

Performance profiling in Sports Psychology(Book Chapter)

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Volume - 3

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Chapter - 1

Performance Profiling in Sports Psychology

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Chapter - 1

Performance Profiling in Sports Psychology

Saleej KT

Abstract

The purpose of this chapter to introduce the new psychological method of players self and test evaluation. In this chapter we can discuss about the introduction of sports and psychology. The evaluation part mainly depended on performance profiling of players. The psychological questionnaires are using the evaluation method. The collection of data of players analyzed in a systematic manner. We can use the statistical method of factor structure.

Keywords: Sports psychology, metal toughness and performance profiling

Introduction to Sports

The fulfillment in any field depends upon the human potentials, which is determined by his or her overall participation within the sports and with full confidence and determination. The intention is the signal of development which motivates individuals to attain or to gain of their strive in a given activities if possible is the participation could be frequent. An enough duration and frequency this can yield the private end result that directs to the goal or achievement.

Bodily schooling is accordingly an indispensable a part of the entire education system and has its purpose, the development of physically; mentally and socially match citizen via the medium of bodily sports, selected which will be understanding those effects. Physical training, along with bodily health, ambitions at advanced co-ordination among structures of the frame wider pastime horizons improvement of capabilities, mental alertness, and socialization. All of which might be conducive to a successful institution dwelling.

Sports activities and games is a vital piece of education and a way to perform physical and emotional well-being people. It ought no longer to be well-known that bodily schooling and is a favor vain problem and just a methods for the sake of entertainment and engagement of children and younger human beings. Curiously, it has to be regarded as an essential a part

of lifestyles exercises. Ideas, as an example, well-being, health, individual and social development and emotional well-being are firmly identified with brandish and bodily practice.

Behind any athlete or team is a well-organized teaches or management crew, who, with their athletes, has cautiously plotted their campaign closer to fulfillment. The hunt for wearing excellence calls for an knowledge of the planning manner. Performance profiling is extensively used by sports activities coaches and running shoes to enhance a character's and team sports activities performance.

Sports that consist of companies of human beings would require exceptional mental abilities for absolutely everyone due to the various requests of their specific elements of the institution. An instructor a bodily training trainer needs to have the potential to distinguish these necessities via notion and appraisal. The appraisal will normally appear as a few sort of intellectual abilities profiling. There are numerous ways this could be carried out, but an instruct is usually required to permit the individual to turn out to be especially conscious of their view of the intellectual requests placed upon her or him. as soon as those had been distinguished, the competitor ought to be urged to analyze in which he or she is as a long way as his or her mental traits and shortcomings and strategies need to be an installation to enhance those areas which have been recognized as requiring a trade.

Nowadays as never earlier than, a person is interested in a huge sort of sports, and with this interest, has come know-how of personalities, occasions, and a widely numerous active participation. This guarantees nicely for the future of sports in our increasing number of leisure society.

Contemporary physical schooling with an emphasis in education via bodily activities is based upon the biological harmony of thoughts and frame. This view sees existence as a totality and the existing spirit in physical education seeks the schooling of man thru physical sports as one component of the social attempt for human enlightenment.

Recreation is a pastime this is ruled via a fixed of rules or customs and frequently engaged in competitively. Sports activities generally refer to activities wherein the bodily talents of the competitor are the sole or number one determinant of the final results (triumphing or losing). The game is normally defined as a prepared, competitive and skillful physical interest requiring commitment and truthful play.

The game has existed for several thousand years. As the sector populace keeps increasing and technology improves in regions inclusive of

transportation, communication, medication, and sports device, the game will preserve to adapt and contain increasingly more humans across almost all elements of the arena.

Sports activities competitions have a critical vicinity in society and are quintessential for the improvement of sports overall performance, they are the most effective method to give a surprisingly unique load to sportsman having mental and bodily demands, many factors of mental practice are critical within the building up to the main carrying event however while handling crew sports, the 3 principal additives are fulfillment motivation, Emotional intelligence, and team brotherly love.

Sports activities have a high social and political cost. It develops character, facilitates to make use of spare time in a practical manner and offers delight, pleasure and people to undertake a mindset of existence. A game is for status, pride and pleasure with a programme of heroic proportions. The primary aim of cutting-edge sports activities opposition is to discover and diagnose the human capacity at an early level of life and channelizes it within the right route to recognize the achievements specifically sports.

Human mind and physique throughout centuries has been the challenge of discussion with the scientists, artists or even laymen. Perhaps no serious try has been made thru either systematic or experimental study to narrate performance with mental traits. Almost all games and sports activities particularly volleyball, soccer, basketball are primarily based upon such essential capabilities that require standard traits of body and thoughts, so thickly associated with overall performance.

Sports Psychology

The field of sports psychology and performance enhancement is growing exponentially. However, the sources of records related to the sphere are extraordinarily limited. The purpose of this site is to offer a discussion board for dialogue of topics which might be applicable to the sphere of recreation psychology via quarterly courses. The topics in an effort to be included encompass theory, research and exercise of sports psychology as well as social problems associated with the sphere of athletics.

In relation to sports, having mental strength is nearly as important for gamers as bodily fitness. Stress can get to the fine sports activities stars and mental education is, therefore, an essential ability to own. “Whilst the going gets tough, the hard get going” is one way to say it. Or, as one sports psychologist put it, mental toughness is “the capacity to continually perform

closer to the top variety of your talent and ability irrespective of aggressive circumstances.”

With sports psychology a developing subject of observing, extra athletes are seeking to enhance their mental prowess as well as their physical exercising workouts. Right here, we study a number of the high-quality cases of sporting intellectual crumble and the way we can all research from those examples.

There may be a skinny line that exists among mentally-strong sporting fulfillment and beneath-strain failure.

"Sports psychology, to position it definitely, focuses on the psychological factors related to bodily overall performance," says Dr. John Bartholomew, a companion professor inside the Department of Kinesiology and fitness schooling.

International recreation is full of examples of those who have come so close to glory but mentally collapsed on the final second. Here, we come up with a run thru a number of the maximum well-known sporting moments while the mental stress proved too much, and provide you with the experts view, plus a few top hints that will help you along with your mental sport.

The mental behavior of an athlete plays a tremendous function in the sports activities performance. Psychology aims to expand a better know-how of human conduct and experience. There are many elements which impact the conduct of sports activities man which includes tension, self-assured, aggression and motivation, worry...and so forth. Those mental elements shall have an impact on the overall performance of athletes.

Sports activities psychology way making use of mental theories and concept to elements of sports which include coaching, teaching, competition and many others. At the same time as sports activities psychology is involved with a reading of human behavior in numerous forms of sports activities settings.

Competition sports play a crucial role in modern-day society. Success in sports activities is appreciated and a huge wide variety of people participated in sports activities as part of their each day existence. Cutting-edge sports consist of a spread of different disciplines, which inside the path of records have evolved as a collection of physical sports that have lent themselves taking part opposition and matches. The dynamic improvement of sports shall preserve to engender new paperwork. The beyond decade has visible a giant growth in some of sports in which international championships are held.

