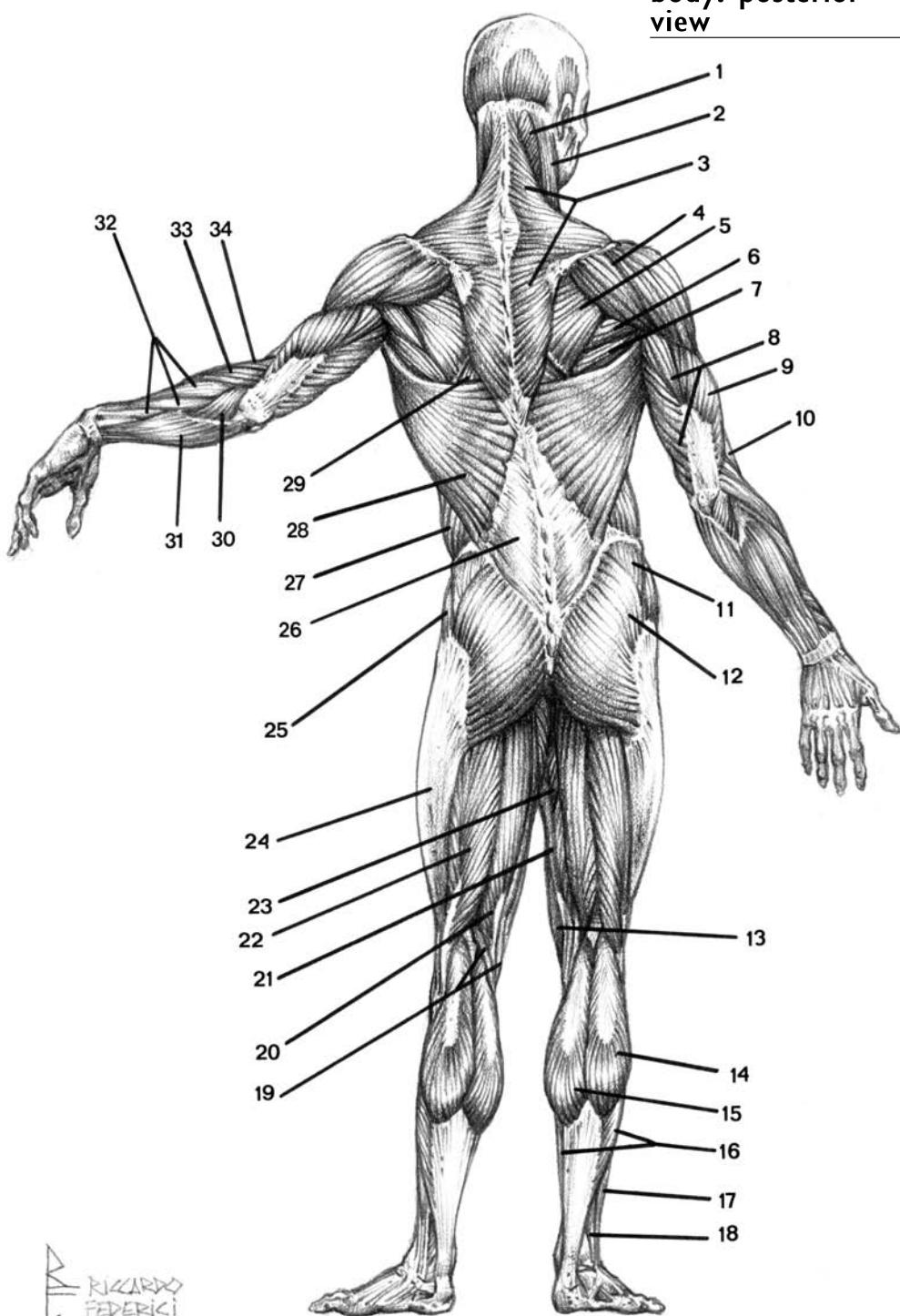
Anatomical tables

**Muscles of the
body:
Anterior view**



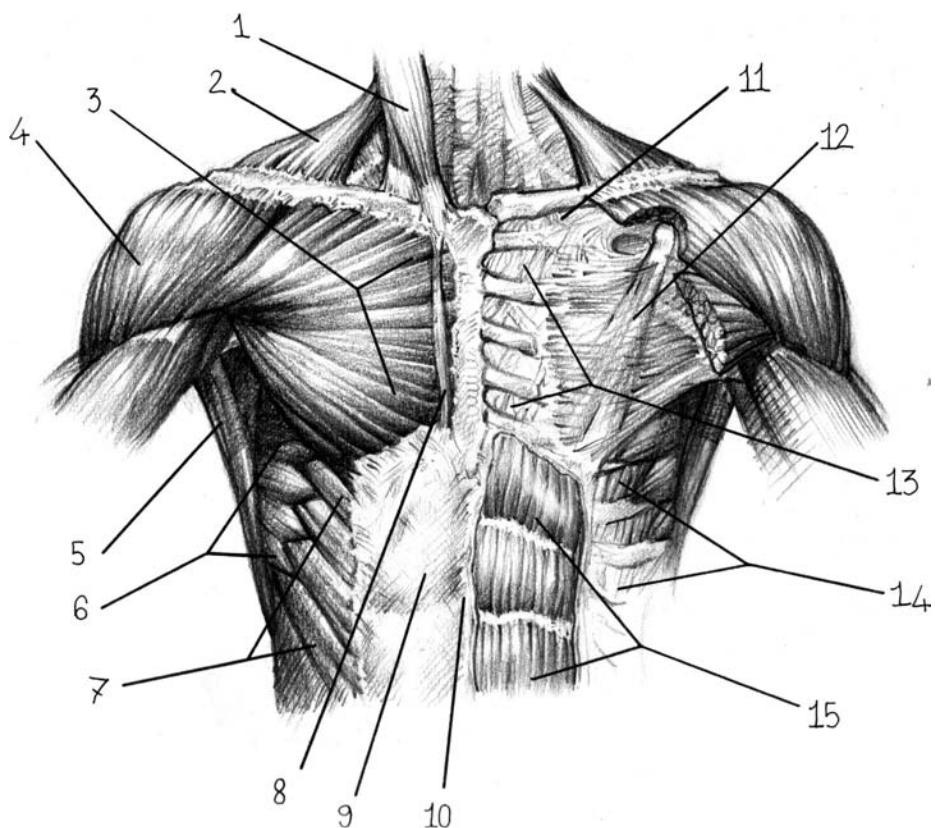
Frontal Muscles: Denomination

1. MUSCULUS STERNOCLÉIDOMASTOÏDEUS CAPUT STERNALIS
2. SECTIONED PLATYSMA (OR CUTANEOUS) MUSCLE
3. INFRAHYOID MUSCLES; MUSCULI INFRAHYOIDEI
4. SCALENE MUSCLES
5. MUSCULUS TRAPEZIUS
6. MUSCULI LATISSIMI DORSI
7. MUSCULUS SERRATUS ANTERIOR
8. MUSCULUS OBLIQUUS EXTERNUS MAJOR
9. APONEUROSIS OF THE MUSCULUS OBLIQUUS EXTERNUS MAJOR
10. SHEATH OF THE MUSCULUS RECTUS ABDOMINIS
11. MUSCULUS ILIOPSOAS
12. MUSCULUS PYRAMIDALIS
13. MUSCULUS PECTINEUS
14. MUSCULUS ADDUCTOR LONGUS
15. GRACILIS MUSCLE; MUSCULUS GRACILIS
16. MUSCULUS SARTORIUS
17. MUSCULUS PERONEUS LONGUS
18. MUSCULUS TIBIALIS ANTERIOR
19. MUSCULUS GASTROCNEMIUS
20. MUSCULUS SOLEUS
21. MUSCULUS PERONEUS BREVIS
22. MUSCULUS EXTENSOR DIGITORUM LONGUS
23. MUSCULUS VASTUS MEDIALIS
24. MUSCULUS RECTUS FEMORIS
25. MUSCULUS VASTUS LATERALIS
26. TENSOR FASCIAE LATAE REFLEX
27. VAGINA MUSCULI RECTI ABDOMINIS
28. MUSCULUS GLUTEUS MEDIUS
29. MUSCULI RADIALIS BREVIS AND LONGUS OF THE CARPUS
30. MUSCULUS BRACHIORADIALIS
31. MUSCULUS FLEXOR SUPERFICIALIS
32. MUSCULUS BRACHIALIS
33. BICIPITAL MUSCLE OF THE ARM
34. CAPUT LATERALE MUSCULI TRICIPITIS
35. DELTOID MUSCLE; MUSCULUS DELTOIDEUS
36. MUSCULUS PECTORALIS MAJOR
37. CUTANEOUS MUSCLE

Muscles of the body: posterior view

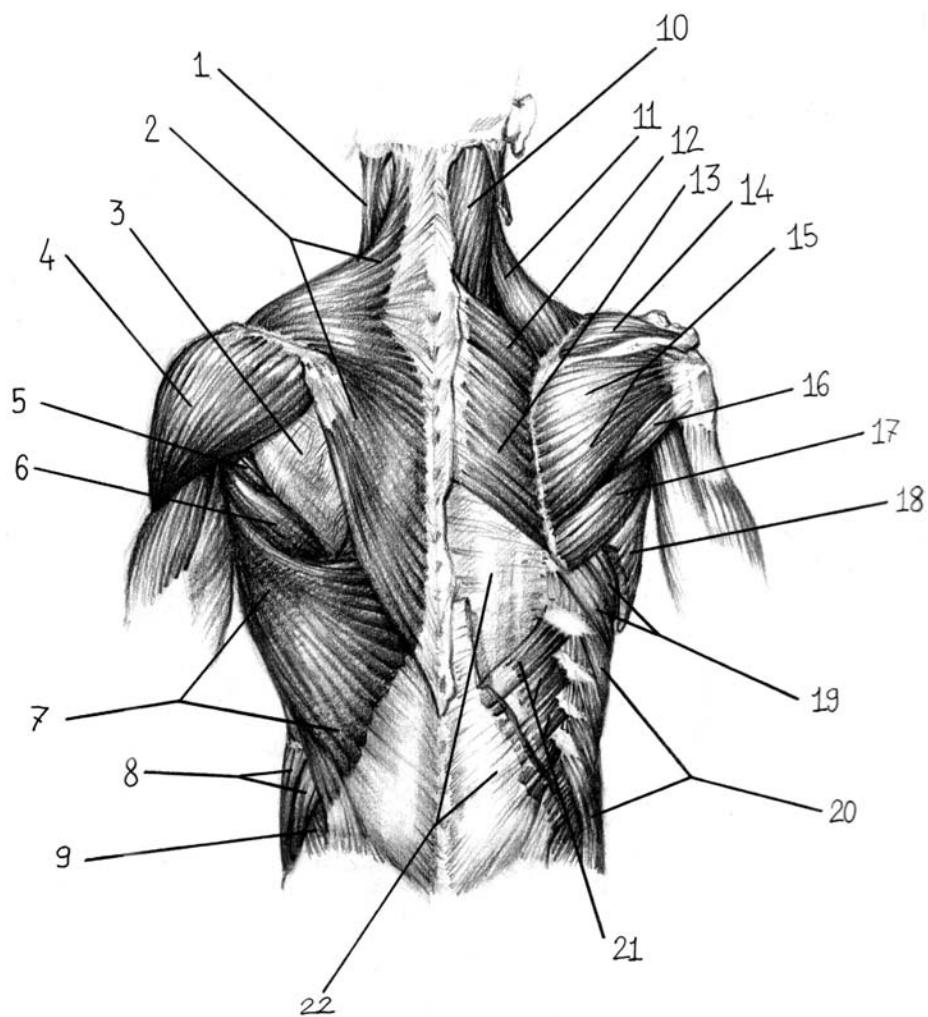
Posterior Muscles: Denomination

1. MUSCULUS SPLENIUS CAPITIS
2. MUSCULUS STERNOCLEIDOMASTOIDEUS
3. MUSCULUS TRAPEZIUS
4. DELTOID MUSCLE, MUSCULUS DELTOIDEUS
5. MUSCULUS INFRASPINATUS
6. MUSCULUS TERES MINOR
7. MUSCULUS TERES MAJOR
8. APUT LONGUM MUSCULI TRICIPITIS
9. APUT LATERALE MUSCULI TRICIPITIS
10. MUSCULUS BRACHIORADIALIS
11. MUSCULUS GLUTEUS MEDIUS
12. MUSCULUS GLUTEUS MAXIMUS
13. MUSCULUS SARTORIUS
14. MUSCULUS GASTROCNEMIUS LATERALE
15. MUSCULUS GASTROCNEMIUS MEDIALE
16. MUSCULUS SOLEUS
17. MUSCULUS PERONEUS BREVIS
18. MUSCULUS PERONEUS LONGUS
19. MUSCULUS SEMIMEMBRANOSUS
20. MUSCULUS SEMITENDINOSUS
21. GRACILIS MUSCLE; MUSCULUS GRACILIS
22. MUSCULUS BICEPS FEMORIS
23. MUSCULUS ADDUCTOR MAGNUS
24. ILIOTIBIAL TRACT OR BAND; TRACTUS ILIOTIBIALIS
25. MUSCULUS TENSOR FASCIAE LATAE
26. FASCIA THORACOLUMBALIS; LUMBODORSAL FASCIA; THORACOLUMBAR FASCIA
27. MUSCULUS OBLIQUUS EXTERNUS MAJOR
28. MUSCULI LATISSIMI DORSI
29. MUSCULUS RHOMBOIDEUS MAJOR
30. MUSCULUS ANCONEUS
31. MUSCULUS FLEXOR CARPI ULNARIS
32. MUSCULUS EXTENSOR DIGITORUM DEL CARPUS
33. MUSCULUS EXTENSOR RADIALIS LONGUS
34. MUSCULUS BRACHIORADIALIS

A — Thorax front wall

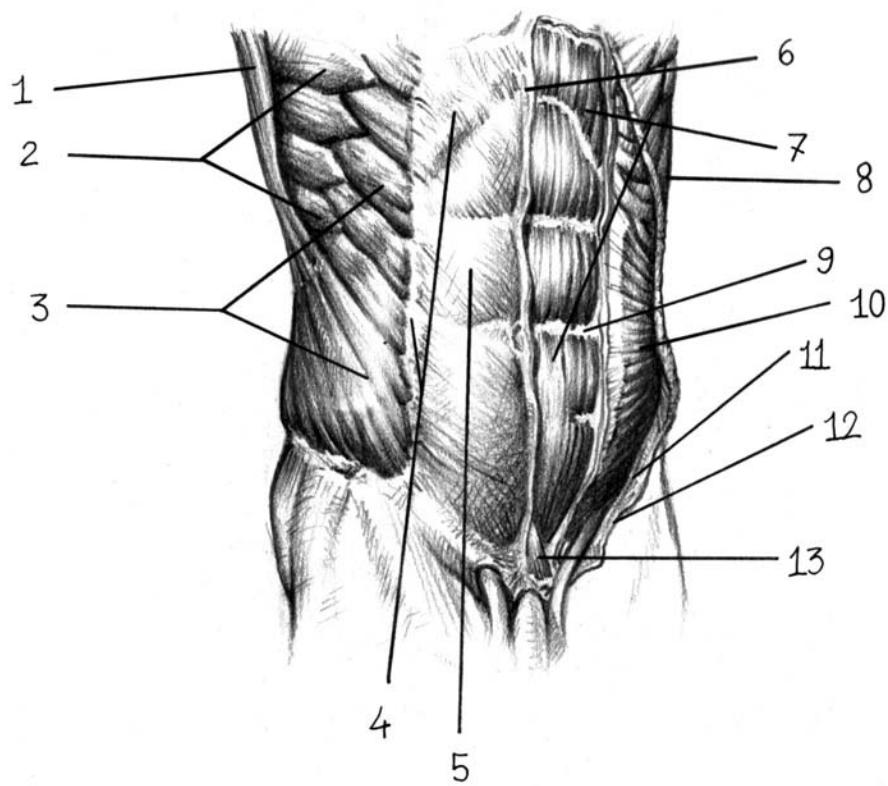
(A) - Thorax Front Wall Muscles: Denomination

1. MUSCULUS STERNOCLIDOMASTOIDEUS
2. MUSCULUS TRAPEZIUS
3. MUSCULUS PECTORALIS MAJOR
4. MUSCULUS DELTOIDEUS
5. MUSCULUS LATISSIMI DORSI
6. MUSCULUS DENTATUM ANTERIOR
7. MUSCULUS OBLIQUUS EXTERNUS
8. MUSCULUS SERRATUS
9. SHEATH OF THE MUSCULUS RECTUS ABDOMINIS
10. ABDOMINAL LINE – WHITE LINE
11. SUBCLAVIUS
12. MUSCULUS PECTORALIS MINOR
13. LIGAMENTA INTERCOSTALIA ESTERNI
14. MUSCULI INTERCOSTALIA
15. MUSCULUS RECTUS ABDOMINIS

B - Thorax back wall

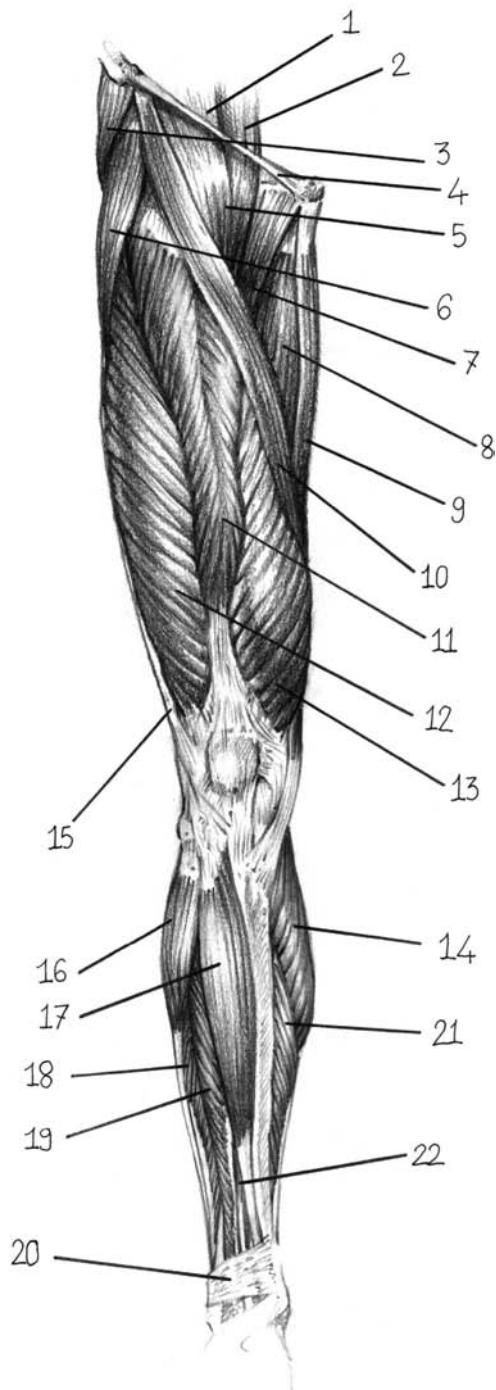
(B) - Thorax Back Wall Muscles: Denomination

1. MUSCULUS STERNOCLEIDOMASTOIDEUS
2. MUSCULUS TRAPEZIUS
3. MUSCULUS INFRASPINATUS
4. MUSCULUS DELTOIDEUS
5. MUSCULUS TERES MINOR
6. MUSCULUS TERES MAJOR
7. MUSCULUS LATISSIMI DORSI
8. MUSCULUS OBLIQUUS EXTERNUS ABDOMINIS
9. TRIGONUM LUMBAL [PETITI]
10. MUSCULUS SPLENIUS CAPITIS
11. MUSCULUS LEVATOR SCAPULAE
12. MUSCULUS RHOMBOIDEUS MINOR
13. MUSCULUS RHOMBOIDEUS MAJOR
14. MUSCULUS SUPRASPINATUS
15. MUSCULUS INFRASPINATUS
16. MUSCULUS TERES MINOR
17. MUSCULUS TERES MAJOR
18. MUSCULUS LATISSIMI DORSI [SECTIO]
19. MUSCULUS SERRATUS ANTERIOR
20. MUSCULUS OBLIQUUS EXTERNUS ABDOMINIS
21. MUSCULUS SERRATUS POSTERIOR SUPERIOR
22. FASCIA THORACOLUMBARIS