In every competition, the same old of overall performance in every game acquire new top. That is because of the have an effect on of cutting-edge schooling gadget and the development in various technological know-how like Biomechanics, exercise body structure, sports activities medication, sports psychology ...and many others. This enables the sportsperson to train through current approach and techniques. Acquisition of the brand new standard can also be attributed to the higher expertise of the human organism on the subject of bodily, intellectual, motor performance qualities.

Recreation and workout mind research is an obligatory part of the game science teaches. This teach adds to the exceptional professional practices associated with physical games, as an example, - teaching of physical schooling, leisure and health advancement, and kinesiology related callings - in light of the reality that it assumes a intellectual element for the contributors. Game and exercising clinicians see physical action in some one-of-a-kind approaches: physical motion as a device for wellness, physical action as an tool for human capability, and physical movement as a tool for social exchange.

In earlier days sports activities mind technology become for the maximum component involved approximately growing assessment techniques that might distinguish the ones people with the opportunity to become pretty authentic well-known competition. Today the emphasis is on intellectual making ready, practices that enhance the mental capabilities with a purpose to assist athletic exhibitions at the way to elegance. These aptitudes comprise intellectual symbolism and middle preparing. inside the event that a competitor is not kidding about becoming the nice, she or he may be, the most essential solving is a experience of duty regarding exercise the proper things.

Game mind research includes the investigation of the intellectual variables associated with aid and execution in don. Prologue to sports activities Psychology offers an critical comprehension of the way the exclusive parts of brain studies may be related to don hobby. Appraisal of identification kinds might be pointed out identifying with brandish cooperation. This can be prolonged to speak about notion and authority dedication to put on funding and similarly the connection amongst nervousness and excitement as for upgrading wearing execution. Intellectual capabilities making ready will then be illustrated, along with objective setting, institution factors, symbolism, high-quality self-in connection to accomplishing crest donning execution. Prologue to sports Psychology offers a more noteworthy comprehension of the intellectual procedures of individual competitors and organization waft to improve carrying execution.

Do not forget society a dwelling creature which all components of it upload to its survival. This view is the functionalist perspective, which each part of a fashionable public is organized to hold up its solidness. Functionalist view wears as a almost non secular enterprise that utilizations custom and provider to improve the basic estimations of a well-known public.

Brain studies are helpful inner physical movement as it can be utilized to boost and impact one's factor of view at the benefits of well-being. This branch of have a look at has become a portal into numerous vocations in bodily pastime, for instance, a wellbeing advisor, physiotherapist, and training. Mind technology is utilized within the instruction framework to assist energize all understudies, notwithstanding their bodily capability, to take an interest in a sound and dynamic way of existence. In an enjoyment setting, brain science is utilized as part of ads to convince individuals to need to land up extraordinarily greater physically dynamic. The vocation of a well-being consultant utilizes the advantages to mind research to permit their customers to accomplish their proposed goals. Some treasured methodologies to enable a consumer to perform their objectives may additionally comprise, objective putting, an active trainer, or a diffusion of applications.

Cutting-edge don at every stage of contention and in for all intents and purposes every sporting motion has profited from the usage of intellectual standards and intellectual preparing inside the quest for most intense athletic execution, push administration, more advantageous preparing kingdom of mind and every other part of recreation in which the psyche, emotions, and bodily execution meet.

Importance

The period of overpowering quality and stamina overseeing sports is finished, and the age of the rationally intense competitor has arrived. Competition are not anymore the shallow muscle heads and robots customized to complete one goal, triumph. Contemporary competitors going for walks from the secondary college to talented degrees are confronted with many weights and allurements, normally outdoor the domain in their game. These weights can prevent a competitor's execution generously; on this way, the weights ought to be controlled by means of clinicians. The adequacy of games mind technology is exhibited thru the fields several speculations, packages, and an assortment of techniques and techniques.

Statistics associated with the sector is extraordinarily confined. The reason of this website is to provide a discussion board for discussion of

topics which are relevant to the sector of sports activities psychology through quarterly publications. The subjects so that it will be covered include concept, research and practice of sports psychology as well as social troubles related to the sector of athletics.

The mental conduct of an athlete performs a fine role within the sports activities performance. Psychology goals to broaden a better knowledge of human behavior and enjoy. There are many elements which affect the conduct of sportsman together with tension, self-assured, aggression, and motivation, fear...etc. those mental factors shall influence the performance of athletes.

Sports psychology means making use of mental theories and ideas to elements of sports including coaching, teaching, competition etc. even as sports activities psychology is concerned with analyzing of human conduct in various kinds of sports settings.

Sport Psychology: the way it enables Athletes In our trendy public these days it seems like games govern the land. Anywhere we look, there may be some kind of wearing occasion occurring or being broadcast. Nearly all and sundry might be viewed as an fanatic of no much less than one recreation. A few human beings take after games like a faith. With such an increased deal with sports, the competitor's exhibitions are positioned under a magnifying lens. This places extra weight on competition to offer a effective execution. In no way again do competition play for the sake of entertainment, they play to win. This isn't always happening simply at the expert stage; it's far going on all degrees of sport. From teenager's baseball to patio football, the objective is to win in any respect price.

The period of overpowering first-class and stamina overseeing sports is finished, and the age of the rationally excessive competitor has arrived. Competitors are not any extra the shallow muscle heads and robots changed to finish one goal, triumph. Modern-day competitors going from the secondary college to proficient levels are faced with many weights and allurements, often out of doors the domain in their game. These weights can repress a competitor's execution considerably; on this way, the weights must be managed with the aid of clinicians. The viability of video games brain technological know-how is shown through the fields several speculations, packages, and collection of strategies and methodology.

Game mind research is special many of the related mind research disciplines for numerous reasons. The expression proposes that there are stated everyday practices used by sports clinicians and its is recognized as with every science, the usual methods to deal with the practice, making

ready and affirmation of the sport therapist are certainly known over the universe of game and athletic contention. The element of games brain science here that has an inclination to separate it from other type of related mind technology is the overall closeness of the connections created among an individual competitor and their therapist. The regular professional limits of expert separation are distinctive in sports conditions wherein extreme feeling and focused longing are the gasoline that the two drives the competitor onwards and makes them defenseless against intellectual anxieties. Many recreation analysts assume a multi-dimensional part inside the lives of their competitor customers - organized talented therapist, associate, sounding board, and accomplice and recommend are each workable and altogether moral phase to the connections that could create by using and by

Sport and workout mind studies is a compulsory part of the game science teach. This teach adds to the one of a kind expert practices related with physical physical activities, for instance, - educating of bodily coaching, diversion and well-being advancement, and kinesiology associated callings - in mild of the truth that it assumes an intellectual component for the members. Game and exercise clinicians see physical motion in some various approaches: physical motion as an apparatus for well-being, physical movement as a tool for human capability, and physical motion as a device for social change. Execution profiling is the point at which a mentor or games clinician breaks down the execution of the competitor with the aim that they could distinguish the qualities and shortcomings. There are numerous blessings to this as it's miles pinnacle to backside and can without much of a stretch distinguish shortcoming, so the competitor can make strides

This mental assurance is the component that a well-being professional might also undertake to embed in a consumer. The significance of brain technology in bodily motion has prospered as teachers and amusement promoters are higher ready to see how the importance of wellness is seen through their members. Exercising and recreation mind research is believed to be an important part of physical movement and recreation, which allow people to obtain their human capability. The significance of interest and recreation mind research in expanding human capacity can be visible by taking a gander at how it affects advanced competition, don professionals, and the use of representation and symbolism on this educate. Elite competitors are reliably near their greatest capacity to the extent bodily potential and excellent are concerned. This has made perspectives be moved

closer to exercising and sport brain technology to permit the competitors to make the subsequent stride closer to their last targets. To make this next stride, workout and game analysts take a gander at some zones.

The level that a competitor performs on any given day relies upon five number one things, bodily aptitudes, and intellectual abilities, level of specialized know-how, key mindfulness, and shot. "Opportunity" is every one of those factors that aren't beneath the competitor's manipulating, for example, the climate and how splendid the restriction is. As there are continuously some wild matters in sports, execution is surrendered over to possibility to a few diploma. To permit a competitor to get the "shot" attitude insane some video games groups and competitors have procured a video games clinician. A games therapist will allow a competitor to concentrate more on the parts of the enjoyment which are underneath their manage. I must compose a paper on the viability of games brain research but on account that there may be no confirmed statistics or insights I'm able to compose on the ways that video games therapist's assistance a competitor come again from damage.

Performance Profiling in Sports

Overall performance profiling is while a train or sports psychologist analyzes the performance of the athlete with a purpose to become aware of the strengths and weaknesses. There are many advantages to this as it is extensive and might without difficulty perceive weakness, so the athlete can enhance.

Related to the athlete within the creation of the overall performance profile increases intrinsic motivation. On top of having extra motivation, the athlete-coach courting may be greater. A sporting example of overall performance profiling is football. If Rooney wants to find out in which he's weaker, he ought to use overall performance profiling. This will permit him to investigate his overall performance with his teach and work out a contingency plan.

The first gain to overall performance profiling is the reality that the athlete and train can certainly become aware of the strengths and weak spot of the athlete's performance. That is a gain because it permits the athlete to paintings with their coach on improving the weak point. As an example, if a CM in soccer was weak on his capability to look passes and players runs, then his teach ought to take a look at the overall performance profiling and paintings with the footballer on this specific ability.

Some other gain of overall performance Profiling is that it will increase motivation in an athlete. PP does this as the athlete can genuinely perceive

their weaknesses, because of this they can easily work towards improving the weakness and becoming a power. Because the athlete's weakness is his imaginative and prescient, he might be stimulated to enhance.

A final gain of overall performance Profiling is highlighting any variations between the train and the athlete's belief of the athlete's overall performance. This is a gain due to the fact if both the athlete and the educate do a overall performance profiling P they may come up with a few differences.

Overall performance evaluation presents the athletes and coaches with objective facts that helps them understand performance. This method is underpinned with the aid of systematic commentary, which gives valid, dependable and specified data referring to performance. Performance analysis can help enhance the coaching process by presenting statistical and video statistics.

This goal records helps improved feedback between coaches and athletes. Subsequent interventions can then cause a more overall performance impact. We work intently with coaches, athletes and different service vendors to make certain that the evaluation is efficaciously integrated into athlete improvement programmes.

Performance Profiling gives an insight into how the player views their sport and their potential in it. Coaches who are not aware about their player's perceptions in their personal game, chance dropping the hobby, attention, and motivation of the gamers to their personal improvement.

Even though the educate can also should make sacrifices in not working in an area they experience is essential, the participant might also gain more confidence by way of enhancing a exclusive characteristic that holds more concern for them for the duration of the performance. This brought self-assurance may want to have a fine effect on their entire recreation. By means of discussing every different's perceptions of the player's ability, the educate can are seeking for to question and cast off negative, 'irrational' thinking the player has approximately their capability.

Sooner or later, with the aid of breaking down their sport, players benefit a clearer photo of their sport, their capabilities and a way to work toward enhancing them. The targets set by using the player will offer an on-going motivation to improve in the course that they've agreed with their coach.

While using performance profiling it lets in the athlete to be more inspired because the athlete seems like they've more control over their very

own performance and how they are able to enhance. This offers them a greater experience of motivation as it allows them to experience as although they have an enter on how their schooling regime is going and performance Profiling additionally permits them to see the view that the train has on their overall performance. Seeing the coaches view might have a fantastic impact on motivation as they might try to paintings more difficult if the view become bad, as they would need to paintings harder to impress the instruct.

Visualization is a not unusual time period used to describe guided imagery or the manner of forming photographs in our mind like images or actions, pictures recreating our first-class performances, and the way it feels to perform simply the manner we need it to. These photos may be visible, kinesthetic- how our body feels, tactile-how it feels to the touch, auditory-the way it sounds, even olfactory-what we scent. The usage of thoughts power we are able to call upon those photos time and again, enhancing ability thru repetition practice session. The mind and body can emerge as extra prepared to simply carry out the talent and can enhance both bodily and intellectual reactions in certain situations. The growing athletes, who make the quickest development and who in the end turn out to be their quality, make huge use of mental imagery. They use it each day, as a means of directing what is going to happen in training, and as a manner of pre-experiencing their exceptional competition performances. Intellectual imagery frequently begins out truly, as you think thru your goals, your moves, and your preferred aggressive performances.

Performance Analysis

Overall performance evaluation gives the athletes and coaches with objective records that allow them apprehend overall performance. This method is underpinned with the aid of systematic statement, which affords legitimate, dependable and precise facts referring to overall performance. Performance analysis can assist enhance the coaching system by means of presenting statistical and video data.

This objective record helps better comments among coaches and athletes. Subsequent interventions can then cause a more performance effect. We work intently with coaches, athletes and other carrier vendors to make certain that the evaluation is efficiently integrated into athlete improvement programmes.

Coaches and athletes spend an amazing deal of time considering how you can improve, or trying to recognize the factors that make up an excellent performance. Many coaches rely upon what they take a look at in actual-time

to tell their coaching choices. Studies show that coaches can, on average, recall around 40% of key performance factors that they had definitely seen. In terms of the education technique, if the observation of performance is confined then the rest of the system is then in the query. That's why performance evaluation may be extremely useful.

Benefits for Athletes

The benefits of athlete's improved technical and tactical expertise, choice making and advanced self-belief

Advantages for Coaches

The blessings of coaches to Assists in know-how of athlete's strengths and weaknesses decorate their own improvement and training exercise and permits in-depth review of performance.