C — Abdomen wall (Anterior view)

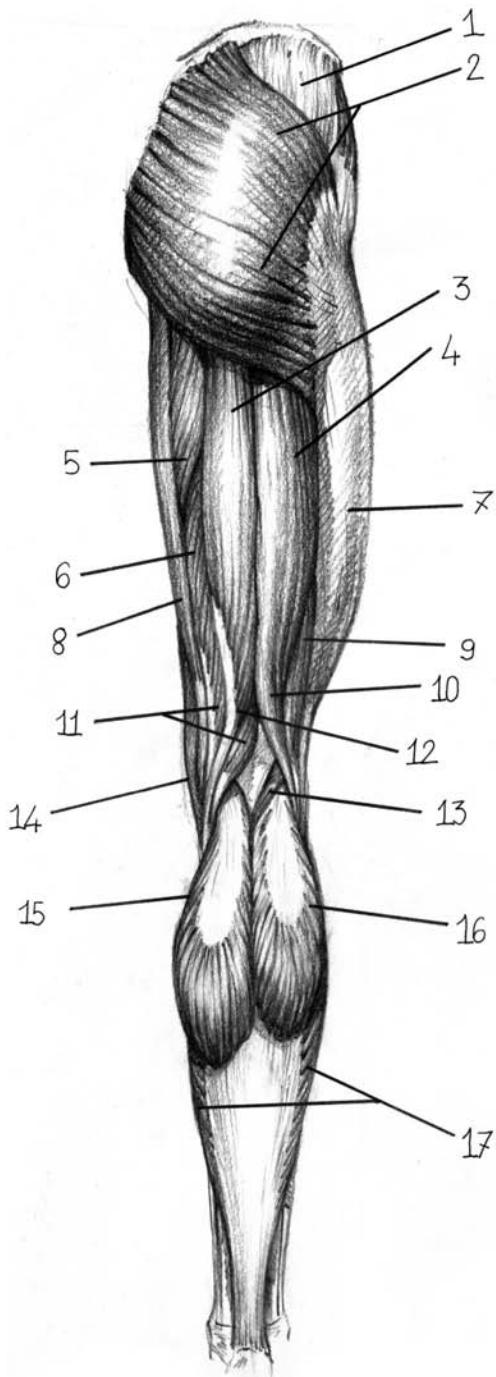
(C) - Front Abdomen Wall Muscles: Denomination

1. MUSCULUS LATISSIMI DORSI
2. MUSCULUS SERRATUS
3. MUSCULUS OBLIQUUS EXTERNUS
4. MUSCULUS OBLIQUUS EXTERNUS [APONEUROSIS]
5. SHEATH OF THE MUSCULUS RECTUS ABDOMINIS
6. ABDOMINAL LINE- WHITE LINE
7. MUSCULUS RECTUS ABDOMINIS
8. MUSCULUS OBLIQUUS EXTERNUS ABDOMINIS [SECTIO]
9. INSCRIPTIO TENDINEI
10. MUSCULUS OBLIQUUS INTERNUS ABDOMINIS
11. INGUINAL LIGAMENT
12. MUSCULUS OBLIQUUS EXTERNUS [APONEUROSIS]
13. MUSCULUS PYRAMIDALIS

D — Thigh muscles (anterior view)

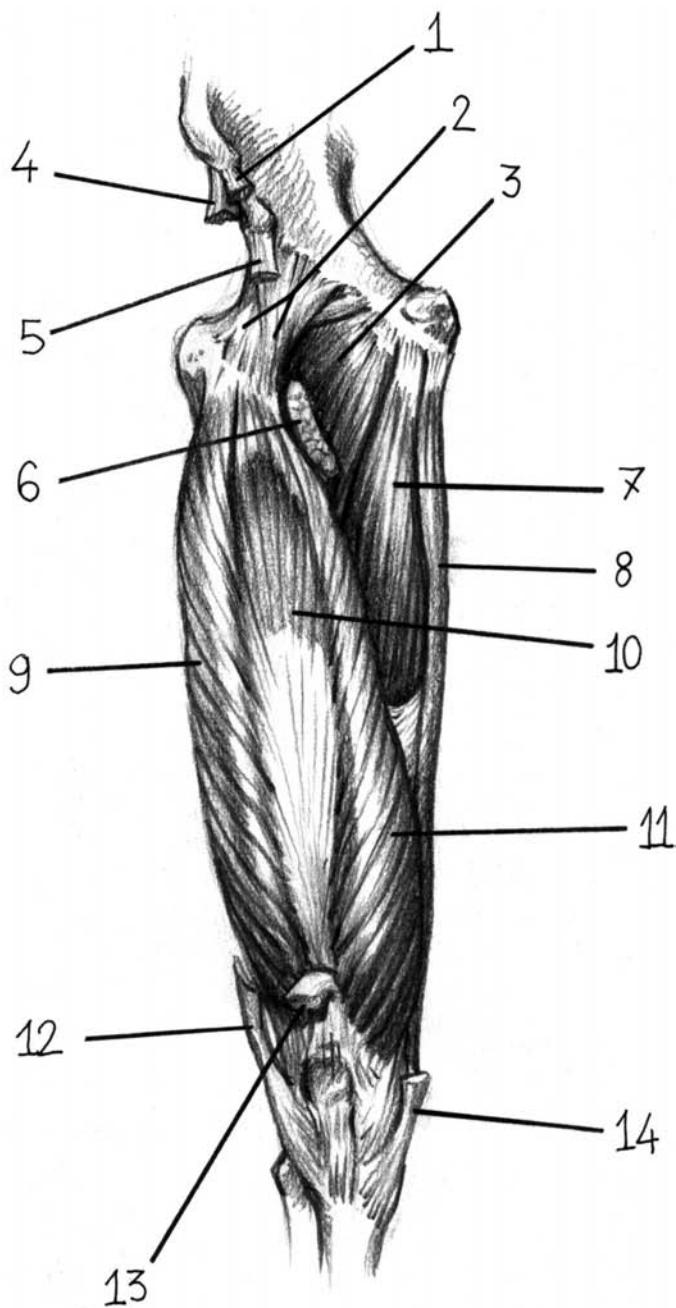
(D) - Thigh Muscles: Denomination

1. MUSCULUS ILIACUS
2. MUSCULUS PSOAS MAJOR
3. MUSCULUS GLUTEUS MEDius
4. INGUINAL LIGAMENT
5. MUSCULUS Iliopsoas
6. MUSCULUS TENSOR FASCIAE LATAE
7. MUSCULUS PECTINEUS
8. MUSCULUS ADDUCTOR LONGUS
9. MUSCULUS GRACILIS
10. MUSCULUS SARTORIUS
11. MUSCULUS RECTUS FEMORIS
12. MUSCULUS VASTUS LATERALIS
13. MUSCULUS VASTUS MEDIALIS
14. MUSCULUS GASTROCNEMIUS
15. Iliotibialis
16. MUSCULUS PERONEUS LONGUS
17. MUSCULUS TIBIALIS ANTERIOR
18. MUSCULUS PERONEUS BREVIS
19. MUSCULUS EXTENSOR DIGITORUM LONGUS
20. VAGINA TENDINUM MUSCULORUM EXTENSORUM
21. MUSCULUS SOLEUS
22. MUSCULUS EXTENSOR HALLUCIS LONGUS

E — Thigh and groin muscles (posterior view)

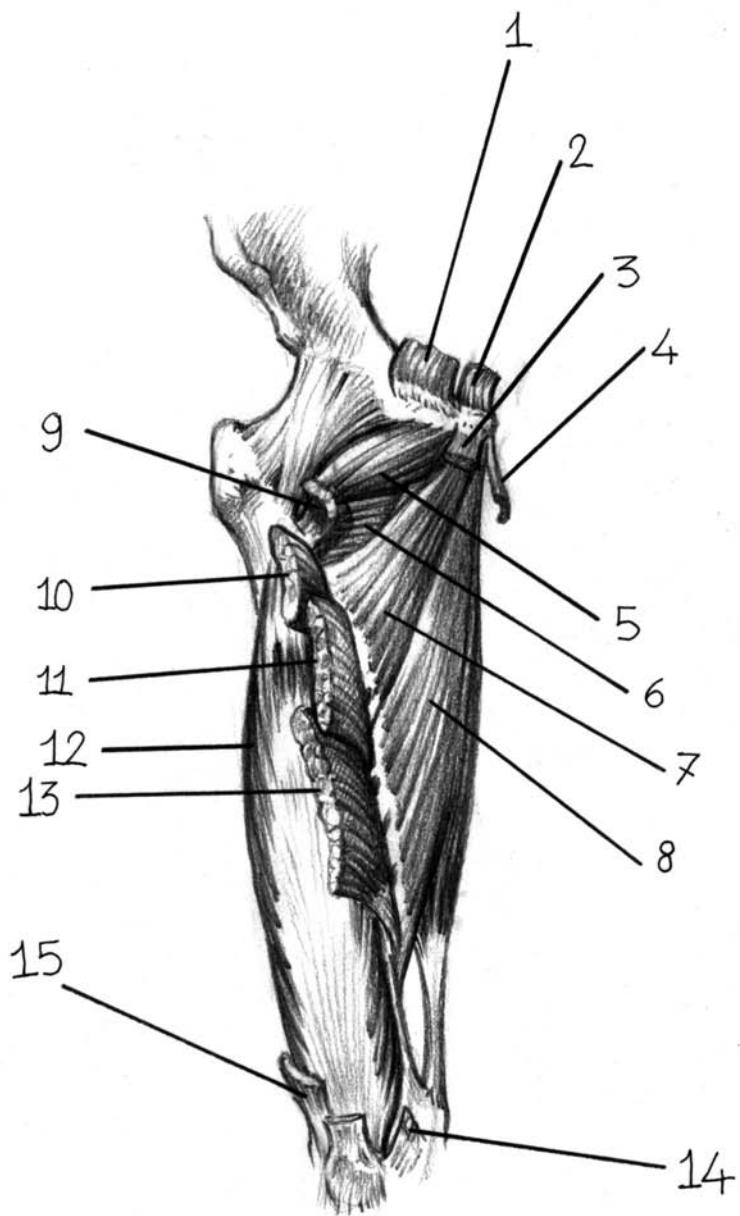
(E) - Groin and Thigh Muscles: Denomination

1. APONEUROSIS GLUTEI
2. MUSCULUS GLUTEUS MAXIMUS
3. MUSCULUS SEMITENDINOSUS
4. CAPUT LONGUM MUSCOLI BICIPITIS FEMORIS
5. MUSCULUS ADDUCTOR MAGNUS
6. MUSCULUS SEMIMEMBRANOSUS
7. ILIOTIBIALIS
8. MUSCULUS GRACILIS
9. CAPUT LONGUM MUSCOLI BICIPITIS FEMORIS
10. CAPUT BREVE MUSCOLI BICIPITIS FEMORIS
11. MUSCULUS SEMIMEMBRANOSUS
12. MUSCULUS SEMITENDINOSUS
13. MUSCULUS PLANTARIS
14. MUSCULUS SARTORIUS
15. CAPUT MEDIALE MUSCULI GASTROCNEMII
16. CAPUT LATERALE MUSCULI GASTROCNEMII
17. MUSCULUS SOLEUS

F — Thigh muscles (anterior view)

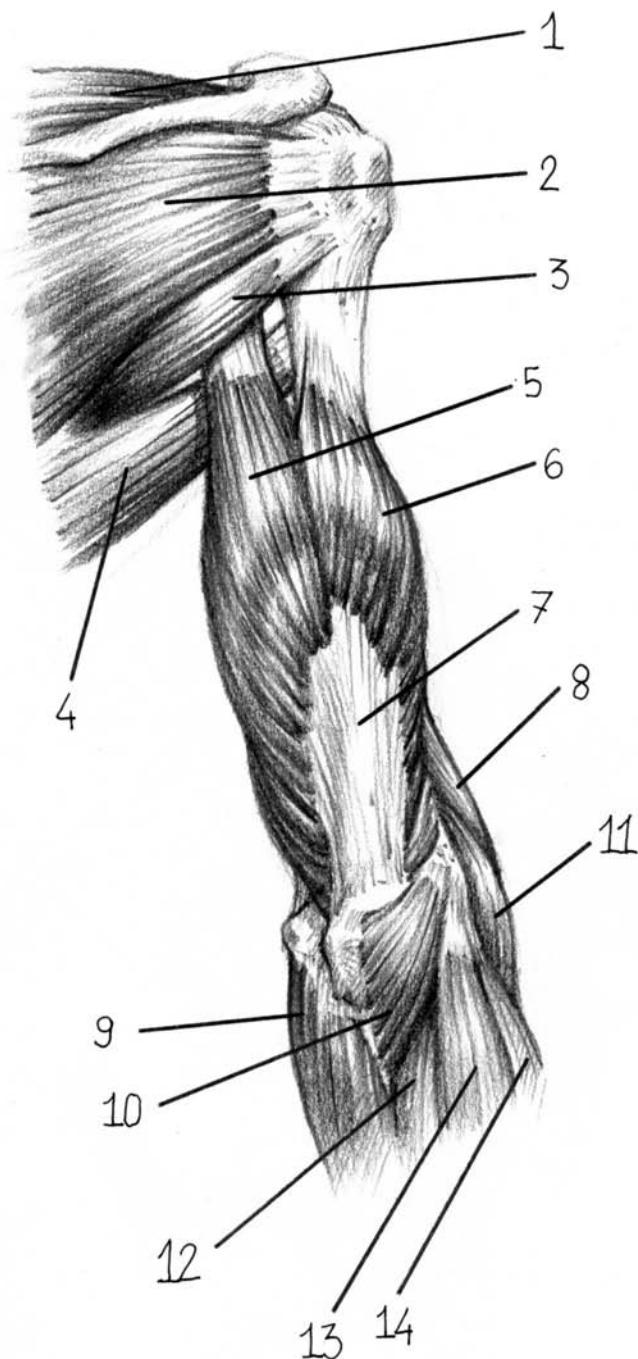
(F) - Thigh Muscles: Denomination

1. SARTORIUS [ORIGIN]
2. HIP JOINT [LIGAMENTS]
3. MUSCULUS PECTINEUS
4. MUSCULUS TENSOR FASCIAE LATAE [ORIGIN]
5. MUSCULUS RECTUS FEMORIS [ORIGIN]
6. MUSCULUS ILIOPSOAS [SECTIO]
7. MUSCULUS ADDUCTOR MAGNUS
8. GRACILIS
9. MUSCULUS VASTUS LATERALIS
10. MUSCULUS VASTUS INTERMEDIUS
11. MUSCULUS VASTUS MEDIALIS
12. ILIOTIBIALIS
13. RECTUS FEMORIS TENDON [SECTIO]
14. SARTORIUS TENDON [SECTIO]

G - Thigh muscles (anterior view)

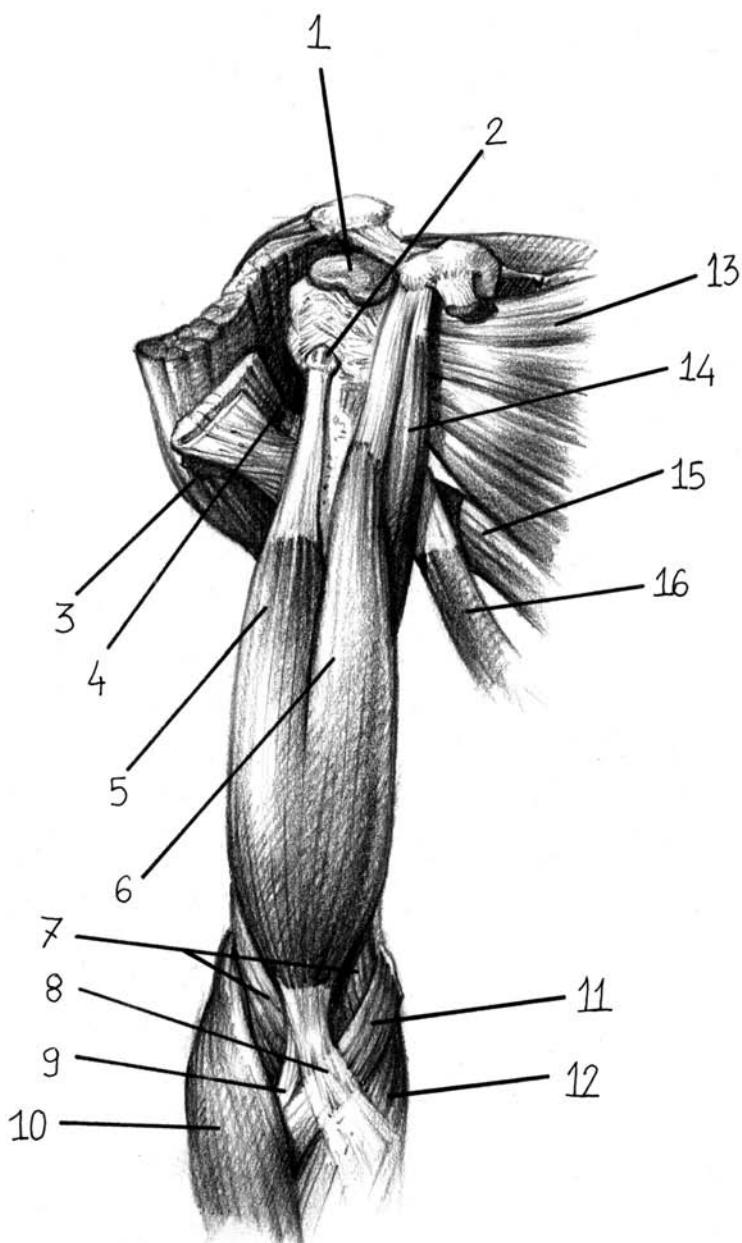
(G)- Thigh Muscles (Anterior View): Denomination

1. MUSCULUS PECTINEUS [SECTIO]
2. MUSCULUS ADDUCTOR MAGNUS [SECTIO]
3. MUSCULUS ADDUCTOR BREVIS [SECTIO]
4. MUSCULUS GRACILIS [SECTIO]
5. MUSCULUS OBTURATOR EXTERNUS
6. MUSCULUS QUADRATUS FEMORIS
7. MUSCULUS ADDUCTOR MINIMUS
8. MUSCULUS ADDUCTOR MAGNUS
9. MUSCULUS ILIOPSOAS [SECTIO]
10. MUSCULUS PECTINEUS [SECTIO]
11. MUSCULUS ADDUCTOR BREVIS [SECTIO]
12. MUSCULUS VASTUS INTERMEDIUS
13. MUSCULUS ADDUCTOR LONGUS [SECTIO]
14. MUSCULUS VASTUS MEDIALIS [SECTIO]
15. MUSCULUS VASTUS LATERALIS [SECTIO]