The performance evaluation group on the sports activities Institute pass beyond the traditional methods of studying video; the usage of the superior performance analysis software program, athletes and coaches can have an extra knowledge of overall performance, letting them make higher choices about their training and interventions.

The sports activities Institute has furnished overall performance analysis guide to wheelchair basketball athletes for a number of years. The persevering with intention when running with an athlete is to assist them to recognize how they're acting. Our role is to provide them and their coaches with goal information, increasing their probabilities of maximizing training results and accomplishing achievement. Thru this provision athletes have the opportunity to:

- Enhance the understanding of performance with particular and goal overall performance critiques after every recreation at some point of the season.
- Offer a real-time technical evaluation to improve their abilities.
- Set realistic desires and targets for specific fits via video remarks.
- Help other provider vendors with their provision.
- Offer online get right of entry to video footage, so that you can enhance comments and verbal exchange among staff and athletes.
- Provide help via schooling camps and competition profiling.

Mental Toughness

Mental toughness describe a package deal of characteristics that consist of an surprisingly excessive stage of `resolution , a refusal to be intimidated ,

an capability to live targeted in excessive-strain state of affairs, a capacity for preserve an foremost stage of arousal during a competition, an unplugging eagerness to compete whilst injured, an unyielding attitude whilst being beaten, a propensity to take dangers when rivals display warning and a flexible, possibly obstinate insistence on completing a competition in preference to conceding defeat.

In assessment to the physical toughness that's durability, an exceedingly high threshold of ache or a rugged-style approach to competition intellectual longevity suggests traits of thoughts or intellect. An exception is jean cote who writes; mentally hard athletes are capable of hold their feelings in control and are calm and relaxed below strain situations.

Qualities of a Mentally Hard Athlete

1. Calm beneath strain, staying cool inside the heat of opposition. He would possibly get a bit anxious or excited earlier than the motion, however he's completely in control and does no longer permit this arousal to end up a distraction whilst the overall performance begins.
2. She is unfazed by way of the opposition or the conditions within the place. When a bigger, harder, or faster competitor enters the field she does not falter or hesitate however alternatively a “convey it on!” attitude has and is even extra motivated to do her fine. Rain or shine, she brings her a game and is assured in her skills.
3. He has tremendous powers of attention, capable of recognition on what is crucial and block out the whole lot else. He does no longer allow mind approximately the beyond or the future, bad feedback from fans or combatants, or fears of failure to get inside the manner of his concentration. He is without difficulty capable of live absolutely present within the now.
4. She possesses a aggressive sort of tunnel imaginative and prescient. once that whistle blows or the clock starts she is laser-focused only at the matters that count number maximum in that moment, including the feel of her body, her breath entering into and out, the relevant attractions or sounds that beautify her capacity to react quickly, bodily awareness of her teammates or competition, and connection to the area, ball, balance beam, swim lane, or whatever other factors are critical within the warmthness of the moment.
5. He has a winning mind-set. He usually indicates up to exercise and video games on time absolutely ready to do his best. He's

supportive of his teammates and does what he can to assist them prevail. He keeps his power up and pushes to the bounds even if a win seems out of attain. He listens to the train and puts in more exercise hours to best a circulate. He remains wonderful and trains like a champion irrespective of what.

6. She does the paintings and has open thoughts in terms of studying. She does not track out suitable recommendation whilst it appears inconvenient and is always trying to analyze from high-quality teachers, successful athletes, and the reports of the champions she admires. Even when she's off the sector, she reads or listens, watches films, and does physical activities to educate her body and thoughts in becoming a more potent and smarter athlete.
7. He is assured and believes in himself regardless of what. He does now not concentrate to the naysayers who try to put him down and inform him he's no desirable, although the ones bad messages are coming from an unhelpful train or unsupportive dad and mom or pals. He knows he can do this and has no purpose of giving up.
8. Disappointments or setbacks do no longer shake her perception in her abilities and goals. She is resilient and may be rebound speedy from losses, upsets, or horrific breaks. She knows that those are a regular part of the opposition and continually seeks to apply them as studying opportunities. She we could these items truly roll off her again and is quickly capable of refocus on persevering with her education, enhancing her talents, and appearing better in the future.

Cote's evaluation of studies on 'coach and peer have an impact on children's development via game' attracts on 1996 paintings through Smith and small, who describe mental sturdiness for youngsters as 'the capacity to keep physical arousal inside possible limits'. Once more, this is a more restrained interpretation; even though of the route, it applies particularly to children. The relevance of this paintings is that it demanding situations popular notions that mental longevity is absolutely an innate best that a few athletes have others do not.

Cote discusses 4 methods designed to 'enhance youngsters' mental longevity'.

1. Changing elements of the situation that place unnecessary strain on young athletes; this could consist of practicing away from spectators or maybe converting guidelines to in shape the skill degree of the athlete.

2. Increasing aid for managing pressure situations: this entails operating on technical talent acquisition in order that the younger athlete acquires the self-belief so one can execute the competencies in.
3. helping children expand a tremendous attitude opposition; at the outset, a younger athlete must learn that tension is 'no longer produced completely with the aid of a situation ' and that cognition is the important thing to responding correctly to even the most taxing situation.
4. Rehearing relaxation; cote, in conjunction with numerous other pupils, encourages intellectual exercise at an early age, in particular, coaching youngsters the abilities needed to relax and the capability to apply imagery.

Mental durability can be taught in adolescence; the presumption is that it will carry thru to maturity. Mental sturdiness is simply a potential to live calm and at ease and retain a degree of emotional control at some point of a contest is another trouble.

The unmarried instance includes most of the salient capabilities of mental toughness. He noted an appropriate stage of arousal, managing emotion and bringing his nonetheless to bear even as several rivals both spun off the track or simply resigned them to defeat.

Goal setting is the process of outlining targets or goals. These goals are generally recreation-precise desires and may be long-term - triumphing the league - or quick-time period - rating 3 factors from 6 photographs at some stage in an exercise game. Purpose placing may be an in particular effective motivating device for teens as it could. The train can play a critical role in setting out goals for an individual player or a team. By using supporting the player or team set dreams there is a dedication from both aspects towards realizing the aim.

Write down the dreams, and setting them in a prominent location, allows reinforcing the commitment entered into when the dreams are set down. The educate have to understand that the goals need to be challenging and plausible however additionally flexible, because the goal is to task the participant to reap the purpose, no longer offer an not possible mission. Through providing everyday feedback, the train can further venture the gamers to reap their dreams. Shorter time period desires are better for a few young adults as often they will not be capable of realizing how they're progressing toward an extended-time period goal. This will result in a loss of consciousness and decreased motivation.

Benefits

1. To aid in figuring out the precise intervention
2. to maximize the athlete's motivation and adherence to the program
3. To reveal any modifications through the years
4. To expand focus of essential qualities important for achievement in a sport
5. To recall performance from a joint instruct and athlete angle
6. To useful resource in figuring out the precise intervention in favored areas of exchange
7. To help in schooling programme layout with cognizance on first-rate overall performance
8. To screen adjustments over time
9. Assists recognition and progress towards usually agreed desires
10. gives a visual display clean for reference and comments
11. Maximizes the athlete's motivation and adherence to a program

Overall Performance Profiling Comprises of Four Steps

Step one is for the coach to introduce to the athlete the idea of overall performance Profiling and how it can assist to direct education to regions of precise need. This system can be aided by using a experience of mutual consider, and it should be made clear that any facts received approximately the athlete will stay strictly confidential. Coaches have to strain that there aren't any right or wrong answers concerned within the manner however that sincere appraisal will facilitate a extra effective final results. The coach wishes to explain that the method will cognizance at the athlete's present day emotions concerning their instruction for competition.

In the second step the athlete becomes actively involved on this step of the manner, and the subsequent query has to be directed to the athlete:

Spend five to ten minutes list the traits or characteristics that the athlete feels are crucial. If an athlete finds this hard, the teach can use activates, however it is for the athlete to determine on what characteristics are chosen. The train must try and get the athlete to listing the key mental elements; however the same manner can be implemented to technical skills or bodily attributes, which includes electricity, pace, agility, stability and many others. In this step, the athlete should try and become aware of 15 to twenty characteristics.

The Next Step is for the Athlete to Charge each of the Identified Characteristics

1. On a scale of zero (never vital) to ten (extremely crucial), the athlete rates the perceived significance of each characteristic for an elite performer of their unique sport/event.
2. The athlete uses the same zero to ten scales to rate their current belief of themselves on the subject of an ideal country of 10.
3. A calculation is then finished to determine the 'Discrepancy' value. The better discrepancies suggest regions that could need to be addressed through schooling or different intervention.

Within the fourth step, the unique athlete refocusing after mistakes and attention are key concerns that might be addressed. This can be via intervention techniques along with self-communicate or a quick set recurring, relying on the precise instances and options of the athlete.

Sports Psychology and Overall Performance Profiling in Sports Activities

Sports and Games psychology is a mandatory factor of the sports science discipline. This discipline contributes to the diverse expert practices associated with bodily sports consisting of - teaching of bodily schooling, exercise and fitness merchandising, and kinesiology associated professions - because it performs a mental position for the contributors. Game and exercise psychologists view physical activity in several exceptional methods: physical activity as a device for fitness, bodily pastime as a tool for human ability, and bodily activity as a device for social trade.

In earlier days sports psychology changed into ordinarily involved with developing assessment methods that could identify the ones humans with the potential to grow to be critical superior athletes.

Today the point of interest is on mental training, exercises that make stronger the mental abilities with a view to help athletic performances at the route to excellence. Those capabilities consist of intellectual imagery and awareness education. If an athlete is critical to turning into the fine he or she can likely be, the most crucial factor is a dedication to exercise the proper matters.

Game psychology entails the look at of the psychological elements related to participation and performance in recreation. The sports Psychology presents a fundamental know-how of ways the diverse elements of psychology may be implemented to game participation. Assessment of

personality kinds may be discussed regarding sports participation. This will be extended to talk about motivation and leadership contribution to recreation participation as well as the relationship between anxiety and arousal with admire to enhancing carrying performance. Psychological abilities training will then be tested, consisting of aim putting, team dynamics, imagery, high-quality self-on the subject of attaining top wearing performance. Creation to game Psychology presents an extra expertise of the mental techniques of character athletes and crew dynamics to decorate wearing performance.

Think about society as a residing organism which each part of it contributes to its survival. This view is the functionalist angle, which every part of a society is dependent to keep its stability. Functionalist regard sports as a nearly non-secular organization that makes use of ritual and ceremony to enhance the common values of a society.

Psychology is useful inside physical activity as it can be used to promote and have an impact on one's angle on the benefits of fitness. This department of look at has grown to be a gateway into many specific careers in physical hobby including a health consultant, physiotherapist, and schooling. Psychology is used inside the schooling machine to assist inspire all students, despite their physical capacity, to take part in a wholesome and energetic life fashion. In an activity placing, psychology is used in commercials to steer humans to want to come to be more physically active. The career of a fitness representative uses the advantages to psychology to assist their clients to acquire their meant goals. Some beneficial strategies to assist a consumer to obtain their goals may additionally encompass, intention setting, an enthusiastic teacher, or a variation in applications.

Cutting-edge recreation at every degree of opposition and in truly every wearing interest has benefited from the application of mental concepts and intellectual schooling inside the pursuit of maximum athletic overall performance, strain management, stepped forward schooling mindset and each different element of game where the thoughts, feelings and physical overall performance intersect.

Meaning of Sports Activities Psychology

The age of overwhelming strength and stamina governing sports activities is over, and the age of the mentally tough athlete has arrived. Athletes are no longer the superficial jocks and robots programmed to accomplish one aim, victory. Present day athletes ranging from the high faculty to expert levels are confronted with many pressures and temptations,

typically outside the area in their recreation. These pressures can inhibit an athlete's overall performance notably; consequently, the pressures need to be treated by way of psychologists. The effectiveness of sports psychology is confirmed through the fields many theories, packages, and type of techniques and strategies.

Anywhere we look, there may be a few form of sporting occasion happening or being televised. Nearly everybody could be taken into consideration partial to as a minimum one recreation. A few people comply with sports like a faith. With such an improved consciousness on sports activities, the athlete's performances are put underneath a microscope. This places more pressure on athletes to offer a winning performance. Not do athletes play for fun, they play to win. This isn't always taking place just on the professional level; it is occurring on all degrees of the game. From little league to backyard soccer, the purpose is to win at all cost.

The age of overwhelming electricity and stamina governing sports is over, and the age of the mentally tough athlete has arrived. Athletes are now not the superficial jocks and robots programmed to perform one goal, victory. Modern athletes starting from the high faculty to professional tiers are faced with many pressures and temptations, normally outdoor the area of their recreation. These pressures can inhibit an athlete's performance significantly; therefore, the pressures want to be handled by psychologists. The effectiveness of sports psychology is established through the fields many theories, applications, and style of techniques and processes.

Sports activities psychology is precise among the applied psychology disciplines for some of reasons. The word suggests that there are normal common practices employed by way of sports psychologists and it's far mentioned as with any science, the baseline approaches to the schooling, training, and certification of the sports activities psychologist are well understood the world over of game and athletic opposition. The characteristic of sports activities psychology exercise that has a tendency to distinguish it from another shape of implemented psychology is the general closeness of the relationships evolved among an man or woman athlete and their psychologist. The commonplace professional boundaries of professional detachment are specific in sports environments where intense emotion and aggressive preference are the fuel that both drives the athlete onwards and makes them vulnerable to mental stresses. Many sports activities psychologists play a multi-dimensional position inside the lives in their athlete customers - educated expert psychologist, buddy, sounding board, confidante and guide are each possible and completely moral issue to the relationships which could broaden in exercise

Importance

Sport and workout psychology is an obligatory element of the sports activities technological know-how discipline. This subject contributes to the various expert practices associated with bodily activities inclusive of - the teaching of bodily education, exercise and health merchandising, and kinesiology associated professions - because it performs a intellectual function for the contributors. Recreation and exercising psychologists view physical interest in several one-of-a-kind ways: physical hobby as a device for fitness, physical interest as a tool for human capability, and physical hobby as a tool for social trade. Overall performance profiling is while a coach or sports activities psychologist analyzes the overall performance of the athlete with the intention to pick out the strengths and weaknesses. There are many blessings to this as it is in depth and can without problems pick out weakness, so the athlete can enhance.