H — Arm back muscles

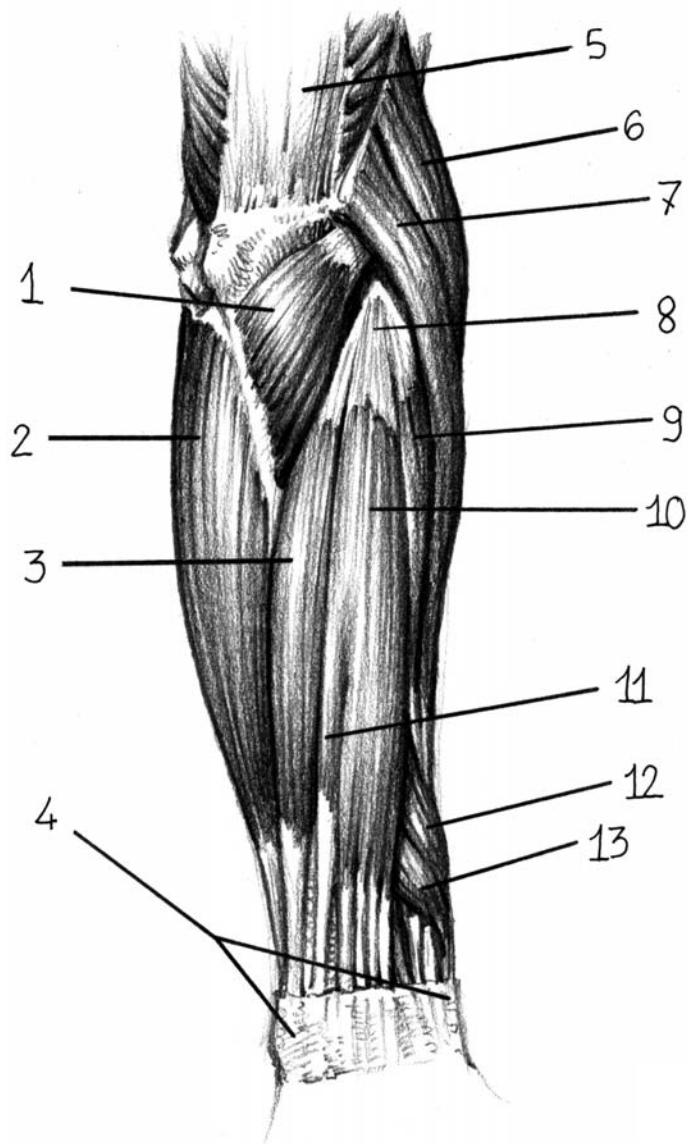
(H) - Arm Back Muscles: Denomination

1. MUSCULUS SUPRASPINATUS
2. MUSCULUS INFRASPINATUS
3. MUSCULUS TERES MINOR
4. MUSCULUS TERES MAJOR
5. CAPUT LONGUM MUSCULI TRICIPITIS
6. CAPUT LATERALE MUSCULI TRICIPITIS
7. TRICEPS [TENDON]
8. MUSCULUS RADIALIS
9. MUSCULUS FLEXOR CARPI
10. MUSCULUS ANCONEUS
11. MUSCULUS EXTENSOR CARPI RADIALIS LONGUS
12. MUSCULUS EXTENSOR CARPI ULNARIS
13. MUSCULUS EXTENSOR DIGITORUM
14. MUSCULUS CARPI RADIALIS BREVIS

I - Arm front muscles

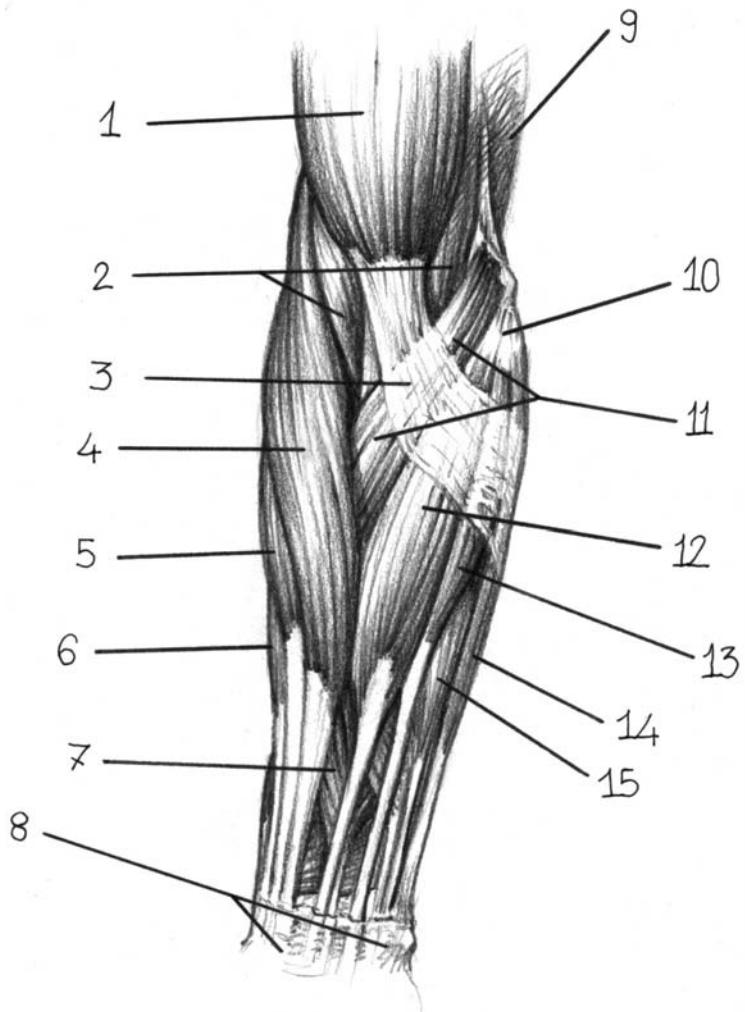
(I) - Arm Front Muscles: Denomination

1. BURSA MUCOSA [SUBDELTOID]
2. VAGINA MUCOSA INTERTUBERCULARIS
3. MUSCULUS DELTOIDEUS
4. MUSCULUS PECTORALIS MAJOR
5. CAPUT LONGUM MUSCULI BICIPITIS
6. CAPUT BREVE MUSCULI BICIPITIS
7. MUSCULUS BRACHIALIS
8. APONEUROSIS MUSCULI BICIPITI
9. TENDON MUSCULI BICIPITI
10. MUSCULUS BRACHIORADIALIS
11. MUSCULUS PRONATOR TERES
12. MUSCULUS FLEXOR CARPI RADIALIS
13. MUSCULUS SUBSCAPULARIS
14. MUSCULUS CORACOBRACHIALIS
15. MUSCULUS TERES MAJOR
16. MUSCULUS LATISSIMUS DORSI

L — Forearm back muscles

(L) - Forearm Back Muscles: Denomination

1. MUSCULUS ANCONEUS
2. MUSCULUS FLEXOR CARPI ULNARIS
3. MUSCULUS EXTENSOR CARPI ULNARIS
4. EXTENSOR RETINACULA
5. MUSCULUS TRICEPS
6. MUSCULUS BRACHIORADIALIS
7. MUSCULUS EXTENSOR CARPI RADIALIS LONGUS
8. MUSCULI EXTENSOR [TENDON]
9. MUSCULUS EXTENSOR CARPI RADIALIS BREVIS
10. MUSCULUS EXTENSOR DIGITORUM
11. MUSCULUS EXTENSOR DIGITI MINIMI
12. MUSCULUS ADDUCTOR POLLICIS LONGUS
13. MUSCULUS EXTENSOR POLLICIS BREVIS

M — Forearm front muscles

(M) – Forearm Front Muscles: Denomination

1. MUSCULUS BICEPS
2. MUSCULUS BRACHIALIS
3. APONEUROSIS MUSCULI BICIPITIS
4. MUSCULUS BRACHIORADIALIS
5. MUSCULUS EXTENSOR CARPI RADIALIS LONGUS
6. MUSCULUS EXTENSOR CARPI RADIALIS BREVIS
7. MUSCULUS FLEXOR POLLICIS LONGUS
8. FASCICULI TRANSVERSI APONEUROSIS PALMARIS
9. MUSCULUS TRICEPS
10. MUSCULI FLEXOR [TENDON]
11. MUSCULUS PRONATOR TERES
12. MUSCULUS FLEXOR CARPI RADIALIS
13. MUSCULUS PALMARIS LONGUS
14. MUSCULUS FLEXOR CARPI ULNARIS
15. MUSCULUS FLEXOR DIGITORUM SUPERFICIALIS

Power-Flex STRETCHING

Frequently Asked Questions

Question 1, Marco

QI am 30 years old and I have been practicing martial arts for some time. I have finally realized that in order to achieve good results in this sport I must maximize my muscular flexibility. Since I am no longer a little boy is there much I can do to improve it? Will I be able to do splits one day? If yes, how much time is needed?

A Muscular flexibility viewed specifically as articular/joint mobility is one of the fundamental qualities needed to achieve maximum performance in sports. This quality is of particular importance in those sports (such as the martial arts) which require the correct execution of certain types of kicks and specific techniques. Being “loose” produces enormous advantages in terms of explosiveness and muscular resistance. Stretching tends to inhibit contraction of the antagonist muscles which can hinder maximum efficiency of technical movements (in terms of range of loading/charging, for example, of a leg technique and in terms of rate of execution) even if muscular explosivity depends on muscular quality and nervous system reaction capacity. The fact that you are no longer a young kid is not relevant: it is true that muscular flexibility diminishes with age, but this does not mean that you will not be able to achieve excellent results, such as “splits” (assuming you do not suffer from joint damage or articular malformations). If it is a solace to you, I might mention that I was able to achieve a high level of muscular flexibility between the ages of 26/28 though I was not genetically endowed. I strongly recommend the PNF isometric technique which

allows one to make use of neuromuscular principles such as neuromuscular proprioceptor properties together with isometric contraction at the maximum range of joint movement. By applying this technique with necessary precautions you will be surprised by the rapid improvement and you will surely astound your teachers. The speed of improvement depends on your initial level of strength and flexibility, in addition to your level of "attention" to the factors of intensity and training frequency in this technique. This technique will allow you to do splits after a period of time ranging from one month to one year. At the moment, the best book I know on the subject is called "Stretching Scientifically" by Thomas Kurz, one of the true authorities on stretching.

Question 2, Fabio (Side Split)

Q I am a big sports fan and I have been training for some time to do a side split (I am about two palm-lengths from the ground after warm-up): unfortunately, my instructor told me it was useless to train for a side split because it is a genetic ability that depends on a specific shape of the hip joint. Is he right or will I be able one day to touch the ground with my pelvis in a side split?

A Your instructor may surely be an expert in training techniques but certainly hasn't studied bone mechanics of the coxo-femoral (hip) joint. Except for rare pathological cases of malformation (and it is most unlikely in your case), the normal range of movement of the coxo-femoral joint (45/50 degrees in abduction and 45 degrees of extrarotation from a physiologic position) allows one to perform all types of splits. Your present level of opening depends on the degree of flexibility and strength of the adductors muscles of the thigh and groin muscles (which are those most directly involved in a side split). If you train in accordance with the PNF isometric technique and with an expert guide you will be pleasantly surprised by the results.

Question 3, Marco (Muscular Pains and Stretching)

Q I am a well-trained athlete and I practice various sports disciplines, including running, swimming, and cycling. For some time now, I have been suffering from gluteal pains with some strong muscular contractions in that region.

Are there some extension techniques that can help me?

A In order to comprehend your problem, first of all, it would be necessary to specify the exact muscle to which you refer. Often, athletes of various sports disciplines are subjected to femoral biceps sprains and in par-

ticular of its upper insertion (which is to insert itself in the lower part of the gluteus). Pain and regional annoyance in the gluteal zone is often confused with an inflammation or sprain of this section of the femoral biceps (the posterior thigh muscle).

Another important factor, in order to prepare a suitable remedy, is to comprehend if you are dealing with an inflammation, a strain, or a tear, or if you have simply overtrained your muscle. You will not object to the fact that this problem presents itself only on one side: there is always a stronger and a weaker side and often, especially in the case of injuries, we tend to utilize and then to overload only one part or region of the body. This phenomenon is called lateralization and it is very unlikely that it presents itself in so-called "cyclic" sports, in which a bilateral demand and muscle cycle is expected (especially running, swimming, rowing, etc.). I would exclude therefore, in your case, this last hypothesis (of excessive overloading and then lateralization on one part of the body).

The persistence (and cropping up) of inflammations and serious injuries is often, for professionals (who must teach and train themselves for a profession everyday), in the "difficulty" of allowing oneself rest and regeneration periods. Often, it recurs in pain relievers, "masking" and therefore destroying the pain, permit themselves to continue training. In this way, one continues to aggravate a problem that, little by little, tends to become more pronounced and chronic.

THE REMEDY

- Do not abuse pain reliever medicines.
- Recuperate and regenerate the "struck" muscle.
- Once the inflammation has disappeared, proceed to rehabilitate and strengthen the muscular fibers and the associated connective tissue (perimisium, endomisium, epymisium) with specific exercises with low loads/high repetitions. Not respecting this last phase of rehabilitation exposes you to the risk that the problem will re-present itself because the weakest links in the muscular chain are often those which yield first.

In the case in which your problem is caused by a state of chronic muscular fatigue (remember that tired muscles are less strong and elastic), I advise you to subscribe to a resting period session of relaxed stretching (which is well-known: absolutely contra-indicated in this case to isometric PNF stretching, given that the muscular overload that arouses the muscle is suitable for a well-prepared musculature (through specific exercises) and above all uninjured).

Understand, Marco, my difficulty in giving you further clarifications on the treatment of your problem via internet. I recommend, therefore, that you consult an excellent orthopedist or physiotherapist who knows how to examine and evaluate the problem through a visit.

Question 4, Roberto (How isometric PNF works)

Q Hello, My name is Roberto and I would like a detailed description on how one carries out the technique of “isometric PNF” for stretching the pectorals, how many times, and on which occasions one must do this exercise.

I would also like to know if the Pullover is really a useful exercise for helping chest dilation.

I thank you in advance for your time and please accept my compliments for your work and for the importance that it holds for guys who, like me, so many times do not have confidence in their potential.

A Isometric PNF is an extremely effective muscular extension technique, but it must be utilized with extreme caution in order to avoid lack of progress or regressions in joint mobility.

Effectively taking advantage of the principle of progressive overload in extension, one is able to “reset” in a very effective manner the neuromuscular reflexes responsible, together with the rigidity of the connective tissue, for scarce or little-developed joint mobility.

The principle of progressive overload in extension is similar to that the one more commonly known as progressive overload in “contraction,” responsible for strength increases.

In reality, the principle is the same, but for development of super-flexibility, one must act seeking a strength increase to extreme joint ranges. One may comprehend then (for the same principle) the reason for “working” as much as possible with the widest range of movement granted by each joint (in that training stage), in order to increase strength without losing muscular flexibility (or in order to increase it).

The fact of not being flexible depends on various factors among which there is the fact that the more the muscle is lengthened, and as the two actin and myosin myofilaments move farther away from each other losing their optimal physiological superimposition, the more there is a progressive drop in strength. It is normal that, as a consequence in certain extreme positions, our muscles are not able to retain the load (as in the extreme case of suspension splits on two blocks, eventually with handles in your hand).

The purpose of isometric PNF is that of training the muscles (through an appropriate technique) to support ever greater loads (in isometric contraction to the maximum range and, besides all, taking advantage of Proprioceptive Neuromuscular Facilitation). Another story is the possibility of triggering off possible muscular growth through the addition of sarcomeres in a series, the theory not yet universally accepted by the scientific community.

Be careful, Roberto, not to improvise and venture into a similar training without having first understood in depth the principles that regulate it (in

particular the intensity/frequency relationship) and the technique. Keep in mind that it is necessary to carry out a preparation period of the musculature you want to train with this particular technique.

It is really hard to synthesize in a few lines all that is necessary to let you know to apply this technique effectively and safely.

The positions utilized in isometric PNF are equal to those used in ordinary relaxed stretching (also explained in the book), but they are developed by Proprioceptive Neuromuscular Facilitation and by isometric contraction at the maximum range.



The pull-over is a good exercise for chest dilation, provided that it is effected within the range of movement granted by the specific joint. As I have asserted earlier, to train oneself **within the range of movement** is one of the secrets for development of superior flexibility.

Even not utilizing the isometric PNF technique, you will be able to see the improvements in your joint mobility by training with weights (or free-standing) at your maximum range in each movement, and all this is in full agreement with the SAID principle of Specific Adaptation to the Imposed Demand...

Question 5, Lilian (Stretching and recovery times)

Q Well, I have a lot of questions to ask you. You should know that I have been doing fitness for 15 hours per week for 5 years. This is my life!!! Of course, I need great flexibility. I started with fitness and working my flexibility at the age of 23. Actually, everything that I learn about stretching is by the hard way.

1. For example, I am not sure how to respect the times for adequate recovery between two stretching sessions
2. I am not sure how to eat the best for my flexibility.

Thanks a lot for your answer.

AUntil now there has been a greater awareness of the principles and most efficient techniques regarding strength-building as compared to the development of flexibility. Besides, one must also consider that, as far as stretching is concerned, there are a number of mistaken beliefs that only serve to discourage athletes and fitness lovers.

Foremost among these mistaken ideas is the belief that in order to develop and markedly improve one's flexibility, it is necessary to start at a very young age.

My experience (and that of many others) has brought me to the conclusion that it is possible to efficiently develop one's flexibility even at a late age. With regard to the first question I can tell you that an evaluation of recovery times (in stretching as well as in strength-building) has always posed a great dilemma, but is the key to improvement.

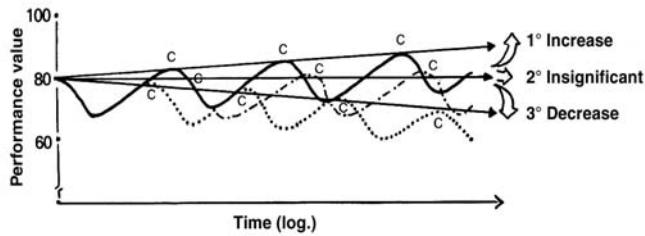
PNF isometric stretching is fundamentally an exercise of strength applied, however, (with the proper precautions and the right technique) to the maximum joint range. This is based on the principle of the ratio between length/tension of the muscles: the more a muscle is stretched, the lesser its strength...

By training the muscle, therefore, to support greater and greater loads to the maximum joint ranges (keeping to, I must stress, the necessary precautions) one achieves greater flexibility. This, in effect, represents an application of the SAID principle of Specific Adaptation to Imposed Demand.

In effects of overcompensation in three groups of trained athletes with an identical load but with different recovery times, one notes the diverse effect in performance: increase (group with continuous line), insignificant increase (group with broken line), decrease (group with dotted line). Incomplete regeneration due to insufficient recovery.

As depicted by the graph, different recovery times lead to improvement, worsening or no effect on body adaptation.

One understands, therefore, that by choosing recovery times erroneously, one risks nullifying or hindering improvement. How can we calculate optimum recovery times? As I explain in this book, it is necessary to develop "body awareness" or rather, that subtle quality that allows one to perceive the degree of stress placed upon our muscles and our organism: it is a quality that is possessed in particular by experienced athletes. In this



Effects of overcompensation on three groups of trained athletes with identical loads, but with different size recovery breaks.

book I recommend recovery times (evaluated within margins of safety) but, if you want to be sure of avoiding mistakes, apply the principle of the natural bodybuilders (for the development of strength/mass) that is, better one or two days more of rest and recovery than one day less. At times, after a prolonged period of recovery, one notes, with amazement, that the strength and flexibility have improved...have you observed this?

2. Diet is a very important aspect in the development of physical traits and it's fundamental to know and apply the basic principles for this reason, and I do not want to limit this discussion to only a few lines. I ask you to consult a good book on diet and dietary supplements in sports (I recommend "Optimum Sports Nutrition" by Michael Colgan). Remember that diet represents only one aspect in the achievement of one's maximum physical development: a correct dietary regimen is fundamental for achieving maximum energy intake and sufficient quantities of vital nutrients are necessary to sustain the processes of bodily adaptation (including hyperplasia).

Question 6, Domenico (Isometric tensions)

Q Dear Mr. De Angelis, unfortunately, there are a few things I have not been able to understand, maybe because I do not know much about them.

What does the adjective "isometric" mean when referred to stretching? In particular, what do the words "isometric contraction or tension" and "isometric strength" mean?

Moreover, on the PNF stretching exercise for the side splits, I am not able to understand in what position one must do the exercise, if standing or seated on the floor is better. Thanks for your time. I hope to write in the future sending photos of the results obtained!