This psychological determination is what a health consultant can also try and implant in a customer. The importance of psychology in bodily interest has flourished as educators and activity promoters are better able to understand how the significance of fitness is view by way of their participants.

Exercise and sports psychology is notion to be an incredibly vital element of physical hobby and recreation, which permit humans to attain their human potential. The significance of exercising and sports activities psychology in growing human capacity may be seen by way of looking at how it impacts high-overall performance athletes, sports activities consultants, and the use of visualization and imagery in this field. High-performance athletes are consistently close to their maximum capacity as far as physical capability and electricity are worried. This has triggered views to be shifted closer to exercising and sports psychology to help the athletes take the following step closer to their final goals. To take this subsequent step, exercising and sports activities psychologists study several areas.

The extent that an athlete performs on any given day relies upon on 5 predominant matters, bodily abilities, and mental skills, level of technical ability, strategic cognizance, and danger. "Chance" is all those variables that aren't under the athlete's manipulate, together with the weather and the way desirable the opposition is. As there are always a few uncontrollable things in sports activities, performance is left as much as chance to a point. To help an athlete get the "danger" factor out in their thoughts a few sports activities groups and athletes have selected to rent a sports activities psychologist. A

sports activities psychologist will help athlete awareness greater at the factors of the sport which might be beneath their control. i used to be alleged to write a paper at the effectiveness of sports psychology but considering that there's no demonstrated records or records i will write on the methods that sports psychologist's help an athlete return from injury.

One manner that sports activities psychologist's help athlete's return from damage is to apply visualization. Otherwise called imagery, visualization works with the aid of an athlete visualizing her or him scoring the goal, hitting the hollow-in-one, or scoring that touchdown. Visualizing additionally enables to govern and fortify the nerve pathways in the brain so that after that massive you may have entire manipulate over your emotions and your reactions at this type of presser-crammed time. An athlete ought not to be injured to practice visualization.

Sports psychology approach making use of mental theories and ideas to factors of sports activities along with training, coaching, competition and many others. While sports activities psychology is involved with reading of human conduct in diverse styles of sports activities settings.

Competition sports activities play a important position in current society. Achievement in sports activities is liked and a huge range of humans participated in sports activities as part of their each day life. Cutting-edge sports consist of the variety of various disciplines, which within the route of records have evolved as the group of bodily activities that have lent themselves collaborating opposition and suits. The dynamic improvement of sports shall maintain to engender new paperwork. The past decade has visible a full-size increase within the variety of sports activities in which international championships are held.

In every competition, the same old of performance in each recreation acquire new peak. This is due to the have an impact on of contemporary schooling gadget and the development in various technological know-how like Biomechanics, exercising physiology, sports activities remedy, sports psychology ...and so forth. This allows the sportsperson to educate through contemporary method and techniques.

Recreation and workout mind research is an obligatory a part of the sport science educate. This educate adds to the one of a kind expert practices related with bodily sporting activities, as an example, - educating of bodily training, entertainment and well-being advancement, and kinesiology associated callings - in light of the reality that it assumes a mental part for the participants. Recreation and workout clinicians see bodily action in a few

exceptional ways: bodily motion as a tool for wellbeing, bodily motion as an instrument for human capacity, and bodily movement as a device for social alternate.

In previous days sports mind technological know-how turned into for the most element involved about growing assessment techniques that could distinguish those individuals with the possibility to become incredibly actual accepted competitors. Nowadays the emphasis is on mental preparing, practices that make stronger the intellectual talents on the way to assist athletic exhibitions at the manner to class. These aptitudes contain mental symbolism and center making ready. inside the occasion that a competitor is not kidding about becoming the pleasant, she or he may be, the maximum fundamental solving is the feel of duty regarding practice the proper things.

Importance

Game and workout psychology is a mandatory factor of the sports science discipline. This discipline contributes to the diverse professional practices associated with bodily sports consisting of - the teaching of bodily education, activity and fitness promoting, and kinesiology related professions - as it plays a mental function for the contributors. Recreation and exercise psychologists view bodily interest in numerous unique approaches: bodily hobby as a tool for fitness, physical activity as a device for human capacity, and physical interest as a device for a social alternative. Performance profiling is while a teacher or sports psychologist analyzes the performance of the athlete so that they can become aware of the strengths and weaknesses. There are numerous advantages to this as it's miles extensive and can without problems perceive weak point, so the athlete can enhance.

This psychological dedication is what a fitness representative may also try to implant in a consumer. The importance of psychology in bodily interest has flourished as educators and pastime promoters are higher able to apprehend how the significance of fitness is view through their members.

Workout and sports psychology is a notion to be an exceedingly important factor of bodily activity and game, which permit humans to reach their human capability. The significance of exercise and sports activities psychology in increasing human capacity may be seen via searching at how it impacts excessive-overall performance athletes, sports experts, and the use of visualization and imagery in this discipline. Excessive-overall performance athletes are always close to their maximum potential as a long way as physical potential and energy are involved. This has caused

perspectives to be shifted in the direction of exercise and sports activities psychology to assist the athletes to take the subsequent step in the direction of their final goals. To take this next step, exercising and sports psychologists look at several areas.

The level that an athlete performs on any given day depends on five foremost things, bodily abilities, and mental talents, stage of technical ability, strategic cognizance, and risk. "Danger" is all those variables that are not underneath the athlete's manipulate, including the weather and how excellent the competition is. As there are constantly some uncontrollable things in sports activities, overall performance is left as much as danger to a point. To assist an athlete get the "danger" component out in their mind a few sports groups and athletes have selected to rent a sports psychologist. A sports activities psychologist will help an athlete consciousness extra at the elements of the game which might be underneath their manipulate. I was presupposed to write a paper at the effectiveness of sports activities psychology but due to the fact, there may be no proven statistics or information I can write on the approaches that sports activities psychologists help an athlete go back from injury.

One way that sports psychologist's help athlete's go back from injury is to use visualization. In any other case known as imagery, visualization works by using an athlete visualizing her or him scoring the purpose, hitting the hollow-in-one, or scoring that touchdown. Visualizing also allows to manipulate and support the nerve pathways within the mind so that after that huge you may have complete manage over your emotions and your reactions at this type of presser-filled time. An athlete does not have to be injured to practice visualization.

Sports activities psychology manner making use of psychological theories and ideas to factors of sports along with coaching, coaching, opposition and so on. Even as sports activities psychology is involved with a reading of human conduct in numerous varieties of sports activities settings.

Competition sports play an essential function in current society. Fulfillment in sports activities is preferred and a massive range of people participated in sports activities as a part of their daily existence. Contemporary sports encompass the variety of various disciplines, which within the path of history has evolved as the institution of bodily activities that have lent themselves collaborating opposition and matches. The dynamic development of sports activities shall keep engendering new paperwork. The beyond decade has visible a great growth within the quantity of sports wherein worldwide championships are held.

In each opposition, the same old of overall performance in each recreation obtain new peak. that is because of the influence of current schooling system and the improvement in diverse technology like Biomechanics, workout body structure, sports activities medicine, sports activities psychology... etc. This allows the sportsperson to teach through modern means and techniques.

Sport and exercising mind research is a compulsory part of the game technology educate. This train adds to one of the kind professional practices related to bodily sporting events, as an example, - instructing of bodily education, amusement, and wellness development, and kinesiology associated callings - in mild of the truth that it assumes a mental component for the members. Sport and exercising clinicians see bodily movement in some exclusive methods: physical movement as a device for wellbeing, bodily action as an instrument for human capacity, and bodily movement as a device for social trade.

In earlier days sports activities mind science became the most component worried approximately creating assessment techniques that could distinguish those people with the opportunity to grow to be relatively real universal competitors. These days the emphasis is on intellectual getting ready, practices that reinforce the intellectual capabilities so as to help athletic exhibitions on the way to class. These aptitudes contain intellectual symbolism and center getting ready. Inside the event that a competitor is not kidding approximately turning into the exceptional, he or she may be, an essential fixing is the feel of obligation concerning practice the best matters.

Sport mind studies consists of the investigation of the intellectual variables related to support and execution in don. Prologue to sports activities Psychology offers an vital comprehension of ways the distinct elements of mind research can be connected to don interest. Appraisal of identification types might be pointed out identifying with brandish cooperation. This will be prolonged to speak approximately inspiration and authority commitment to wear funding and in addition the relationship among anxiousness and pleasure as for upgrading wearing execution. Intellectual talents making ready will then be illustrated, consisting of goal putting, organization factors, symbolism, superb self-in connection to accomplishing crest donning execution. Prologue to sports Psychology gives a more noteworthy comprehension of the intellectual processes of man or woman competition and institution flow to improve wearing execution.

Don't forget society a residing creature which all components of it upload to its survival. This view is the functionalist point of view, which

every a part of a well-known public is prepared to hold up its solidness. Functionalist view wears as a practically religious enterprise those utilizations custom and service to beef up the primary estimations of a popular public.

Mind research is beneficial inside bodily movement as it may be applied to boost and impact one's factor of view at the advantages of well-being. This branch of look at has been a portal into diverse vocations in physical interest, for instance, a wellness marketing consultant, physiotherapist, and training. Brain science is applied inside the practice framework to help energize all understudies, regardless of their physical capability, to take an interest in a valid and dynamic manner of existence. In an enjoyment putting, brain technological know-how is utilized as a part of commercials to persuade individuals to want to land up surprisingly more bodily dynamic. The vocation of a health guide utilizes the advantages to brain studies to enable their customers to perform their proposed targets. A few valuable methodologies to permit a patron to perform their targets might also include, goal placing, an energetic trainer, or a variety of applications.

Modern-day don at each stage of competition and in for all intents and functions each sporting motion has profited from the usage of intellectual standards and mental getting ready in the quest for maximum severe athletic execution, push management, more advantageous making ready state of thoughts and every different a part of game in which the psyche, feelings, and physical execution meet.

The period of overpowering nice and stamina overseeing sports activities is completed, and the age of the rationally excessive competitor has arrived. Competitors are not anymore the shallow muscle heads and robots customized to finish one objective, triumph. Modern-day competition strolling from the secondary school to talented stages is faced with many weights and allurements, typically outside the domain in their sport. These weights can restrict a competitor's execution generously; in this manner, the weights must be managed by way of clinicians. The adequacy of games mind science is exhibited through the fields several speculations, packages, an assortment of methods and techniques.

Sport Psychology: the way it enables Athletes In our fashionable public nowadays it appears like video games govern the land. Anyplace we look, there may be some sort of wearing event taking place or being broadcast. Nearly all people could be regarded as an fanatic of no much less than one sport. A few people take after video games like a faith. With such an

elevated focus on sports activities, the competitor's exhibitions are positioned under a magnifying lens. This places extra weight on competition to give a victorious execution. Never once more do competitors play for the sake of leisure, they play to win. This is not happening simply at the professional level; it's far happening all degrees of the game. From kids baseball to patio football, the objective is to win at all prices.

The duration of overpowering satisfactory and stamina overseeing sports is finished, and the age of the rationally intense competitor has arrived. Competitors are not anymore the shallow muscle heads and robots changed to finish one objective, triumph. Contemporary competition going from the secondary school to talented ranges are faced with many weights and allurements, regularly outdoor the domain of their recreation. Those weights can repress a competitor's execution considerably; on this manner, the weights must be controlled by means of clinicians. The viability of games mind technological know-how is shown through the fields several speculations, packages, and an collection of strategies and technique.

Recreation brain studies is special most of the related mind studies disciplines for various reasons. The expression proposes that there are acknowledged everyday practices used by sports clinicians and it is recognized as with any technological know-how, the standard methods to address the instruction, getting ready and confirmation of the game therapist surely realize over the universe of a game and athletic competition. The detail of video games brain science hone that has an inclination to separate it from different types of connected mind technology is the general closeness of the connections created between an person competitor and their therapist. The ordinary expert limits of expert separation are specific in sports conditions wherein critical feeling and centered longing are the fuel that the two drives the competitor onwards and makes them defenseless against mental anxieties. Many game analysts anticipate a multi-dimensional component inside the lives of their competitor clients - organized proficient therapist, associate, sounding board, companion, and recommend are each plausible and altogether ethical phase to the connections that may create via and by.

Recreation and exercise brain studies are a obligatory a part of the sport science educate. This train adds to the different expert practices associated with bodily exercises, as an instance, -educating of bodily guidance, diversion and health development, and kinesiology associated callings - in mild of the reality that it assumes a intellectual component for the individuals. Game and exercise clinicians see bodily action in a few diverse

approaches: bodily motion as an equipment for wellness, physical movement as a device for human capability, and physical movement as a tool for social trade. Execution profiling is the point at which a mentor or games clinician breaks down the execution of the competitor with the aim that they are able to distinguish the qualities and shortcomings. There are many advantages to this as it's far pinnacle to backside and can without a good deal of a stretch distinguish shortcoming, so the competitor can make strides.

This intellectual warranty is the issue that a well-being specialist may additionally undertake to embed in a patron. The importance of mind technological know-how inside the physical motion has prospered as teachers and entertainment promoters are higher ready to see how the importance of health is seen with the aid of their individuals.