P.S.—I, in the gym, have always done stretching that is defined as relaxed in the book, with rather good temporary results.

The day after the training though, I have always had pains in the groin region and reduced mobility. Is this because of too much effort?



A The muscle carries out an isometric tension if it produces tension (or it tends to contract) without the length's undergoing variations. This occurs in cases when the applied load is equal to the applied strength. In the particular case of isometric tensions, the two muscular myofilaments of actin and myosin do not slide one on the other causing muscular shortening, but maintain equally their degree of superimposition.

Contractions in isometry (as explained in detail in the book) may be used in order to increase muscular overload in "shortening" and cause substantial strength increases in classic bodybuilding or free-standing exercises (Super-Strength development). They may be used further in "lengthening," or to the maximum range of joint movement to cause extreme strength increases of opening and therefore substantial improvements in joint mobility (Super-Flexibility development).

In order to make you comprehend better: the act of pushing constitutes an isometric tension, in the absence of movement, against a fixed surface (especially walls, floor, or pushing a blocked bar). The exercises proposed in the book (one of which is referred here) are carried out standing up for the purpose of practicing with the appropriate weight, a positive stress in extension, and an increase in strength to the maximum range in the side split/adductors (in the specific case).

Finally, Domenico, one important recommendation: read this book over and over again to comprehend deeply the various techniques of execution and the basic principles on which they work.

Each piece of advice and each recommendation are the fruit of long hours of personal experimentations carried out in the gym and studying various texts and specialized medical magazines. To ignore one fundamental factor (as for example to pass over the preparation period for the isometric technique or to mistake the loads or the training frequency may bring you far from the predetermined results, with consequent muscular aches and pains). In each case, make reference to your “body awareness,” to the list of errors that impedes improvement of flexibility, and to the summary of recommendations present at the end of each chapter.

Question 7, John (Pain without results)

Q Hello, I'm 39 and studying Taekwondo. My flexibility is very bad and always has been. I've purchased the “Secrets of Flexibility” by Thomas Kurz, but have not obtained good results. My hips seem to hurt a lot and I have pulled muscles.

I'm doing isometric stretching 3 times per week, and my goal is to do side splits at some point, but I don't even have 90 degree flexibility yet.

Can you suggest a comprehensive routine for stretching? I have had no improvement in flexibility for 5 months. Am I stretching too much?

Besides, can you explain PNF stretching to me and how this differs from isometric stretching. How many sets should I do and what day?

Should I stretch after the workout; and using what techniques? Since I'm pulling muscles and can hardly walk the next day after my Taekwondo workout, what should I do?

Thanks so much for your answer...

A The publications by Thomas Kurz on the subject of “Stretching and Flexibility” are among the best I know on the market. Knowledge, together with personal experience, provides extra information that can give you that “something more” for those who want to learn and experiment. I am convinced that knowledge without personal experience, in most cases, will bring few results but ... be aware that ‘practice’ should be done correctly and must follow specific rules and norms. In the case of PNF isometric stretching it is easy to get carried away by enthusiasm and make mistakes by not taking into consideration the necessary precautions or failing to adhere to prescribed regulations.

Both the PNF technique and PNF isometric stretching take advantage

of "Proprioceptive Neuromuscular Facilitation," fooling the system by means of a series of contractions and relaxations of the muscles that want to be extended, which leads to a greater degree of muscle stretching.

Moreover, PNF isometric stretching necessitates isometric contractions at the maximum individual range for each muscle group which is to be trained. The aim is to associate with each very efficient stretch (by means of Proprioceptive Neuromuscular Facilitation) an increase in force to the greatest range of movement. Surely, this brings about a great overload for the muscles and tendons (even though the tendons are not unduly stretched). For the reason, overdoing the frequency of training sessions and the number of sets, repetitions and exercises can lead to overtraining and overstretching, which is counterproductive for the muscle fibers and associated connective tissue (perimysium, epimysium and endomysium) and, in extreme cases, can lead to muscular tears.

End result: noticeable loss in strength at higher ranges of motion and also lesser flexibility for the muscles that are being trained.

I believe that in your case the problem is one of insufficient muscle recovery time (3 PNF isometric training sessions a week is difficult for most people to handle), too much load (too many repetitions and sets of exercises). The right number of repetitions and sets of exercises can only be determined by you, yourself by resorting to that quality which I described in the book as 'body awareness'. In the case of PNF isometric exercise the rule, 'the lesser-the-better' is the most fitting one. **Remember also to choose only one exercise for each muscle group.**

Before using this technique it is *fundamental* that you prepare your muscles beforehand by doing exercises with a low load/ high number of repetitions so as to strengthen the connective tissue which, together with the muscle fibers, will be stretched in a more effective way during the PNF isometric exercises.

PNF isometric exercises should always be done at the end of your training session – never before since they act on the neuromuscular reflexes and by tensing up the specific muscle group in question may predispose to injuries.

Remember:

- 1) Allow sufficient time for muscle recovery.
- 2) Start gradually and do recovery and rehabilitation exercises of the type low load/ high number of repetitions.
- 3) When you are ready, do 2 training sessions per week, optimally with breaks for PNF isometric exercises of 1 or 2 sets of 2/3 repetitions.

Happy training!

Question 8, Kim B. (Overstretching)

Q Dear Sir, I am using Thomas Kurz' stretching method described in "Stretching Scientifically", but I am not making progress. I think it's because I am overstretching, since my groin feels sore for two days after I do an isometric stretching workout. With isometrics, how much muscle soreness should I experience, if any? I have read that if I feel sore at all, I should lighten up my isometric workout.

At this time I perform isometric stretches about twice a week, or whenever I stop feeling sore. I hold the last contraction for 30 seconds, but I'm thinking about shortening it. What would you recommend?

Thank you for your help.

A With regard to PNF isometric stretching, experiencing pain in the days following a workout means that excessive strain was placed on the muscles, and, especially on the associated connective tissue. Muscle connective tissue has a stretch threshold that is markedly reduced in comparison with that of the muscle fibers themselves (muscle connective tissue can be stretched up to 67% of muscle length before tearing: M.J. Alter 1996), and for this reason is susceptible to excessive stress and, thus, contraindicated in training.

While training with the PNF isometric technique, you should not experience pain in the days following a workout, otherwise, you may undercut your flexibility: the damaged connective tissue, once repaired, will trigger a compensatory reaction (as in the case of scarring) that leads to an increase of tissue in the damaged area, with consequent thickening and reduced stretchability of the muscles. In order to avoid this from happening, it is important to strengthen the connective tissue (which renders it less susceptible to tearing), by engaging in specific exercises at low load/high repetition ratios and spacing out the frequency and intensity of workouts appropriately.

It is very likely that a final 30 second set of the isometric contractions using the PNF technique is excessive but, even more important, is the fact that the intensity of the contractions *is too great*. You should consider the fact that by increasing the number of sets, you markedly increase the degree of strain and muscle stretching: it means that 30 seconds of isometric exercises at the maximum range achieved through three sets of contractions and relaxations should be safer and more appropriate than five sets at 30 seconds. Once a certain threshold of stretching is attained, further training may be counterproductive. It is much better to proceed in a safe way one step at a time, rather than taking two steps ahead and three backwards.

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Question 9, Kim (Dynamic strength exercises)

Q Dear Sir, when one does dynamic strength exercises for the inner thigh and femoral biceps in preparation for isometric extensions (as the connective tissue is too weak for isometric exercises), is it better (or necessary) to do exercises using the complete range of movement? For example, normal curls for the femoral biceps utilize a limited range of movement, while in the stiff-legged deadlifts exercise the muscle works in an extension position.

Thanks for your help.

A It is necessary to carry out dynamic strength exercises within the maximum range of movement because, as I have often explained, *training the musculature within all the range of movement is one of the secrets for increasing joint mobility*. On the other hand, training the muscles on limited range diminishes flexibility and predisposes one to injuries.

Utilization of the isometric PNF technique (characterized by strong isometric contractions on the maximum individual range) requires a trained musculature. Dynamic strength exercises prepare to train the musculature according to the principle of gradual load increase within the maximum range and with the precise aim of bringing the connective tissue and muscular fibers to support the less-than-maximal loads of the isometric contractions of this technique.

Working always on the maximum range is an application of the SAID principle (Specific Adaptation to the Imposed Demand). It is a grave error to subject the musculature to strong strains of the isometric PNF without prior preparation of the musculature with dynamic exercises with low loads/high repetitions on the complete range.

IMPORTANT NOTE: Dynamic strength exercises, in any case, represent a type of stress on the muscles and already by themselves cause an extension of the muscular fibers. This means that isometric PNF training, done after dynamic strength exercises on the maximum range, is more intense and, for this reason, the intensity must be well calculated (in order not to cause an excessive load and therefore counterproductive flexibility increases). In practical terms, this means that three series of isometric contractions effected after warming up should be (in the majority of cases) reduced to two in the case in which one has trained himself previously with dynamic strength exercises.

Often, whoever trains with this technique does not comprehend the muscular length factor: three series with the same load can have notably different intensities (and therefore of stress on the muscular fibers) according to the work range.

One of the keys for success in this technique is, therefore, to find the appropriate model of intensity for training that is not counterproductive.

How? With practice and listening to one's body.

Question 10, Andrea (Dynamic Strength Exercises and PNF Isometric Stretching)

Q I am writing concerning some clarifications. I would like to say, first of all, that I have been practicing martial arts for seven years, even if not with competitive ambitions, but I am nevertheless interested in improving my joint mobility.

In my annual training plan (elaborated according to a double periodization), in each one of the two preparatory periods, training of the capacity of aerobic endurance by mainly running on the street is expected, for two times per weekly microcycle, plus one unit of training of the specific technique (that weight becomes ever more important moving forward in the preparatory period), to an intensity that, at least initially, is rather mild, still in the aerobic system.

I ask myself if it is also possible to insert dynamic strength exercises in this initial period, perhaps in the unit of technical training, before the technique, or before a running session, led eventually with a light intensity in order to take into account the stress brought about by dynamic strength exercises appropriate for the lower limbs, involved in the running.

In any case, with which weekly frequency should the dynamic strength exercises be performed in the preparatory period of isometric PNF?

Concerning isometric PNF, I ask you the following:

- What is the best sequence to follow while performing the exercises in this book? From which sequence must I understand that it is not correct to train, in the same session as the aerobic condition (perhaps through running), or the technique, and isometric PNF?
- Are dynamic strength exercises executed even after the preparatory period of isometric PNF of one to three months?
- Could isometric PNF training enter into competition with training of other physical capacities, like aerobic endurance, anaerobic lacticide, and explosive strength, in exhausting the individual reserve of adaptation?
- In the specific case of the side split, in the exercise proposed, and feasible according to two different types, the position to assume is that illustrated in figures a) and b) on the top of that page, according to which should one remain in an upright position and open wide his legs?

Or should one maintain his legs tense until bringing them, to the limit, to the position illustrated in figure a) (paragraph: Joint mechanism of the side split)? In the latter case, personally I would consider the

use of the stretching machine in order not to stimulate my knees too much? By the way, is such a tool easily found, or is it necessary to go to particular retailers (a price indicative of what it could be)?

Thank you for your attention.

A Dynamic strength exercises are aimed at building gradually basic muscular strength in extension in order to insert afterwards, in a second moment, the isometric PNF exercises. They are also aimed reinforcing the connective tissue around and inside the muscle. The intensity of these specific exercises must increase gradually by remaining within the limit of the high repetitions (not less than thirty per series). All this is important to repeat because, even if there is a medium-low intensity, they always form a certain demand and overload for the musculature.

As I have written in this book, the effectiveness of a method depends not only on the exercises themselves, but also on the way in which they are inserted and arranged together with the other exercises (of general conditioning and/or competitive specifics). This is to tell you that (answering to your first question) dynamic strength exercises may be inserted in the preparatory period, but at the end of a conditioning session. These exercises, besides reinforcing, relax and lengthen the muscular fibers (and the associated connective tissue). We must keep in mind that, in fact, they are effected within all the period of movement, granted by the joint. Concerning their frequency, at least initially, they may be carried out every day (since the intensity is very mild) and, gradually, arrive at a minimum of one or two times in the ambit of the weekly microcycle).

Regarding the correct sequence of exercises for maximum efficiency, both the strength exercises and those of aerobic conditioning are done nearly at the beginning of the training, after the warm-up, and, in sports like martial arts, competitive aerobics, and in all the sports with an explosive character, after dynamic stretching (not ballistic! This is how it is explained in this book).

- Yes, dynamic strength exercises are carried out during all the annual training microcycle and they must not be suspended for a greater period than one month. Coming closer to the competitive period or maximum form, muscular power and explosive capacity augments, and there is the risk that, suspending the dynamic strength exercises (high loads/low repetitions), could come a drop in strength and resistance of the connective tissue, with consequent danger of lesions.
- Isometric PNF does not enter into competition with development of various physical capacities but be careful: in some sports in which it is fundamental to train oneself to the maximum joint ranges (present also

in specific competitive movements, like high kicks, splits, jumps, etc.), specific competitive trainings, added to those very intense ones of isometric PNF, may cross the useful threshold of adaptation of the muscles to lengthening. In practical terms, this means that training, for example, with jumps, free falls in splits, high kicks, together with dynamic strength exercises, isometric PNF, and relaxed stretching, one can run the risk of overstretching his muscles and the connective tissue, jeopardizing its extensibility.

- The position to assume is that of a front lunge (like that of the squat, but with an even greater opening range) that, for the reasons of safeguarding the knee joints, maintains the legs lightly bent. Nothing forbids you from carrying out isometric contractions on tense legs until coming to the ground, but each person must take into account his body weight, strength and flexibility of his adductors, and stability of his knee ligaments. Surely it is not physiological to do suspension splits (and therefore to keep legs tense with maximum overload on the knees), but it is always true that in sports not everything can be considered correctly physiological and beneficial for the physique (it is sufficient to think about free falls in splits and anaerobic routines for two minutes).

I repeat: each type of training must be built and “individualized” according to each one’s physical qualities and his athletic goals.

The use of the stretching machine can be useful but not indispensable: I know various models and, among these, I do not advise plastic ones (like one of a noted American brand) and I do advise, instead, those of steel that are equipped with durable opening systems. Strong contractions in closing of isometric PNF subject it to strong stimulations and the weakest would end up breaking apart.

You can find them in mega stores for sports accessories specialized in the martial arts and their costs range from \$250 to \$500.

One final recommendation: on tense or semi-bent legs, in order to practice the side split, you must be sure to respect the correct alignment of your hip with your femurs (see Articular mechanics of the side split). In the contrary case, you would waste time and energy without obtaining ANY results.

Question 11, Todd (Side split prejudices: verification test)

Q For twelve years, I have been stretching for alternate periods. I have been able to do sagittal splits without great efforts, but I am not able to do side splits. I have read many articles concerning this, but I would like to know if there is a simple way to understand if one has the correct alignment of which all the experts speak. I look at the photos in

the texts, but I still have some doubts. I do not believe that leg power is the problem. Do you have some suggestions you could give me?

I thank you in advance.



AI believe that the myth of the side split is generated by not knowing about joint mechanics of the coxal-femoral joint (hip).

Too many prejudices exist on the subject and, in a certain sense, they reflect the actual lack, in the Italian and world editorial (aside from very small and rare exceptions: see T. Kurz, *Stretching Scientifically* and M.J. Alter, *Science of Flexibility*; you may consult greater details on these publications in the bibliography), of highly specific texts.

There exists a very simple test that will permit you to know if, at least potentially, you will be able to carry out side splits in the future (see the last paragraph). I say "potentially" because you will not improve even one centimeter in the side split training, for example, the biceps. By this I mean (and I want to emphasize) that it is true that this book provides you with all the instruments to improve your joint mobility considerably, but it is also true that no one, not even I, can give you confidence, motivation, and perseverance to train yourself you do not have the desire. Even if you possess one of the best available bows on the market, you will never hit the center of the target unless you decide to aim, arrow after arrow, and point towards the target.

What I see in the world (sports and not) is not a lack of instruments, but a lack of will in utilizing those instruments.

It has been said and written:

"The mass is great, but the workers are few"...understand well... the instruments of work in order to improve in any sports discipline and in life, but very few are those who seize them and begin to use them...

We want everything right away, and we get discouraged if the results do not come within one or two weeks time. It is much, much easier to become convinced by the mass that one cannot do something. It is impossible, they say. In our case: you have not stretched out since you were young, you will never be able to do it, they say.

They say the cartilage has become stiffened, not knowing what they are talking about

Nevertheless, Todd, if you never believe in what you do in life and if you never present yourself a "way out," at least try to use it! Go beyond this overwhelming sense of impotence that reigns in society.

This introduction is to tell you that many people, even if you show them that their joints have normal functionality (as I have described in the book, forty-five degrees of abduction and forty-five degrees of turnout - as much as necessary, muscular and connective tissue permitting, to carry out a perfect side split), they do not train themselves constantly for a minimum period of time (minimum!). The same concept is valid for losing weight: how many people (who unfortunately often train poorly, against the rules of physiology) abandon and drop everything after only one month of trainings?

SIDE SPLIT TEST:

Laterally on a chair or any plane, bring your leg laterally to the height of your hip, turning it outward (see figure).



Being able to carry out this position, you will demonstrate forty-five degrees of abduction and forty-five degrees of turnout of the hip's femur. Do this as much as necessary to know that you do not have the joint "deficiency" and insufficient for a side split...certain necessities for the correct training technique (see isometric PNF).

For a deeper explanation (through very clear anatomic tables, photos, and images), please consult the section "Joint mechanics of the side split" on page 48.

Question 12, Tristan (Isometric Stretching and Dynamic Stretching: Errors that Hinder and Strongly Limit Results)

Q Before all, a brief description of my training routine. I train myself with martial arts twice per week.

I do isometric stretching three times a week, greatly concentrating on the side split and on stretching the femoral biceps.

When I begin isometric extensions, the first thing I do is "the butterfly," staying seated with my feet together and trying to get my knees to the floor, continuing afterwards with side openings.

For the femoral biceps from the seated position with one tense leg forward, I bend myself forward until touching my feet.

On the days when I do not carry out isometric stretching, I do relaxed stretching. My warm-up consists of warming up the joints, then a cardiovascular warm-up of five minutes followed by dynamic stretching: leg thrusts on the front side, back and lateral. All followed then, according to the day, by isometric or relaxed stretching.

I have based this routine on the book *Stretching Scientifically* by Thomas Kurz.

These are my questions:

1. At the moment, I am circa twenty-five cm. From a complete side split, this after three to five isometric stretching repetitions. Certainly when I began practicing this method (isometric stretching), I was much higher. Is it normal that once the extension proceeds, one is able to fall into a complete split?
2. In contrast to what was exhibited in the book, "Stretching Scientifically," I need to utilize my hands on the floor when I carry out these side openings in such depth in order to vary the muscles' load.
3. I feel that I am flexible enough in the posterior muscles of my thighs to do sagittal splits, but when I try to do them, I realize that the back leg arrests the descent. Which exercises can you recommend to me in order to improve extension of the leg's

muscles that finds itself in a back position in sagittal splits?

4. When I began my stretching routine, I was much more able to force to the limit the positions in isometric stretching. In this way, even in dynamic stretching I was kicking my legs as high as possible, seeking to force them even higher.
5. All this brought me pains inside my thigh that became present in the following days, leaving me with fewer results in the extension.

As a result, I have lightened my stretching routine by doing dynamic stretching in the warm-up phase, thrusting my legs in a controlled manner and, in isometric stretching, not forcing the extension until feeling pain.

In your opinion, is my decision to lighten the extension loads correct? I feel that I am gradually improving, but I still have some mild pains in the inner thigh. Must I still lighten my loads or are these pains normal?

1. In "Stretching Scientifically," Kurz talks about inclining your hip. Could you explain this principle to me in depth? Does this mean to push your buttocks to the back? He refers to this movement as necessary in order to carry out a side split.
2. How does one know if he has a correct hip alignment/bending?
3. The book "Stretching Scientifically" also uses as an example the side split with feet pointed upward. Which is easier, the one with the feet up or forward, and is it possible to do them both? Do they need different hip alignments?
4. How should warming up before a stretching session be understood?
5. Could you give me some other instructions with reference to my stretching routine?

I eagerly await your answer and help.

- A**
1. The purpose of training is to habituate the athlete to accomplish tasks gradually that are ever more difficult and demanding. The same is valid for physical qualities like strength, resistance, and flexibility. When one has reached a certain training level and falls into splits, even cold, he sets the same demand that is necessary for an untrained individual to do only one arm bend. By this I mean simply that once a certain degree of flexibility and strength for a split is achieved in the requisite muscles, it is easy, rather, very easy to display this extremely flexibility even cold.
 2. When one carries out the isometric contractions, it is necessary to pay a lot of attention to two factors:
 - a That the ground's surface is not so smooth or slippery so as to be able to cause your legs to skid, which is very dangerous in the

extremely vulnerable positions of isometric contractions where the muscle is subjected to tension in maximum extension.

- b To have the possibility of easily unloading the weight from your arms (or at least to decrease it) if it were necessary. This is valid both for those who begin isometric tensions. In such case, remaining very high from the floor, they need one or two supports (especially stairs, steps), and for the extreme situation of suspension splits (only for experts!) in which case, in order to avoid injuries, one must be able to quickly unload the heavy weight imposed on the joint when needed.

Therefore, nothing bad will happen if you put your hands on the ground.

- 4. In sagittal splits, the iliopsoas muscle must be elongated in a particular manner that, if contracted (as in your case), it blocks and limits the descent. In order to optimize any split or any joint (from the point of view of flexibility), much attention must be paid to the biomechanics of one's joints with the aim of optimizing their extension. In the case of sagittal splits, it is easy to run into the error of "rigging" the split by turning out your back leg (in such a way that you descend more). This does nothing more than unload the weight and the extension of the psoas muscle onto the adductor. In order to maximize the sagittal splits, one must maintain a correct hip alignment (maintained in a squared position and not turned out). See the figure below where the correct position and hip alignment for capital splits is shown.



- 5. The biggest error that one can commit in stretching, and particularly in isometric and dynamic stretching, is that of forcing and exceeding your limit. You can remain years and years blocked at the same extension range in spite of hundreds of hours of stretching if you excessively force positions. An excessive load loses its beneficial training effect, producing only pains and no result. A similar thing occurs in isometric stretching which, being a strength exercise, submits to the same laws that regulate strength increases. If one does not allow the adequate rest between stretching sessions, the gains in terms of strength to the maximum articular range are hindered if

not precluded from. Do not be afraid, therefore, to lighten loads. If you still feel pain in the days following isometric or dynamic stretching, this means that you have mistaken the loads (in isometric stretching by extending yourself too much with an excessive load; in dynamic stretching by kicking your legs too hard and high). When isometric stretching is carried out according to the correct loads, there are no pains or muscular problems in the following days.

6. I have explained clearly and simply the fundamental importance of the position and “relation” of the hip to the femoral biceps. You can lose years of results seeking to do the side split erroneously without taking into consideration the correct joint position to maintain.
7. In the side split with feet pointed up and with feet pointed forward, the hip’s position with respect to the femurs is identical.
8. In order to know if the hip is correctly aligned, it is sufficient to widen your legs without effecting anteroversion of your hip (pushing your buttocks back). At a certain point, you will perceive an arrest. This arrest is caused by the large trichinae which touches the hip, and from the pubo-femoral ligament which resists excessive abduction.
9. Warm-up is aimed at that of preparing the body for the imposed demand by the training. In the case of stretching, increase the muscles’ viscoelastic qualities and warm-up the joints. A light sweat is okay, but also remember to do, together with the cardiovascular warm-up, joint rotations.
10. Your routine appears well-built. Pay attention to loads... A rule? Do not go too far!

Question 13, Del Decker (Isometric PNF: STRONGER and MORE FLEXIBLE muscles. Why?)

Q I have some questions regarding stretching; I’ve read Tom Kurz’s *Stretching Scientifically* ... a great book.

I am training with Tang Soo Do and with weights in order to develop speed and power.

1. I ask myself how I may develop a greater static flexibility without warming up ... to arrive directly at doing the splits, in order to be clear. Why some people always seem at the same distance from a complete split whether they are hot or still cold? It seems that I must always warm up before getting there.
3. Besides arriving at and carrying out a complete side split, I would like to be able to bend myself in such a way as to be able to touch the floor with my chest with my back upright and still

in a split. What type of stretching should I do in order to make a similar bend? It seems so difficult for me.

4. Is it safe to do isometric stretching for side and sagittal splits in the same day?

5. What is the difference between PNF and isometric stretching?

A Thank you for your very interesting question that allows me to explain better how the impressive technique of isometric PNF functions.

The capability of a muscle to relax itself (and then to extend itself) is directly proportional to its strength: this means that in a certain stretching position there exists an applied load to the fibers. How much stronger a muscle is depends upon its being able to relax itself given that the muscle in question contracts fewer muscular fibers/sarcomeres: the fewer sarcomeres that shorten themselves (sarcomere = actin and myosin: for more information, consult another physiological book.) the less one shortens the extended muscle. You can well comprehend as a person coached by the isometric PNF technique that one *will have a specific strength developed to its maximum range articulated so as to to allow him to easily support the burdens to which the elongated muscles were subjected*. On the other hand, a person who is not trained, will at once try to straddle his legs, for example, looking for going down into a split, and his muscles will progressively diminish their strength of contraction (until reaching 0) and their muscular fibers will all be chronically contracted, not permitting them optimal relaxation with respect to loosening their burden.

As you will be able to notice in the gym, strength diminishes little by little as a muscle becomes elongated (not incidentally, there are few who carry out the complete range of these next exercises, being blindly tied to the weight and to the judgment of the other people in the gym because, if one were to put the complete range of these exercises into practice, he would diminish the load lifted in a considerable way). All this is to tell you that the purpose of the isometric PNF is that of increasing strength in a progressive manner to its maximum individual joint range. It is a very innovative concept for stretching and it is very effective. I advise you, in each case, not to improvise on the exercises and the mode of execution, but to utilize the wealth of knowledge contained in my book or Thomas Kurz's one.

This said, I turn to your questions:

1. The purpose of stretching for professionals is that of bringing every single joint (or at least those necessary for the particular sport, because in some sports excessive mobility can be a handicap) to the maximum overture granted by each single joint. Once one has arrived at the maximum joint range, different from those which

could damage the ligaments (that is absolutely not useful and inadvised since optimal performances in team gymnastics and in martial arts are not necessary to carry out contortionist numbers), the only way is that of mastering the extreme position in a manner whereby one may get there without even warming up. At this point, I am sure of having sufficiently attracted your attention and you are asking yourself: how does one come to do this? **For example, how does one come to do splits without warming up?** By continuing to increase the **strength** in that position. Now I'll give you an example: it is likely that those who do splits without warming up will, when doing stretches (and has trained according to the principles of *Power-Flex*), train by doing splits in suspension (to the extreme limit with some bars in hand) ... the result is that the people will be able to maintain comfortably a split for one, two or more minutes (even capable of watching a football match comfortably in a split with a beer in hand!). As a result, a cold split is not a very difficult exercise for that person. One of the secrets is in the advancement of weight without exaggerating and without being in a hurry: to accustom the muscles to a yet greater weight/length muscular relationship.

2. In order to put into practice the move of which you speak, a complete coxal-femoral mobility (from the hip) is necessary, in addition, to considerable flexibility of the femoral biceps and of the lumbar zone.
3. Not only it is safe to practice the two splits (saggital and side-frontal) on the same day, but it is also advised when you train with the isometric PNF: in the first place, there are different muscles involved (principally femoral biceps, quadriceps, and iliopsoas for the saggital splits and mainly adductors for the side) and it is very important that you benefit from a nearly total rest of the muscles on your days of repose. Consider the increases in strength (the purpose of the isometric PNF is to increase strength and such increase occurs not during training, but in periods of recuperation). Practicing the different splits on different days, the muscles would not benefit from a complete (and positive) pause, being in some ways indirectly hastened by the practicing of another split (and in the isometric PNF, insufficient recovery means nothing, very few results, or immediate decrease of flexibility). The rule is valid as well for the increase of muscular volume/strength for brief, intense and infrequent training.
4. PNF stretching takes advantage of the Proprioceptive Neuromuscular Facilitation (a type of neuromuscular reflex that favors muscular elongation, and is further explained on pages 40, 85).

Isometric stretching uses increases of strength with contractions in isometry to the maximum range (this term is used by Kurz in his book).

Concerning *Power-Flex Stretching*, I have preferred to utilize the term isometric PNF because it seemed more complete to me, since the technique in question contains the two benefits of PNF and of the contraction in isometry to the maximum range.

Question 14, Muhamad (The Gymnasts' Secret is static, active stretching. How do gymnasts develop impressive strength? Incredible tests of free standing strength. Here is how to develop it).

Q Dear Sir, I have always been impressed by the ability that some athletes possess to lift their legs as high as their head and to maintain them in that position for several minutes without any support. In accordance with Mr. Thomas Kurz, author of the book *Stretching Scientifically*, this ability is called static, active stretching and it would call for strength in the lumbar muscles and of the abdominal section (especially the lower section) that can be developed with sit up exercises, lumbar extensions, etc. In reality, I am not able to lift up my legs farther than the line of my pelvis. Can you explain the reason to me? Which type of training can you suggest to me in order to acquire such a capacity?

A Anyone who has seen gymnasts at work knows the impressive strength that they capable of exhibiting their tests of strength, and among these, the difficulties cited are called "squads": to lift up one's legs farther than the height of one's pelvis until arriving even at the height of one's head, sustained only by one's arms (or by only one arm).

It becomes natural to think that these athletes are endowed with a supernatural force and hold training secrets unknown to others.

The truth is that in sports training (just as in any other discipline of life), there exist truths and peculiar secrets that are nothing more than tested strategies that exhaust to perfection laws and physiological mechanics of another nature.

The development of static, active flexibility, or else, in the extreme displays of gymnasts' tests of strength (as I have examined carefully in my book *Power-Flex Stretching*) principally depends on the two fundamental factors that I must necessarily take into account in order to rival such athletic "difficulties":

1. Development of specific strength
2. Development of joint mobility

1. Development of specific strength. Principle Application SAID.

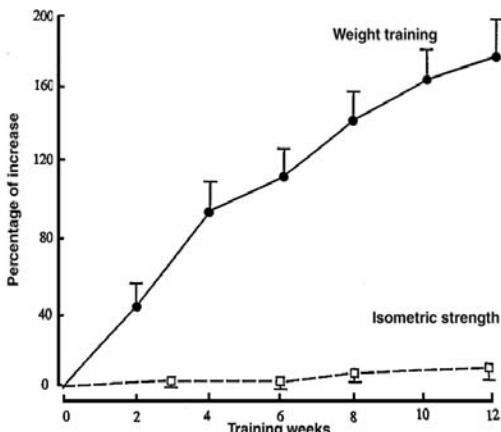
One of the little-known concepts in sports training (and in general in any type of skill) is the Principle of Specificity, or of the Specific Adaptation to the Imposed Demand, at the core of which the body (and the mind) adapt themselves in a specific manner to the specific strains induced by training.

Why does a gymnast who is capable of doing squats, the levels of arm spreadings or bendings on an arm and a leg, showing in this way extraordinary strength, then make a bad impression in a bodybuilding gym, when he is not able to emulate someone who lifts up twice his bodily weight in exercises such as, for example, the squat? The concept is all here: specificity of training.

Why, as we will have noticed in many cases, changing training method, for example, a bodybuilder (that you pass up for a classic exercise like the bench press to ones more specialized like crosses/overtures), will one notice a drop in strength? The reason is specificity: the body adapts itself to the specific pressures of strength/flexibility/coordination and resistance of various exercises for which, by changing the exercise, one loses his degree of specialization.

With particular reference to the static, active flexibility and the "squats," one may develop a remarkably superior strength by choosing the exercises of the proper method of training, with particular reference to the modality of execution, like, for example, the angles of work, the type of contraction, the speed of execution.

In reality, the great, but yet the greatly ignored concept of specificity, finds its foundation in various scientific studies. Representative is the study carried out by *Rutherford and Jones* in 1986 in which it is indicated that people subjected to training with weights for the knee's extensors (leg extension exercises for the femoral quadriceps) showed adaptability, and then an increase of strength in a certain joint range and in a certain type of contraction (dynamic); as it is indicated by the graphic, the people trained in dynamic extension of the quadriceps displayed a specific increase of strength in that exercise, but a scanty increase in the static hold at the maximum point of extension.



This increase of specific strength (such as is relative to the type of contraction and range in the certain kind of exercise) was considered in detail by Jones et al. in 1989; they attribute the increase of specific strength to a specific adaptability in the length of the musculature involved in the given exercise (thus an optimal relationship between the muscle's length and tension) and in the differences regarding the greater or lesser contribution of the synergic muscles.

The predominant factor for such increases in specific strength is represented, however, by a neuronal arrangement, which can be expressed in various ways; like for example, by the highest initial frequencies of discharge of the motoneurons and by the most persistent excitation of the motors' unit to a high threshold (Grimby, Hannerz & Hedman, 1981). Moreover, with greater activation of the antagonistic muscles, that initially in people is little trained for such an athletic movement, they come out excessively and uselessly coerced (provoking opposition to the movement), and they become less involved little by little as the training proceeds (Carolan & Caffarelli, 1992); this functional arrangement is the result either of an arrangement in the physiology of the muscular fibers, or of an arrangement of the nervous system which recruited the fibers in a specific way, enabling further a minor degree of co-contraction of the antagonistic system (that otherwise, activated in an excessive manner, would provoke a "braking" action to the movement of the agonistic muscle, with a greater and unproductive energetic expenditure). As a direct consequence of these practices, one will have a greater use of strength and a certain economy in the energetic outlay relative to that certain athletic movement.

2. Development of joint mobility

How great the static, passive mobility is, so much greater is the development of static, active flexibility. A great, passive joint mobility allows for the "positioning" of the body (for example the legs) in a more "economical" manner, yielding the beginnings of biomechanics.

An example? In the most united squad, a person with a closing bust of inferior limbs that are very developed (that for instance are able to be cold) one can in a relatively easy manner vertically raise his legs (still practicing in a specific manner with specific exercises): this is because the lumbar muscles and the femoral biceps do not lend opposition to the closing movement, exercised principally by the femoral biceps and psoas. The same exercise, on the contrary, cannot be put into practice by a very strong person, like for example, a bodybuilder who does not possess adequate mobility of the lumbar parts and of the femoral biceps and who does not have a specific strength. A number of leg extensions do not exist, or aspecific exercises, that can compensate for and augment specific strength developed in a specific manner.

Question 15, Fabio (Work protocol of POWER-FLEX—How to integrate the Power-Flex training system with bodybuilding for development of a superior physique)

QDear David De Angelis, if you have a tiny chunk of time to dedicate to an athlete thirsty for performance, for knowledge, and for success, continue reading.

It all began a year ago, after having read your book *Power-Flex Stretching—Super flexibility and strength for the peak performance*, I have remained struck by it all, so much as to desire the attainment of such performances. It is here that the reason for my letter becomes relevant: after having tried to organize a work protocol on the basis of that what the book explains, I was not able to achieve great results.

In spite of the fact that I have been a full-time personal trainer and instructor for three years, I recognize not having sufficient experience to structure a protocol of this type which could be effective, that takes into consideration all the parameters that embody my objectives. In extreme synthesis, the reason for this letter is the following:

I have been practicing bodybuilding for six years now, I am twenty-one years old, and I possess a good muscular and bone structure, while currently I weigh 141 pounds, 6-7% of which is composed of fat.

I do not aspire to acquire super-mass, but instead my objective is to achieve a *muscular* body, *striated but functional more than anything else*. Thus, when I read your book, I thought that its content fully responded to my sports objectives.

Concluding, if it is not a problem for you and if it is still possible, I would like to have some instructions and even an example on how to structure an effective work plan for “super-flexibility and strength,” and how to integrate it with bodybuilding, all in keeping with the aforementioned objective.

How then can I train myself better in order to achieve maximum muscular development and maximum athletic performance which you have proposed in your book?

How do I link weight-training with Power-Flex in a weekly division?
My present conditions are as follows:

- Age 21
- Weight circa 141 lb.
- % of body fat 6-7
- medium/low flexibility range
- no physical problems
- average muscular development range:
 - arm circumference 32 cm

- thigh circumference root 55 cm, median thigh 53 cm
- waist circumference 68 cm
- bone structure:
 - wrist diameter 5.30
 - elbow diameter 6.10
 - knee diameter 8.70
 - ankle diameter 5.90

I hope that I have not neglected anything and will receive your answer soon. Believe me, I am an athlete who is pleased with doing things on his own volition and completely. By now, I have achieved my objectives, but this time I have felt the need to rely on an expert who has an affinity for my way of thinking and acting.

If you would be so kind as to give me some useful tips, I would be happy. On the other hand, now I know what I want and I assure you that I will reach my objective. You are the right person who can help me to do this.

Please accept my warmest wishes in the hope of soon receiving your comments.

Yours truly, Fabio

ADear Fabio, in the drafting of this book, I have deliberately abstained from providing "pre-made" plans for development of a super-flexible body and with specific strength well above that of the average of others who frequent gyms (note: not for the average sedentary individual). An exception is made for the exercise sequences proposed at the end of the text for development of super-strength (also called static active flexibility with a strong component of isometric force for free-standing exercises). With those, I wanted to provide training instructions exemplary of the SAID principle of Specific Adaptation to the Imposed Demand.

It is always appropriate to repeat it, as the principle represents one of the secrets of success in the sports and athletic field (and, more generally, in all facets of life). The body and the mind, in order to reach a greater degree of efficiency in a certain task (as may be with a somersault, development of a certain muscular section, or that of striking a clay pigeon in flight), must be subjected to specific stimuli.

To comprehend this principle in depth permits then optimal adaptation both at the level of physiological systems (especially adaptation to aerobic/anaerobic effort, physiological adaptation of muscular fibers, neuro-physiological adaptation in fiber recruitment, to cite just a few), and of the mental "patterns" of the athletic movement (it is common knowledge that mental repetition of an athletic movement permits one to memorize it mentally, facilitating its "live" execution and engaging real and appropriate phys-

iological processes of adaptation. Such techniques are very often also utilized by professional bodybuilders and Olympic athletes.

I gave you this introduction on the SAID principle of specific adaptation because, in order to carry out a specific training scheme for a specific athlete (and therefore in order to put this principle into practice, obtaining maximum individual results), there must be knowledge of important factors.

First Factor: What is the athlete's sports discipline? Where are greater deficiencies present? Which athletic movements or, in the case of bodybuilding, which muscular regions does one want to optimize?

Second Factor: How long has that athlete been training? What is the ratio of fat mass to thin mass? Are muscular/joint damages present (especially has he suffered tears or undergone surgical operations, or sprains suffered in the past that periodically tend to manifest themselves)? What is his *aerobic resistance* (this factor is very important for evaluating recoveries between series and between training sessions)?

With this information I want to make you understand that in the field of the science of training it is necessary to pay a lot attention to the particulars, not wanting to fall into the category called "one fits all."

With this book, I have intended to give deep explanations on the physiological and neurophysiological mechanics of development of the physical characteristics of superior strength and flexibility, leaving aside the evaluation of "standardized" cases, or training plans (and for this reason, as you explicitly ask, I will not send you any preprinted material). What concerns me is that of making—as much as possible—the reader of his text conscious of his physical capabilities and put him in a position to be able to create for himself an *ultra specific* plan that fully adapts itself to his physiological, personal characteristics, as well as to his specific athletic goals.

I will now seek to give you valid instructions for integration of bodybuilding and simultaneous development of a physique with characteristics of superior strength and flexibility.

Before all, establish your priorities. Do you wish to attach greater weight to muscular mass increases or to free-standing strength? Your answer to this question is of extreme importance because you could not train hard with both work protocols for bodybuilding and for free-standing exercises without slipping into a state of overtraining over the course of only two weeks.

From your letter, I deduce the first hypothesis and it is on this that I shall base the following instructions:

Scheme 1:

3 BB trainings per week; 3 isometric PNF; 2 aerobic.

Scheme 2:

2 BB trainings per week; 2 isometric PNF; 1 or 2 aerobic sessions.

- BB sessions must be spaced out appropriately in order not to hinder recovery and overcompensation processes.

- Aerobic sessions must be carried out in the days following BB sessions (in order not to raise cortisol levels excessively, which possess strongly catabolic characteristics).
- Isometric PNF (for instructions on *exact execution*, I refer you to the text *Power-Flex*) must follow BB sessions, when one is still warm.
- In the case of extreme fatigue, if one has the impression of not having recovered completely from the prior session, skip the scheduled training and allow oneself an extra day of rest (one will avoid overtraining and, most likely, will observe improvements in strength and flexibility in the days following).

Following these specific guidelines and putting the extraordinary technique of isometric PNF stretching into practice, you will achieve an extremely strong and flexible physique, toughened by trainings that will have stirred all your potential.

To this end, you must employ all your internal resources of will and perseverance that, in any case, have already shone through in your letter.

Question 16, Anne (Muscular Injuries: How to Recover and Start Again at Full Speed)

Q I'm fighting against an injury of my femoral muscle. It's been going on for six months. I always carry out stretching, go to gym, use the machines to lengthen the injured femoral biceps, I've seen a Chiropractor and I'm using R.I.C.E. method but the pain doesn't go away. What else could I do?

A Your problem isn't as much correlated with flexibility as with rehabilitation of the injured muscle, in the terms of strength of that very muscle (femoral biceps). You have surely lost a high percentage of the strength of your injured muscle: it means that for the aims of rehabilitation at first you must rebuild the level of the muscular strength and only then can you work on restoring a normal (may be even higher) level of flexibility.

If you work on flexibility before having rebuilt a basic strength, you are going in the wrong direction (you're on the way towards another muscular damage, or at least, you are slowing down and delaying your complete recovery).

The flexibility is closely connected with the strength: only a few strong muscular fibers allow the others to stay relaxed and therefore extend completely increasing the joint range. Knowing this, train your injured femoral biceps muscle (in accordance with the training low loads/high repetitions, as described in on page 85), then proceed with relaxed stretching very gradually (so as to lengthen also connective tissue which is shortened now since its

whole lengthening capacity hasn't been used due to the injury itself). Later on, you will get to the point of using very extraordinary possibilities of isometric PNF stretching technique, which desperately needs a solid base of muscular strength.

The execution of suspension splits (which represent the highest level of flexibility) doesn't depend on only one component - the flexibility itself, but also on muscular strength (by the way, the ballet dancers don't do this kind of splits, despite the fact that they are flexible). Little by little, when your injured muscle regains its muscular strength, you will see the increasing ability of relaxing in maximum stretching positions. The result will be an increase in flexibility and a higher (much higher) resistance to injuries.

Besides, I advice you to read the next article "Myths and Secrets of Muscular Rehabilitation" - It's much better to prevent rather than to cure.

Myths and Secrets of Muscular Rehabilitation

(David De Angelis)

It seems to be an extraordinary day... the gym is crowded, the music is at full volume, we all feel our bodies full of energy and strength, really out of the common run. In the middle of our training protocol, in the middle of apotheoses of our "pumping muscles" ... oh! A stabbing pain attacks a muscle - the same very muscle which, just a bit before seemed "steelmade" and fit for a super hero. Similar scenes are often seen in gyms and obviously the athletes, who have been training for years, have had such experiences. This article is aimed at advising the injured athlete (and not only) about the means and rehabilitative techniques which will allow him not only to come back to train again safely but also to build a "bombproof" physique that is able to stand great strains it's subjected to while training.

It's much better to prevent rather than to cure.

The main causes of injuries in the case of a bodybuilder are:

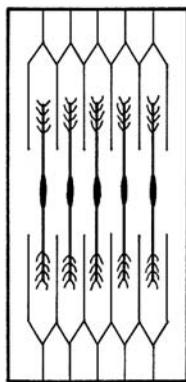
1. The development of an "unbalanced" musculature, with reference to strength/flexibility/resistance level of agonist and antagonistic muscles. The human body is made over the base of a system of opposite strengths which hold the whole skeletal structure. Each structural defect desperately takes to structural (posture) and functional disadvantage (in whichever "common" movement in everyday life as well as in more complex and demanding movements like athletic ones). On one side, developing a "puller," which means a muscle as strong as "steel cable" and abandoning its antagonist "on its own" without equally demanding training, on the other side, the whole

structure is risking both becoming weakened and being predisposed to injuries. Many papers prove it, even if sometimes their shortage or lack doesn't mean the absence of the stated principle (*Arnheim 1989; Gilliam et al. 1979; Klein and Allman 1969; Liemohou 1978; Parker et al. 1983; Rankin and Thompson 1983; Sutton 1984*)

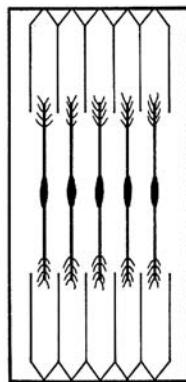
2. The work at limited joint range. This has been one of false bodybuilding myths ever since the dumbbells and weights were invented. Many people misunderstand that "to lengthen" a muscle means to make it "go down" and "flat," and as shown later on, it would be the same as saying that it's enough to have a creatine cocktail while sitting in front of the TV to grow. Unfortunately, many techniques on muscular training strengthen this wrong preconception, commanding the athletes to train their muscles at limited joint range.

The muscle shows the highest level of its contraction when the two main components of its smallest functional unit (actin and myosin of muscular sarcomeres) maintain the best level of superimposition (see fig. 1/A – 1/B). Little by little, as the muscle is subjected to load, the microfilaments tend to move further away from each other so as to allow the fibers to lengthen (in eccentric contraction). It's interesting to notice that the more the muscle is

(fig. 1/A)



(fig. 1/B)



lengthening the more microfilaments are moving further from each other; therefore the strength drops down to zero. This is one of the reasons why it's much easier to work with the same

very load lifting it up at limited ranges rather than at wider ones or the ranges close to physiological limits, due to joint anatomic structure.

Those who train with high loads should decrease the weight and increase the range of the movement in each exercise: it would warrant a remarkable decrease of chances to be injured (those who have been injured are aware how important it is) besides increasing the strength on medium ranges (which will be explained later on).

We are likely to think of strength drop at seeing a "wise" athlete with low weights in his hands, but actually, the muscular work is the same or even higher. Is it better not to "disappoint the audience" or to warrant an "injury proof" physique? The answer is up to you.

Training at limited ranges (which clashes with what is prescribed in this book) you should carefully take into account not only more chances to be injured but even to develop not so harmonious physique (see classic, hardened bodybuilders' limited range position, "orangutan" style, with slightly flexed arms). If we speak about the stage for competition, then the answer is clear. The harmony has always been built over the fusion of opposites, therefore muscular harmony isn't exception. In short, developing a high component of strength and flexibility you can get harmonious muscle. Not by accident is gymnastic called artistic (the expression of harmony of athletic forms and movements), when the opposite qualities merge together, which being expressed together perfectly, have a strong impression on audience and jury. In my opinion, the best pages of competitive bodybuilding (and personal one, in the front of mirror), are still to be written by those who will learn the training techniques aimed at personalizing the harmony of the forms and at depicting it into a perfect body.

The Methods of Rehabilitation

R.I.C.E. Method

RICE treatment is used to reduce hemorrhage and swelling in the case of muscular tissue acute damages. RICE is an acronym and means:

R -Rest of damaged part

I -Ice, putting it on the damaged part for 20-30 minutes each hour in the 4 hours following trauma.

C -Compression and bandaging the part for at least 48 hours**E -Elevate the part to facilitate venous return.**

Oakes (1981) stresses avoiding two important things during such treatment:

1. Avoid putting the heat on the injured part for at least 48-72 hours, since it favors blood in-flow and consequently swelling. Besides, electrostimulators and ultrasound machines must not be used in this acute phase.
2. Don't drink alcohol, since it is a powerful vasodilator. Besides, the exogenous steroids must not be used, since they slow down collagen repair. (see Oakes 1981 and Kellett 1986).

The Method of Progressive Functional Rehabilitation

The method is based over the same principles like super strength and flexibility development, described on page 85.

These principles tend to reconstruct the strength of the injured muscle and its flexibility gradually, rehabilitating it completely to training load. The muscular fibers must get back to the original ratio between strength and flexibility of the fiber itself, but only the absence of the pain isn't enough. Only then you can go on looking for the limits of your own muscular capacities safely.

According to Cummings and Tillman (1992) the injured connective tissue must be given the time to reshape itself. Thus, stressing the injured part excessively (even in the exercises with loads during rehabilitation) may either slow down or hinder the progress, because the effect of stress on the new connective tissue strength depends on the intensity and duration of applied stress. That's the reason why training/rehabilitation load are to be calculated carefully on the base of both; the recovery stage and athlete's capabilities. The loads are to be increased gradually so as to allow the injured part to regenerate and recover safely and progressively.

What about Analgesics?

The pain is our friend when it reveals at which point our recovery is as well as the recovery of injured muscular fiber. Unjustified usage of analgesics, camouflaging the pain, gives us the dangerous illusion of restored muscle, leading an athlete to start training again too early (before complete recovery). This is a dangerous way to make the recovery become chronic and incomplete what gets injured and incompletely recovered muscle to be a weak chain in the system. Analgesics and anti-inflammation drugs can be used, but not too much: *Natura medicatrix* (rest), wise training and the systems of rehabilitation will provide everything else, giving us back joy and happiness to train like before (even more than before).

Question 17, Lars (Stretching Modalities)

Q Dear David de Angelis, I'm Lars Kinnunen and I'm a Thai boxer who's been training hard for a year.

For a long time I was trying to perform the splits but without any improvement. When I started I didn't know anything about stretching but I was training very hard in any way possible and it has improved my flexibility a lot. During last summer I gave up Thai Boxing for two months and when I started training again I found myself at the very beginning - my flexibility was as little as when I started training for the splits.

Then I've bought "*Complete Guide to Stretching*" by Jean Frenette and I've learnt some new stretching exercises.

The point is not my being unable to do stretching but I think I'm not going further with my stretching sessions and I do want to perform the splits.

Some time ago I did stretching before my training for Thai Boxing and I realized that this made my muscles so painful so as not to be able to train myself fully. Recently I heard that doing stretching so thoroughly before training is wrong and perhaps it might explain my muscular pains.

I usually do stretching after my ordinary training and it takes me about 10 to 15 minutes. At the end I can really do the splits but then I go back home where it's rather cold (I live in Denmark) and then I'm not able to get the results I had just had in my gym. So, I start all over again, from the very beginning and it looks as if I didn't get any result, at least it's my opinion.

A friend of mine told me that each muscle is made a different way and that some people are unable to do the splits since their tendons are attached in a crossed way, or twisted or something similar. You must explain it to me very simply because I know very little about human anatomy.

If the tendons were strained (but not twisted), the joints would be free to show off their maximum movement range. So, I'm asking you if it's true that some human muscles are built in different ways, depending on person. If you have any advice on how to do the splits, I would kindly ask you to let me know about it. Maybe I should let you know that before starting to train for Thai Boxing I played volleyball for seven years and, normally, I didn't do stretching at the end of my training routine.

Thank you a lot for having read my letter and I do hope you'll be able to help me.

Sincerely, Lars

A

From your letter, I've taken out 6 fundamental points to talk about:

1. Progression and Consistency in Stretching Training

Each progress in sports training comes out as a sum of many little points which are nothing else but the result of adaptation to various stimulus induced on the body. In the case of stretching, the stimulus is the one of progressive muscular stretching.

Therefore, the maintenance of stretching level through constant training is very important. If, on one hand, it's true that recovery factor is important for stretching techniques like isometric PNF stretching, it's also true that too long recovery periods reduce muscular strength and flexibility capacities. This is the explanation for the fact that after two months pause you had a lower flexibility level.

2. The Importance of Technique in Stretching

Although it's important to know every single stretching position (and a lots of variations, over one hundred), the technique of effecting each single exercise is what really makes the difference, concerning the results. Just think that every single position could be lengthened in many ways both concerning stimulated neuromuscular reflexes (the reflex of "reciprocal inhibition" for active static stretching and "Inverse Myotatic" reflex for PNF) and concerning the level of intensity and muscular loading in stretching. So as to achieve better results you should know not only each single position but also each single technique, and even all this isn't enough: then "practice on the field" comes into game as a factor which allows athlete to dose the training loads perfectly (loads in stretching in the case of stretching).

3. Stretching before training - yes or no?

Stretching can be done before training only if effected lightly as a preparatory exercise for physical activity you want to carry out in your training session. After careful general warming-up and joint rotations, you should go on with a light stretching of the joints which are mostly required in your sports discipline. In the case of Thai Boxing, particularly your legs; besides you can also go on with specific warming-up, "miming" various techniques of execution.

As you said, it's not at all recommended to do the exercises of deep stretching (like isometric PNF stretching) before training: the reason is that this kind of stretching aims properly at "resetting" stretching reflexes so as to let muscle reach higher and higher levels of stretching out, and, therefore a higher joint mobility for an athlete. On the other hand, we should keep in mind that myotatic reflex of stretching is actually aimed at protecting the muscle from excessive stretching out. In case of sports like Thai Boxing, danc-

ing, artistic gymnastics, competitive aerobics and martial arts in general, which require explosive strength at maximum joint ranges, if we went on with resetting the reflexes of stretching before carrying out explosive and quick movements of the limbs, we would run the risk of dangerous connective tissue over-stretching and in worse case of muscular sprains.

So as not to make mistakes, each kind of stretching must be done according to the following sequence:

- **Warming-up**
- **Light Stretching and Specific Warming-up**
- **Training**
- **Isometric PNF Stretching/or Relaxed Stretching**

Active static stretching can be done, especially in particular sports where it's required explicitly (for example in artistic gymnastic and competitive aerobics), before doing isometric PNF stretching.

4. Overstretching in stretching and the best load dosing in stretching out

This is a very delicate matter. This book explains in detail the concept of load increasing at maximum joint range, the concept which is the base of isometric PNF stretching. Here, it's enough to know that load dosing has fundamental importance since too little load (relationship among intensity of contraction, holding-up times of position and joint range) decreases the efficacy of every single exercise. The excessive load brings about excessive connective tissue and muscular stretching - out which does nothing but cause almost sudden muscular stretching capacity decrease.

5. Stretching preconceptions on joint, muscular and individual stretching out possibilities

Almost all the athletes justify their little success in joint mobility increasing with a fact that, physiological and joint factors are likely not to allow the best stretching out. This statement comes from their incomplete knowledge on joint limits and muscular stretching possibilities. Just think of how important maintaining a stretching position is in order to optimize the movement of side opening without having either greater trochanter (epiphysis at the base of femur) as a hindrance against pelvis or coxal-femoral ligaments to hinder the opening itself. However, there's a simple test which lets you find out if, with the right training and technique, you would be able to perform the splits, and therefore each maximum joint range: such test (everybody can do it easily) is explained in this book.

6. How to achieve quick results?

Undoubtedly, there's only one answer to this question: training according to techniques which act over the neuromuscular system, which means over those reflexes which interfere with maximum muscular fiber stretching (Myotatic reflex of stretching). At present, the most quick technique to achieve doing the splits and better joint mobility is isometric PNF. This technique, besides using Proprioceptive Neuromuscular Facilitation (PNF) also accustoms the musculature which is to be lengthened to standing higher and higher load in stretching. I would like to point out that it doesn't mean either forcing the muscle too much or over-stretching it, but acting according to certain precise criteria which set up specific muscular adaptation to that specific movement. The body adapts in a specific way to specific requests it undergoes: Think that strength increase is specific and therefore greater in the position in which it is trained.

Training a joint at limited range makes it "suffer" when reaching higher joint limits it isn't used to working on. On the contrary, working at maximum joint range lets the muscles relax more in that very positions therefore granting a higher and better level of muscular stretching out.

Question 18, Valerio Bonsignore (Which stretching exercises I should carry out for post training day aches? Opposite muscle masses imbalance)

Q Each time I carry out squats or deadlifts (despite I train carrying out 30-40 metres sprint) the day after training I feel some aches in both femoral biceps muscles. Since I'm not flexible by nature (on the contrary!) is it possible that my aches come from this factor? If so, which series of stretching exercises must I carry out?

Thanks a lot.

A At first it's necessary to value the nature of the ache you feel so as to see if it's due to the justified and physiological after-training pain or if it's caused by other factors. In latter case, bilateral aching proves that it's a common factor to both muscle sections. On the other hand, if the aches were only on one side it would be easily attributed to some little muscle lesions.

In your specific case, I think the aches could be attributed to strength and flexibility imbalance of antagonistic leg musculature – between femoral biceps and femoral quadriceps muscles, besides a strength and flexibility trouble in your back thigh muscles. It's useful to remember that evident strength/flexibility relationship imbalance of the opposite muscle masses (agonists / antagonists) is one of leading reasons for injuries: there are many scientific studies which

prove it. Especially in sport disciplines which require explosive strength, like football, athletics, artistic gymnastics, martial arts, when a movement is explosively "loaded" by a strong agonistic muscle, its antagonist must be capable to "stand" such explosive loading without undergoing an excessive load both in contraction (while sprinting when withdrawing a leg) and in extension (lunging a leg after explosive contraction of quadriceps muscle).

I believe that your trouble isn't only to be attributed to the lack of flexibility in your back thigh muscles but even of strength at maximum movement ranges. Actually, while sprinting, the muscle finds itself in a position of abrupt extension followed with sudden contractions. Unsuitably trained musculature leads to what you call "stiffness" which is nothing more than connective tissue microlesions (outside and inside the muscle). In worse cases, especially when complete control over musculature is lost because of tiredness (not by accident, the last descent on skis is the most dangerous one; which is a clear example), a less strong muscle happens not to be capable of standing the strains given by movement. Dangerous muscular strains can be verified, actually, in explosive eccentric movements when a muscle is contracting in lengthening position, above all in the case of uncontrolled or ballistic type of movements. The key word here is specific muscular training, according to the specific criteria. So as to eliminate your trouble, Valerio, you must train your legs (and particularly your femoral biceps muscles) to work with higher and higher loads in lengthening: once your muscles are strong even in extreme stretching positions they will be much less subject to injuries (like in deadlifts positions and in sprint where a great muscular strength on a very wide range of movement is requested).

As preparatory preventive training, you should carry out the exercises with low loads/high repetitions (in your case at leg cure) within full movement range allowed by the joint. The movement must be slow and controlled. Carrying out such kind of specific training for a couple of months (it depends on your present training level), you could go on with isometric PNF stretching which I could define, in such case, as a proper preventive form against muscular injuries, without taking into account super flexibility and strength qualities you could reach. A strong and elastic muscle is surely less subjected to extreme strains which might compromise its wholeness.

Question 19, Salvatore (What are the best techniques to develop an adequate ankle flexibility?)

Q I'm not able to carry out a squat without bending forward. This is caused by a problem of ankle stiffness. Which are the best techniques to develop adequate flexibility in that zone?

A As you well know, above all if you are an athlete who applies the principles of super-flexibility development from this book: the higher is

the range of movement in muscle working the higher is flexibility the very muscle can develop. The human foot's anatomic conformation is such that most body weight is supported by the heel rather than by the forefoot as it happens in animals like cats: this is the reason why humans have developed a shorter and less powerful forefoot.

Working range, which means a range of movement which humans use in ordinary conditions, is normally much lower than the one allowed by the joint itself. It's enough to test the kinetic foot/calf chain movement range in ordinary movements as well as in walking and running. Movement repetitiveness tends either to create a stimulus for adaptation with the time (and this is one of the reasons for sport training) or for an opposite process (like in a case of modern man, who works within limited ankle joint range – unlike the cats). Actually, this negative adaptation has caused, in your case, an ankle stiffness (of course if you haven't injured your ankle, otherwise it would be clear why your ankle joint range is limited). Also in this case the "cure" is gradual increasing of ankle joint work range by the exercises which let calf work within its maximum extension capacities. One of the exercises to carry out are calf extensions, keeping your feet-tips on a step and paying attention especially on lowering very carefully and deeply in maximum calf stretching position. The surface of the step represents ordinary calf work range carried out in common-day life (horizontal level): overcoming this line you will habituate your muscles to work within wider and wider movement range.

Increasing calf and ankle flexibility you reach two targets.

1. The one of offering yourself a better stability in exercises like squat-in a half and complete squat (without using as support 2 kg discs under your heels); in the case of "static" sport disciplines like bodybuilding.
2. In the sport disciplines "of explosiveness and strength" where great capability of sprinting and rising is needed (for example in basketball, volleyball, football, sprint) the work on calf flexibility matched with particular exercises effected with plyometry allow you to reach remarkable results.

There are particular "frontal" shoes which allow you to change foot geometry and to habituate kinetic foot/calf chain to a much wider joint range than the ordinarily used one. It's as if we, wanted (by a heel placed in the front-foot of these shoes) to make calf and ankles work like those of a feline. Jumping in these training shoes (and I'm not advising you to have a drink at the bar in your gym because you would be "labelled" an eccentric type, at least) means a tremendous overloading given to your calves: even because, besides the overloading given by the jump itself (when the impact's force on the ground becomes about six times greater than body weight) the muscles are also lengthened over the normal threshold of work represented by the ground (usually a horizontal level).

Dear Salvatore, if you want to increase your ankles' flexibility as well as that of any other joint in your body it's enough to respect the principle which impos-

es a work within the full range of joint movement, paying attention to not forcing into hyperextension positions where joint stability isn't backed up by musculature. Also in extreme positions like the splits, properly trained muscles for super-flexibility and strength guarantee for adequate and safe joint stability.

Question 20, Gabriele Zampetti (Periodization in Stretching and Competitive Aerobics)

Q I'm an athlete in competitive Aerobics and I would like to learn what to do and how to keep a high flexibility level during the competitions which last two or three days, like international ones. I would like you to give me a kind of week schedule for stretching, more detailed than usual: hours per week, the best exercises etc. Thank you ever so much and good luck.

A Among many physical qualities which an athlete needs so as to reach a high level of performance, the flexibility – meant also as joint mobility – is the one which takes the most time to be developed. However, if the training program is well-structured the time needed to reach a high level of flexibility is not too long. It's also important to train yourself using the most efficacious techniques. A training program is well-structured if it takes into account all the necessary factors which let the athlete reach peak form on time foreseen for the competition. I'm referring to training loads periodization



Italian Aerobic Championship
Above: Emanuele Girometti
Below: Rinaldo Cacchioni (on the right)
David De Angelis (on the left)

which foresees various loads (necessary for physiological adaptation and for improving various physical qualities) to be used in "masterly and wisely" measured doses for the target of competition itself. One simple mistake in valuing periodization may cause a scarce performance in the competitive period, despite maybe having reached your peak performance just a month before.

It's virtually impossible to be "in peak form" throughout a year, when "peak competition" is meant a level of performance "for the competition". Whoever doesn't take periodization factor into account does nothing else but hinder the best development of his own physical qualities.

As said at the beginning, it takes a long time to reach high quality performance and it also goes very slowly but, on the other hand it's rather easy to lose it. Particularly referring to the sport you are practicing, competitive aerobics (which has nothing of aerobic since it requests a kind of anaerobic lactacid in two minutes of competing with less-than-maximum engagement) the flexibility can be kept easily, not only in short periods of competitions but also throughout a year. Anaerobic resistance, needed to keep the body in evolution among splits, jeté, squares, horizontals in a rhythm of about 150 bpm, is lost only after a month without carrying out specific training for this target. On the contrary, the flexibility can be kept easily repeating particular exercises from time to time.

Concerning the training schedule you are asking me for, I advise you to practice isometric PNF technique because of its extraordinary results but I point out the importance of respecting the principles of training which let you reach maximum results. I can reassume as follows:

Always effect one adequate warm up before each training session and before each stretching session (if you carry it out separately). "Squirming" for five minutes or stretching out isn't an adequate warming up. The adequate warm up must be progressive and gradual which takes an athlete to an aerobic regime.

Respect the correct sequence of stretching exercises. Always finish each session with carrying out isometric and/or relaxed PNF stretching training. Don't ever think of a certain phase which might be skipped, even if you are very tired. Remember that only 10 minutes of isometric PNF stretching can guarantee a better flexibility.

In strength exercises, seek to carry out the exercises always at (your own) maximum joint range. As I've often explained, this is one of the secrets why the gymnasts have both a high strength component and flexibility at the same time. Working at limited ranges takes the muscles to adapt themselves to that very ranges of movement, and therefore to lessen rather than increase the joint mobility.

Don't ever over-train your musculature. Tired muscles are less elastic and less powerful. If you manage to get on the stage of competition "fresh

and cool" and as rested as possible, then your flexibility and performance will reach your personal maximum level (within limits of your training and periodization).

Question 21, "Batman" ("Cold Splits" and Suspension Splits)

Q Hi! I would like to thank you because due to your advice and book I've been able to achieve excellent flexibility and now I'm able to do the splits... but, it takes me a long time to warm myself up and I must perform many series of isometric PNF... For some weeks I've been also trying to do suspension splits ... but the difference between when I'm "hot" and "cold" is still enormous!!! ... What should I do and how? Thanks a lot and my best compliments!

A The capability of doing the splits being cold as well as the suspension splits, putting the feet over two supports (chairs, steps, etc.) depends on the level of joint mobility one has reached. Once you reach the complete split on the ground it's necessary to go on working and following the Power-Flex Stretching principles of muscle training at maximum joint range. Continuing with training the strength at maximum joint range and following the indications and precautions, one reaches the point where the flexibility is as good as to allow the athlete to show it off even without warming up and, maybe even to carry out suspension splits. I suggest these procedures for the reasons of correct warming-up before training and competition, even because the suspension splits always bring about possible risks for the performer.

Once you are able to increase the weight in a split, like for example doing it on the ground without help of your hands, which unload the weight, and/or increasing the time of maintaining the position, or increasing the load in the split holding the dumbbells in your hands (obviously it works well only for very experienced people who have trained with Power-Flex system) you'll also be able to show it off being cold.

So as to let you have clear idea, dear Batman, when you succeed in feeling "comfortable" in the split, without using your hands for over 20 seconds, you will also be able to carry out the splits when you are cold and maybe even be able to perform a suspension split.

Basic advice: don't be in a hurry. Be patient in increasing your strength at maximum ranges *gradually*, and little by little, you'll fall into the split. The rush to reach the results brings about dangerous muscle overlengthening, causing microlesions in connective tissue with possible muscle strains, which lessen both the strength at maximum range and, consequently, the stage of joint mobility you've achieved.

Question 22, Dino (Training Specificity and the Martial Arts)

Q Dear David, I'm Dino Puleo, I'm 31 and since 1982 I've been studying Wing Chun style at Italian Kung Fu Academy (Leung Ting's school).

I would kindly ask you to give me some further information on the exercises from your book (*Power-Flex Stretching*).

Training routine:

My training is structured as follows:

- Monday, Wednesday, and Friday - Stretching
- Tuesday and Thursday - Strengthening
- Sometimes also on Saturday when I feel like doing it (only Point 1 as presented below).

Monday, Wednesday and Friday

Point 1: Before starting training sessions I'm interested in, I walk fast for 30 to 45 minutes on a race simulator with the help of a cardio-frequency monitor (so as to slim).

Point 2: Afterwards I go on with abdominals - 5 series of 30. I do the abdominals laying on the ground with my legs wide and bent and I rise only with my shoulders (circa 10 cm). Having finished these 5 series I carry out another 3 series and in each I strain my abdominal muscles for 30 seconds. All this to have abdominal muscles like Bruce Lee or like yours I've seen in photo.

Then I go on with stretching.

Tuesday and Thursday

Before starting I carry out point 1 as above. All the exercises mentioned below are done very slowly (4 seconds to lower, 4 seconds to rise).

Tuesday

- 3 x 10 - 8 - 6 press-ups
- 3 x 10 - 8 - 6 with the help of dumbbells I train my triceps muscles

Thursday

- 3 x 10 - 8 - 6 lateral rise with dumbbells
- 3 x 10 - 8 - 6 with the help of dumbbells I train my biceps muscles

I've got a good muscular mass!

Questions:

1. I'm ready to accept any your suggestion on my training routine and work protocol, set out above.
2. If I understood well, isometric PNF is a kind of stretching with

a difference that the muscles should be hardened when maximum extended.

3. If so, I did the frontal splits with my feet pointed forward and then the frontal splits with my feet pointed upward carrying out 5 series and stretching out my legs until feeling the pain inside my thighs and then harden the muscles for 30 seconds. (Maybe it was only the impression I had, but in both exercises I was raising circa 10 cm from the floor - it had never happened before!)
4. I'm not able to do the following exercises completely:
 - Square Legs, together and maximum
 - Vertical Split
 - Raised Opened Legs
 - Opened Legs Square
 - Half Square
 - Square with Central Support

(I think these are active static stretching exercises). What should I do? Should I insist and try over and over again? If I understood the isometric PNF well - (as for my question n°2) may I apply it on muscles which are involved in the above mentioned exercises? I'm a bit bewildered about it, but probably you understand. Please, explain it to me!

Thank you ever so much and my best wishes.

A One of the secrets for success in sports and in whatever aim you choose to pursue in common life is the one of training yourself to accomplish a task by repeating it over and over again, looking to bring the very same movement to its perfection with time and practice. Each sports discipline has its own sequence of movements to be carried out by a performer who adapts himself to the variations he faces. In the case of martial arts the factor of movements' changes and variations is very high since one must adapt himself to respond to an adversary's movements - something that doesn't happen in the sports where everything is studied in detail (consider competitive aerobics where an athlete makes a pre-established sequence of movements in a pre-established rhythm).

The concepts like specificity and repetition were known to oriental masters of the martial arts. Combative movements known as "forms" or "kata" were foreseen to be repeated by masters' students. Each movement, although perfect from the point of view of mechanical execution (as for the speed, explosiveness, spatial execution), must maintain the "spirit" of the movement itself and it especially works for the martial arts. As "spirit of movement" means "awareness and the will" factors of the very movement and it actually means that, at least in the martial arts, the movement must be executed with the intent of killing or wounding the adversary.

What is this preamble for?

I often read the letters from athletes and martial arts' followers (and others) who aim much of their training and precious energy at carrying out the training that can hardly help them to improve in the sport discipline they are practising. It's caused by the stereotypes of what should be the perfect martial arts' athlete/warrior: a big, massive, brawny athlete like Van Damme (so that we understand one another). In such case you can easily see that exhausting training on muscular mass like bodybuilding, leads you to betraying yourself to the disadvantage of the specificity principle. What is all the muscular mass for, if muscular fibers don't have characteristics like flexibility, velocity, resistance and strength which should characterize a martial arts athlete? Cinematography stereotype of martial arts champions should be replaced with one more similar to a model which embodies the above mentioned characteristics.

The specificity principle works for all sports and it's basic for one's own sport performance. Does an athlete train only with weights paying all his attention to developing only his muscular mass so as to do free-standing exercises? No. After having built basic strength by specific bodybuilding type exercises (with machines and dumbbells) he concentrates himself on reproducing the pattern of technical athletic movement, rebuilding every single position in the sequence of holding during competition.

In short: specificity! It's important to structure one's own training schedule, a work protocol, reproducing the movements at the same speed, joint range, explosiveness which are requested by the sport one is practicing... obviously after having carried out a general training which may be even an unspecified one. Thus: there's nothing worse in martial arts than "killing yourself" and your muscles by training with weights (unspecified exercises) slowly and in a concentrated way (the fibers adopt themselves to slow but not to explosive efforts). Regarding it, I would like to remind you of the well-known SAID principle (Specific Adaptation to the Imposed Demand which all the *Power-Flex* athletes know).

Now I'll proceed with your specific questions:

1. Carry out the strength exercises with weights executing them with a medium high weight at high speed (read: explosive execution). Finish the exercise when the speed tends to decrease because of tiredness, since the neuromuscular system tends to remember the speed of the last repetition and consequently, the explosive capability would be penalized continuing the exercise at a speed weakened by tiredness.
2. You are right if by "to harden" you mean "to contract" the muscle isometrically in stretching position.
3. You must not feel the pain but simple strain or effort of contraction. The pain is a signal, a feedback your body sends you to warn you of

having overcome its adaptation capacity (you are dangerously over-stretching your musculature with all the consequences).

4. All that works for unspecified bodybuilding exercises (with reference to physical preparation in martial arts) also, and above all, works for the exercises called "squares," which are nothing else but exasperation of active static stretching. Leave out those exercises, unless you would like to be a gymnast or competitive aerobics athlete.

Concentrate all your energies on isometric and relaxed PNF stretching at the end of the strength exercises. The technique of isometric PNF execution can be perfectly applied on all striated muscles. Adapting your training to the specificity principle you will utilize your precious energies for the targets which are more suitable for your sport discipline, consequently increasing and improving your performance.

Question 23, (Explosiveness)

Q Since I need explosiveness, am I supposed to do the strength dynamic exercises (which are preparatory for isometric PNF), quickly or slowly?

You shouldn't confuse muscular flexibility (doing the splits) with muscular explosiveness (kicking explosively and quickly), or with ability of keeping your legs in extreme positions (as when kicking in slow-motion, showing-off your balance ability, your control and isometric strength). Above all you should develop joint passive mobility (the splits). Then, in particular, you should work on your explosive strength ability (dynamic flexibility). Then, if you want, you can train active static stretching getting used to keeping your legs in extreme positions (as when kicking laterally) with balance and control. The latter ability isn't desperately needed to be a good fighter or the martial arts athlete. Doing only the splits doesn't guarantee explosive kicks.

You can be very open and have "soft," but not very reactive legs.

Isometric PNF can help you in doing the splits (to do them even in suspension on blocks) but can't help you to make your muscles explosive. You must integrate isometric PNF with stretching dynamic training... Dynamic Stretching doesn't mean ballistic (very dangerous). The dynamic Stretching I speak about, is, however, controlled, where we move explosively but under control and within our own joint ranges (without overcoming our own present limits).

Take everything step by step.

You shouldn't make the mistake: specific exercises for muscle explosiveness are completely different from dynamic preparatory exercises for isometric PNF. You should do the latter exercises in a very slow and controlled way within

all the range of joint movement you would like to train. The purpose of such exercises is to increase the muscle endurance, to strengthen connective tissue and to bring about "rearranging" nervous reflexes of muscular tension on the widest joint ranges. Doing so, after this period of muscle preparation, you will be ready for more specific isometric PNF exercises. The isometric strength must have its base over a dynamic one, and the latter you can get through dynamic exercises, low weights and many repetitions. This is actually the reason for these preparatory exercises for isometric PNF stretching. A weak musculature isn't capable of standing the isometric contraction loading in stretching positions foreseen for this kind of stretching.

Question 24, Mario (Connective tissue shortening and muscle strength loss: to get back the lost muscle elasticity)

D Hi, I'm Mario, I'm 24 and I'm writing you from Caserta Province (Italy) hoping you could help me.

After having injured my knee 2 years ago and being cured later on, I still have a limited complete knee flexion due to connective tissue shortening in the femoral quadriceps muscle and tendon (probably due to protracted isometric muscular contractions with my leg stretched, actually in shortening - I was working on this for a couple of months, every day).

I was doing isometric PNF for a while, but without results.

How could I get my lost elasticity back? Please, be so kind and give me a complete answer, since to me it's very important to overcome this physical limitation. Looking forward to your answering me, I send you my best wishes.

A So as to give you a solution for your problem it's important and necessary to understand, completely, its nature and specifics. Your problem, having had an accident at joint level, could have either a muscular or joint component or even both together. I'll take into account the hypothesis that your knee chronic inflexibility has a muscular nature: if this isn't the case, then you could be given the solution only from a competent orthopaedist who knows the nature of your problem very precisely, as well as the kind of joint damage you have had and the kind of operation you have undergone and the further treatments you had during rehabilitation to restore the use of your leg.

Lets talk about the case where impossibility of complete knee flexion is due only to isometric contractions when the leg is completely stretched - so without joint range at all.

Strength and flexibility are two inseparable and interdependent compo-

nents: if one is lacking, the other will be compromised. The extreme case is a muscle in atrophic conditions when strength and flexibility components are exactly minimal.

Another basic factor is also joint range, actually, the range of a movement usually done, both in sport and everyday life. The body and all physiologic systems, musculature included, adapt to the kind of the work they are usually subjected to (SAID Principle of Specific Adaptation to the Imposed Demand). A joint range, the muscles are usually subjected to, is one of the components for development or flexibility and a joint mobility loss.

If, as you said, you've got your knee used to working in isometric contraction at the lowest joint range, as it happens in the specific case of knee extension, the result could be a probable surrounding connective tissue shortening and a certain variation of tension nervous reflexes, and all this together doesn't allow you to get the highest movement range (in your case a complete knee flexion).

It's better to repeat: a strong muscle is also the one more ready and more capable of stretching out. Strong muscles need to "hire" less fibers to stand load (less fibers are shortening). As a consequence the muscle is subjected to tension but at the same time, it is capable of relaxing.

So, it isn't a chronic tension, as when we want to stretch out a weak and untrained muscle. If so, stretching out a weak and almost atrophied muscle we'll have contraction, of which the purpose is to protect skeletal muscle.

Your body allows you to do spontaneously and without effort, only that which it sees as safe and not dangerous for its physical well-being: the body has its own wisdom which overcomes impulse.

In your case, making slow progress, you should restore the use of that part so as to get it used to the muscle working and a muscular contraction presence at a higher and higher joint range. It isn't enough to do only isometric PNF on a fundamentally weak muscle. One stretching rule is: stretch out what you strengthen and strengthen what you stretch out. It seems that, in your specific case, not only you have made your leg chronically inflexible by isometric tensions at very low range (knee extension) but, by mistake, you have also looked for stretching out (through isometric PNF technique) – so all that what, at first, was to be restored by the muscle working for the strength at higher and higher ranges. This is the mistake many people make in practicing isometric PNF:

They are looking forward to stretching out when essentially, the most important thing to do is to increase the strength, little by little, working over the muscle we want to stretch out with low loading and many repetitions at higher and higher joint range. At first the strength base and only then muscle stretching out by isometric PNF. The isometric strength (as the one shown in extreme stretching positions in isometric PNF) must have its base in muscular strength and some training.

Therefore, start training in a controlled way with low loading, many repetitions, with exercises which put the muscle subjected to contraction at a higher and higher range (throughout time).

So: try to do the free squat (without cage) or the press with low loads, but do it so as to get a higher and higher knee flexion. Unless the worse problems subsist (as those of joint nature), further on, such exercising will allow you to get utmost function and your knee flexion back.

In conclusion I would like to tell you that whichever discipline, subjecting the body to chronic tensions at limited or negligible range (dynamic or isometric training), leads to chronically rigid and inflexible physique development.

In Chinese philosophy and its ancient wisdom, "Tao" represents the harmony and equilibrium coming from the union of the opposites: building a body with high levels of flexibility and strength, leads to the building physique. "Power Flex", like a sword, is tempered by the opposite elements (like fire and water).

Question 25, (Stress over Knee Ligaments)

Q Despite flexing my knee while standing with my legs turned inwards and my pelvis forward for a side split, I feel the stress over my ligaments. Should I put my hands on the floor?

A You must put your hands on the floor or a step, chair, or bench so as to be sure you have control over this extreme position. If you are already at a high training stage in splits, you can put your hands on the floor so as to unload the weight (should it ever become excessive). Putting your hands on the floor or over a steady support is needed to avoid possible muscle lesions in a case of sudden sliding. We should remember that in these extreme positions the muscle happens to be very vulnerable (actin and myosin superimposition is very low as well as the levels of strength and control over position). Pay attention to advice which I have given in on isometric PNF. Before proceeding and opening in a new stretching position (as lowering your pelvis), you must improve your strength in that very position with preparatory strength exercises (and I'm not talking about the dynamic ones like controlled leap).

Pay attention to your knees: stop whenever you feel the pain. You must never feel the pain, neither while training nor in the following days: above all it particularly works for ligaments. Isometric stretching target is to strengthen the part which is in extension, making the muscle stronger at extreme ranges as well as more capable of lengthening.

Slowly but surely: build the strength at extreme movement levels at which you want to improve (by strength dynamic exercises and the isometric contractions at the highest range).

Good luck and enjoy your training.

Question 26, Max (Isometric PNF Stretching: The Position for Side Split)

Q As you told me, the most correct position of isometric stretching for frontal split is the one with the legs turned outwards and chest vertical, keeping the knees slightly bent. Nevertheless, after a certain opening, I lose balance and I'm not able to bend my knees anymore (actually, I hardly keep my balance on my heels...). Should I stop before?

A Many times I've spoken and written on the right position to keep during frontal opening. I would like to point out that the position with the legs turned outwards and chest upright isn't the only correct position: it could also be done with the tips forward and pelvis slightly bent forward – the alignment is the same. The basic factor to think over is pelvis / femur position. If this position isn't correct, then any lengthening will be blocked at a certain point. The block is always of bone nature (greater trochanter banging over pelvis and the ligaments falling into tension).

It's normal and obvious: the more you are widening your legs, the more you must be careful about balance, especially if you are lowering in a position with your legs turned outwards and pelvis upright.

I would like to advise you to push your feet forward and bend your pelvis, so as to be able to maintain your balance easily in such low and wide open positions.

Remember: the more you are lowering in frontal legs parting the greater is the stress over your knee ligaments: therefore, as a preventive measure, you should strengthen your knee stability through the exercises of extending and flexing your legs (leg extension and leg curl). If your knees are very delicate you should practice isometric stretching for side split with your knees bent (for example with pelvis on the floor and bent knees): In such a way the knees are not subjected to load as they really are when the legs are kept in tension (completely or partially).

Good luck.

Question 27, Dynamic Stretching and Strength

Q I've noticed that after practicing some dynamic stretching exercises (above all the back leap) I have some troubles in my lumbar zone and, in spite of the fact that I've been training in karate for seven months, I'm not able to reach even the lowest number of exercises (30) requested for each strength dynamic exercises set, above all in legs parting with my back on the floor. I would kindly ask you to give me further explanations for my troubles. Thanks a lot.

A You shouldn't mix up dynamic stretching exercises (leaps and rotations) and strength dynamic ones. The first are useful for increasing muscular elasticity / explosiveness (but they must always be carried out very carefully, otherwise could become as dangerous as ballistic stretching).

The strength dynamic exercises are useful for preparing the muscles to stand the load in opening positions.

If you can't reach even 30 repetitions (without even ankle load) in frontal legs parting exercises, with your back on the floor, it means that your adductor muscles are extremely weak. I wouldn't be surprised if your side legs parting level were extremely low.

As I've written in this book, increasing the strength little by little in extreme positions, you become more able to relax in such very positions, therefore the flexibility is increasing. *The lack of flexibility is caused by the lack of strength in certain positions (splits).*

Question 28, (Side Split Posture)

Q Hi, I'm Samuele and I'm practicing martial arts. You tell us to keep our pelvis as upright as possible while practicing isometric PNF exercises for side split, but then again it seems impossible to carry out the side split on the feet, unless bending the trunk forward so as to free the joint.

A If you are training for side split on the feet you must do your best to keep the position of being as upright as possible, yet keeping the right pelvis alignment. Actually, it means either putting your toes forward and bending your pelvis (without excessive bending which gets you to have your chest almost parallel to the floor) or keeping your legs turned outwards and your pelvis in "physiological" position.

As I already said in this book, to keep the chest as upright as possible means to bend the pelvis slightly forward (so as to free the ligaments and to withdraw greater trochanter which would, otherwise, touch the pelvis and wouldn't allow the correct level of abduction), but at the same time, without bending the chest down to the floor too much. This chest/pelvis bending downwards increases the opening level but doesn't actually help you to fall into split.

The example of wrong training for sagittal splits: the back leg (being turned outwards) lets you lower more, but it doesn't allow the psoas muscle to lengthen and strengthen effectively while extending. The result is: if you make up the positions you see yourself more open but, in fact, you are cheating yourself (or

the others). Essentially: always keep the correct joint alignment to subject your muscles to an efficacious lengthening / strengthening and not to stress your joints. *Don't ever overcome your own present limits, but - respect them.*

If you force certain positions, subjecting your muscles to over-stretching, you are damaging connective tissue and greatly harming and compromising the results. The secret of stretching is: make the position "comfortable" even if it looks extreme at that very moment. As it's described widely in this book: (gradual strength increasing at extreme position/joint range and neuromuscular systems "defense" "tidying"). If the body/muscle feels "comfortable" in one extreme position it relaxes as a consequence. It's not enough to lengthen a muscle so as to modify its structure and its lengthening capability but it's also important to train it through special dynamic strength exercises and, in the end, isometric ones which build the strength and flexibility dowry at the same time. This is the reason why the classic relaxed stretching doesn't allow as important a flexibility gain as Power-Flex stretching/strengthening (dynamic strength exercises at the highest range and isometric PNF).

Question 29, (At First Train the Strength, then the Flexibility)

Q In the positions like "kiba-dachi" I don't feel at ease since I think I'm not able to reach my maximum opening level and I also feel a little stiffness in my knee ligaments. Besides, the isometric contraction of my femoral quadriceps muscle, needed to keep such a position, takes my attention off my main target. I mean that doing the split, (it's an inch shorter than complete) I'm able to cope with the position quite easily with a little help of my hands and without risking overstretching my adductor muscles.

A Even if in that position your attention is "taken" by the effort and muscle working in keeping on the position because of femoral quadriceps muscles, actually your adductor muscles are being trained (for side split). Normally, such position costs an effort to be kept at least at the beginning. This is the reason why 98% people have weak and not very flexible thigh adductor muscles: we hardly ever take this position in our everyday life. Our body is the result not only of our genetic inheritance but also of the adaptation it goes through whenever it is subjected to the stimulus (work, sport, environment, etc.).

If your hand were put at plaster at a certain joint angle, after being immobilized for some time, you would see your muscles habituated to that joint range and not only to immobilization itself. The result is the loss of flexibility and strength of immobilized muscle. The very same thing happens to

thigh adductors in everyday life, even if in a bit different way (without a real external immobilization).

That's also a SAID Principle of Specific Adaptation to the Imposed Demand.

Walking or standing on feet, the adductors are subjected to very little load and that's why they are shortened: how could you hope that by increasing the load by lever lengthening (the legs) you could easily stand the load in stretching position and do split? It's impossible without training these muscles correctly and gradually.

Train with weight beam (even unloaded) on your shoulders and do deep squats, parting your legs more and more. You must repeat the exercise many times (with low load) and work in a "calm" zone so *as not to damage connective tissue around muscles*. Doing so a couple of times a week, and having suitable recovery between the training session, you'll see that your nervous system as well as your neuromuscular reflexes in that opening position won't be "on the alert" contracting the very same muscles whenever you want to open. Therefore, the result will be wider opening.

Keep in mind: gradual training, mostly insisting on opening position. Then, having increased the strength, you'll see some improvements in capability of legs parting.

Don't only lengthen: strengthen in one safe stretching position. It's better to have a shorter slope but 20 repetitions more in a deep squat position.

Question 30, Luca (POST POWER-FLEX and Isometric PNF – Further Explanations)

Q Dear Mr. De Angelis. Here I am again to ask you for further explanations on Power-Flex Stretching and Isometric PNF. I have a clear idea of what isometric PNF is, but I would like to learn about some other details, maybe useless, but I need to be sure of what I'm going to do so as not to be afraid of hurting myself. That's why I'm going to present you with further questions:

1. Speaking about final contractions, do you mean that in my extreme opening position I should contract my legs to close them or to push them to the floor?
2. A guy, who is practicing martial arts in my gym, told me that by using creatine and proteins I could slow down or even stop lengthening. Is it true?
3. I've tried to do some strength exercises, but I'm not able to do more than to rise for a few centimeters. Is this normal or not? Should I put more effort in making the muscle get used to that

kind of effort so as to see some results later on or give up doing this kind of exercise?

4. I am training by myself. Could I have troubles? Could you advise me how to make my training safer despite the fact that I do it by myself?
5. Could you advise me how to distribute my training, including isometric PNF?

Please, take into account that I always train myself with weights at lunch time on Monday, Thursday, Saturday and sometimes on Sunday, and on Tuesday and Thursday I train myself with martial arts from 9 to 10.30 p.m. and sometimes on Sunday.

6. Are the exercises mentioned in your book enough to reach complete mobility since I don't have any physical defect and I'm able to do the test you quoted in your book? Were I to want to do some other exercises (since you've explained only isometric PNF method and some exercises in your book) could you let me know which book to buy to see what kind of exercises I should do? The reason why I'm asking you about this is very simple - I'm rather ignorant on the matter and I've been carrying out only the kind of stretching which is taught in the gyms.

ALet's go on with your questions.

1. By "final position" of contraction I mean the one you reach after contraction /relaxation precautionary series.

By "final position" is meant whichever position (sagittal openings, side openings...).

You are referring to the proposed exercise in a standing position. In such case both contracting your legs to close them and pushing them to the floor mean the same very thing. In such case you must contract your adductor muscles as if you wanted to "pinch" the floor with your legs apart and to rise from the floor. Obviously, considering the relationship length/muscle tension (increasing the joint working range the muscle capacity of contracting is decreasing) and considering the very stretching position you've reached (since it's the "final" one) the strength of isometric contraction will be limited (at least at the beginning).

Increasing the strength in that position, little by little, you will also be able to "maintain it" as well as to relax. Therefore, the result is muscle lengthening.

Keep in mind: before reaching the point of carrying out isometric PNF stretching technique You must train those hard mus-

cles hard you would like to lengthen later on. As for this, you can do dynamic strength exercises with low loads and many repetitions. I know I'm repeating, but it is very necessary because if you skip this phase it could harm and hamper your further progress. Your muscles need to have certain basic strength because they are requested isometric strength development: such basic strength could be built by dynamic exercises, gradually increasing the load, but always repeating many times (at least 30, 40 until over 100 per series).

You can see a valid flexibility increase only doing these exercises slowly and at your own highest range: the principle is the same - it means to use your joint to work on the ranges it's not use to gradually. The principle of Specific Adaptation to the Imposed Demand recurs here.

2. Nutrition is basic for getting suitable energetic support for your training as well as for muscle tissue building. This works for both increasing the muscle mass and the ordinary maintenance of bodily functions (there's a cyclic tissue replacement). As for the proteins, they are very important for plastic support supply for muscle/sarcomeres tissue increasing; if muscular hyperplasia in lengthening proved (sarcomeres increase in a series).

So, a suitable quantity of proteins is welcome: they are BASIC not only for stretching but also for all other kinds of physical activities as well as for mere surviving and health.

As for creatine it's well known that a high monohydrated creatine assumption brings about muscle strength increasing, by available energy increasing (ATP adenosin-3-phosphate) and consequently about capacity of increasing intensity and duration of training.

Considering that, as you have already read in this book, the flexibility is directly correlated to various factors like connective tissue elasticity and the strength on highest personal working range (besides being correlated to strictly neuromuscular factors). The assumption of creatine can determine a muscular lengthening capacity increasing. Such capacity is being lost progressively in the periods of "creatine discharging," when creatine concentration levels inside the muscle drop drastically.

Despite the fact that creatine has a certain, even remarkable efficacy, when it's taken too much (as integrator) it is not as essential for the body as the proteins.

3. If you are referring to active static stretching exercises, which means to extreme positions, shown in this book, don't do them, unless you need to develop a certain specific strength (for example if you are a gymnast or competitive aerobics athlete). If you want to be suc-

cessful in “your” sport you should train developing specific characteristics of “your” sport: joint mobility and explosiveness or, maybe, only isometric strength with certain qualities of co-ordination. There’s an exception to the rule: the artistic gymnastic which develops strength, flexibility, and extreme space co-ordination qualities of athlete. By the principal of “specific” I actually mean that: if you want to run like a hare don’t train like a turtle. If you want to swim like a fish don’t learn to fly.

4. Being alone or in someone’s company you must have full control over extreme stretching positions. You must not allow anybody to force your position. In some positions only one millimeter over is enough to cause connective tissue microbreakage or, even worse, muscle sprain. You are the only one who knows when to stop, so, as for this, you can’t rely on a friend, above all if he is not very experienced.
5. Please, follow the instructions from this book. In scheduling your training you must carefully take into account and never forget that isometric PNF must be seen as a strength exercise: therefore it undergoes the rules of strength increasing which foresee adequate recovery periods between training sessions. Be careful about the right quantity of work so as not to risk failing the expected results. Over-training could be another risk (see the adaptation graph on page 185).
6. You can find great books on stretching with a plenty of figures. I devoted myself to showing various kinds of stretching in Power-Flex (including very efficacious isometric PNF). The matter of showing how to do the exercises was beyond the scope of this book. I was pointing out “how”, “why” and “when”, referring to the most important and basic principles of physiology and neuro-physiology. A true athlete must know and understand his own body so as to respect it and reach its highest expression.

Good luck.

Question 31, Wesley (Doubts on Training Loads and Stretching Recovery Times)

QHi David, great informational site! My name is Wesley Tyrone, from California, USA. I’m a fitness enthusiast and part-time actor. I am 24 years old, currently striving for maximum flexibility (side split) trying to work my way up into martial arts/action movies.

I have been surfing around your website, which seems like the only great source on the matter of flexibility, though I’m still confused about training frequency/duration.

1. How many times per week should I dedicate to strength exerci-

ces for my hips/adductors?

For example : one day on/one day off or one day on/two days off or 3 times per week?

2. Should I do strength & stretching exercices in the same day (same workout)?

3. Should I do stretching after strengthening or before?

4. How many total sets for strengthening (and reps?)

5. How many times should I do such PNF stretches? (5 stretches of 20 seconds, 10 stretches of 20 seconds....?)

I'm really confused about this topic : frequency, sets, reps...

I'm looking forward to your reply.

Many thanks

A In this book I explain the close relationship between strength and muscular stretching capacity. It's impossible to achieve remarkable improvement in muscular stretching capacity and joint range of mobility-ROM (Range of Motion) without a certain level of strength appropriately developed according to some precise criteria. I figure from your question that you understood that it's not only enough to stretch out a muscle but it's also necessary to proceed with specified strength exercises. But, which are the guidelines for doing such exercises so as to intervene over stretching capacity?

Specificity

The first factor to take into account is the characteristic of specificity, which is a part of stretching. It means that flexibility isn't a general body characteristic but it's specific for each single joint: a person can have different levels of ROM in different parts of his body (for example, he could be not very flexible at scapulo-humeral cinguli level – the shoulders, but very flexible at the hip joint). These differences are mostly the result of specific adaptation to strength level and muscular flexibility. Keeping in mind this fundamental characteristic of flexibility, it's necessary to train over such base, therefore, choosing specified exercises which train the muscle to work gradually at higher and higher joint ranges. Working in this specific way, a specific stimulus for ROM increasing is being made even in joints and "openings" which normally, in every day life actions, we don't use completely. This is the case of the side split, where the engaged muscles are those normally held at minimum range and with low loading in stretching-out. It's completely normal that these muscles, in most people, are unaccustomed to this movement and consequently, their "disuse" (or limited use) is great enough to harm the level of opening.

Load Size in Muscular Stretching Positions

Another fundamental factor is the choice of loads with which the muscles should be trained in stretching positions.

Actually, this is a very difficult concept to be theorized and calculated, since the level of exercise intensity (relationship loads/opening level/ROM) is very difficult to calculate: not only does each person have his own characteristics of muscular strength and flexibility but these characteristics can remarkably vary in the same very person depending on muscular section.

Despite the fact that this book has given some information on hold-up times and recovery between the sets of isometric PNF exercises, actually, I would like a Power-Flex athlete to develop his body awareness. On the base of this “perceptive” quality, while training an advanced athlete should feel the point when “training” limit is reached (and as “training” I mean such a kind that produces an adaptation, and in this specific case lengthening and a stimulus for strength increasing at that very range). Such an important quality (which a brand new athlete or an athlete in a hurry doesn’t have) allows dosing the number of exercises, sets and opening levels so as not to cause a dangerous muscular over-stretching (in this case, possible microlesions of connective tissue cause a strength loss at that very joint range and at the same time drop in very stretching capacity). The secret is: gradual load and work-range increasing.

Shortly, it means that if (for side split) you train complete squat (with your pelvis below your knees in maximum knee-flex position) at first you respect the Principle of Specificity. On the base of the second principle of gradual load increasing you should train, at first, without loads for many times (high repetitions-about 30 per set), being careful about perfect execution and maintaining the knee-flex position for a few seconds, with constant tension without rebounding. After an adequate recovery period (two, three or more days) repeat the sequence, and, eventually, go on with executing the same number of exercises with an unloaded beam.

With strength increasing (reaching 3 sets of 50 repetitions) you can increase the weight to lift and/or widen your legs in squat position. Have you ever seen remarkable level of flexibility at the hips of Sumo wrestlers? And, not by accident, they often find themselves in a squat position with widened legs: this improves their capability of maintaining position and, therefore, the level of strength and flexibility at hips (don’t be surprised to see 2 Sumo wrestler doing the Side Split!).

Recovery Time between Training Sessions

“Body awareness” takes its place even here. Who could know better than you whether your musculature has recovered between two sessions? If you see the curve of adaptation to loads and muscular super-compensations (see the

graphs on page 185) you will understand that if you don't recover enough, (having adequate and abundant rest in the days between training), you can't get strength increase at trained joint ranges and, therefore, joint mobility increase will be little, or will even decrease.

A Trick and Advice so as not to Make Mistakes

The trick is to value if that very day is the right day to train. Do it in the morning, before getting up, when you are still "cold": if you feel even a little muscular stiffness, that's probably the day to go shopping rather than training. If you don't feel any stiffness it means that you have recovered completely and you can train.

The advice, as for recovery, is to allow yourself one or more days of rest more than you've calculated. In such case you can be sure of not exceeding in training frequency. Even you have certainly been able to ascertain that, not by accident, after some extra days of recovery, the level of your strength and flexibility is higher. So, why don't we go to the seaside today?

I'll answer your questions in brief:

1. It's enough to do the strength exercises once or twice a week, but do them having at least two days recovery period between training sessions.
2. Consider dynamic strength exercises as the exercises of stretching (besides the strength ones) and isometric PNF exercises as strength exercises (besides the flexibility ones). It's better to do them, with appropriate loads, all in the same day, so as to grant a suitable recovery between the training sessions.
3. It's better to do the stretching after strength exercises if your aim is to increase joint mobility.
- 4./5. Please, read the part of this answer regarding the size of load in stretching training (dynamic strength exercises) but don't ever forget to listen to your own body to know whether it has recovered completely.

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THE BOOK

Do you need to achieve a higher level of flexibility? Does your sports discipline require extraordinary strength? You can express all your athletic capabilities by developing your strength and flexibility to the maximum. In some sports disciplines like martial arts, artistic gymnastics and competitive aerobics, a higher level of joint mobility is not only needed, but it is also fundamental for reaching a high level of performance.

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THE AUTHOR

David de Angelis has been studying training techniques and muscular physiology for years. He has taken part in many martial arts and aerobics competitions and has devoted a great deal of his studies and experiments to super strength and flexibility achievement. He collaborates with many magazines specialized in the field.

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