Exercise and recreation mind studies is thought to be a vital part of physical motion and recreation, which allow individuals to achieve their human ability. The significance of interest and sport brain studies in expanding human potential may be seen by using taking a gander at how it impacts superior competitors, don specialists, and the usage of representation and symbolism in this teach. Elite competitors are reliably close to their finest capability to the quantity bodily capability and high-quality are involved. This has made views be moved towards exercising and game brain technological know-how to permit the competitors to make the following stride in the direction of their final objectives. To make this next stride, workout and sport analysts take a gander at a few zones.

The level that a competitor plays on any given day is based upon five primary matters, bodily aptitudes, and mental talents, level of specialized information, key mindfulness, and shot. "Opportunity" is every one of those factors that aren't underneath the competitor's manipulate, for instance, the weather and how superb the restrict is. As there are continuously a few wild matters in sports activities, execution is surrendered over to the opportunity to a few degrees. To permit a competitor to get the "shot" angle insane a few video games companies and competition have procured a video games clinician. A video games therapist will allow a competitor to concentrate greater at the elements of the amusement this is under their control. I should compose a paper on the viability of video games brain research however since there's no demonstrated statistics or insights I'm able to compose in the methods that games therapist's help a competitor come back from harm.

References

1. Frost R. Psychological concepts applied to physical education and coaching. Philadelphia: Saunder, 1971.

2. Martens R. Sport competition anxiety test. Champaign, Ill.: Human Kinetics Publishers, 1982.
3. Martens R, Bump L, Rodgers L, Mount C, Beals J. American coaching effectiveness program. Champaign, Ill.: Human Kinetics Publishers, 1987.
4. Martens R, American Coaching Effectiveness Program. Coaches guide to sport psychology. Champaign, IL: Human Kinetics Publishers, 1987.
5. Taft R. New Journals of Psychology. International Journal of Psychology, [online]. 1967; 2(4):317-318. Available at: <http://dx.doi.org/10.1080/00207596708247229> [Accessed 15 Jul. 2017].

Chapter - 2

Yoga a Way of Life: Unique Yogic Module for Better Health

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Chapter - 2

Yoga A Way of Life: Unique Yogic Module for Better Health

Dr. Komal Meshram and Dr. Ajay Meshram

Abstract

In our modern world the pace of life is growing so faster and we are losing touch with true inner peace and power. We are experiencing imbalance in mental, emotional & physical health leading to stress followed by illness and diseases. These problems can be overcome by yogic module which consists of yogic exercises. For better maintenance of body functions even in normal healthy subject's yogic exercise are found to be beneficial. Yogic module consists of yogic exercise like asana, pranayam and meditation which can reveal you where you are resisting your natural state and help you to achieve self-control and tolerance. Asana-are physical postures, pranayam are breathing exercises focusing on breathe and meditation-means focusing mind on a particular object, thought or activity. Yogic module promotes positive health and has a noticeable benefit on general health status of the individual. Practice of yogic module would help to reduce the incidence of life style modification disorders and will result in better quality of life.

Keywords: Yogic exercises, asana, pranayam, meditation, life style disorders, modern life style, health

Introduction

Yoga derived from Sanskrit root “Yuj” means union, is essence of life which brings peace and wellbeing ^[1]. Yoga is an ancient discipline designed to bring balance and health to the physical, mental, emotional, and spiritual dimensions of the individual. Since ancient times in India, Rishis (wise men and saints) explored nature and the cosmos in their meditations. They discovered the laws of the material and spiritual realms and gained an insight into the connections within the universe. They investigated the cosmic laws, the laws of nature and the elements, life on earth and the powers and energies at work in the universe - both in the external world as well as on a

spiritual level. The unity of matter and energy, the origin of the universe and the effects of the elementary powers have been described and explained in the Vedas. Much of this knowledge has been rediscovered and confirmed by modern science.

Yoga comprises of eight aspects or “limbs:” yama (universal ethics), niyama (individual ethics), asana (physical postures), pranayam (breath control), pratyahara (control of the senses), dharana (concentration), dyana (meditation), and samadhi (bliss) and often depicted metaphorically as a tree ^[2]. Yoga is a science that facilitates homeostasis also alters the autonomic nervous system as well as cardiovascular functioning. It is recommended as a non-pharmacological tool for managing stress by “National Centre for Complementary and Alternative Medicine” ^[3].

Yoga has greatly impacted our life through safeguard arogya which involves physical and mental well-being by taking care of all aspects of normal health as well as during ill health.

Yoga gets rid of disease by means of Asana, sin by pranayam, attains fortitude by dharana and marvelous consciousness via Samadhi. Practice of physical postures (asana) improves the muscle strength, mind-body coordination and balance. At cellular level there occurs improvement in the blood flow, tissue perfusion and oxygenation. Focusing on one’s own breathing (pranayama) while practicing yoga body movements and vice versa can function as a tool to increase awareness of tension/relaxation states. Meditation (dhyana) calms down the mind, improves the concentration enhancing better work output ^[4]. By maintaining tranquility of mind it can promote clear thinking, better judgment and effective decision making. It also alters the autonomic balance to promote health ^[5].

“The finest present one can get through yoga is to know himself and master himself”. Yogic module having asana, pranayam and meditation fusion helps to explore health at three dimensions namely physical, mental and spiritual level. It also enables one to harmonies and recharges the body with life energy; to awaken the unlimited power of mind ^[6].

There are so many research evidences which support the belief that certain yoga techniques may improve physical and mental health through down-regulation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system (SNS). The HPA axis and SNS are triggered as a response to a physical or psychological demand (stressor), leading to a cascade of physiologic, behavioural and psychological effects primarily as a result of the release of cortisol and catecholamine’s (epinephrine and nor

epinephrine). This response leads to the mobilization of energy needed to combat the stressor through the classic “fight or flight” syndrome. Over time, the constant state of hypervigilance resulting from repeated firing of the HPA axis and SNS can lead to dysregulation of the system and ultimately diseases ^[2].

Modern lifestyles are though easing the life of today's man however they have a negative effect on health both physically, socially, psychologically and spiritually. The reasons for such problems are multiple to mention some of them lack of physical exercises, using technology given machine for easing life and spending much of our time on these machines, moving with transportation from place to place and sitting long hours in the office and in front of computers are some of them. Modern lifestyle intensifies the risk of obesity, diabetes, heart diseases and cancers ^[7]. Pollution due to modern technologies causes different respiratory diseases.

We live in an age in which tremendous amount of stress and responsibilities are placed on us. Each day an excitation, stimulation is bombarded on us from the moment we get up to sleep, creating stress to our body, mind and nervous system. All these lead to life style disorders where modern medical profession has failed to prevent this class of ailments.

Some of them are

A. Behavioral Problems

- Nutritional/eating disorders
- Lack of sun exposure-Vitamin D deficiency
- Vitamin A deficiency
- Insufficient intake of dairy products-Ca

B. Mental Problems

- Attention deficit
- Anger management issues
- Suicidal tendencies

C. Sleep Disturbance

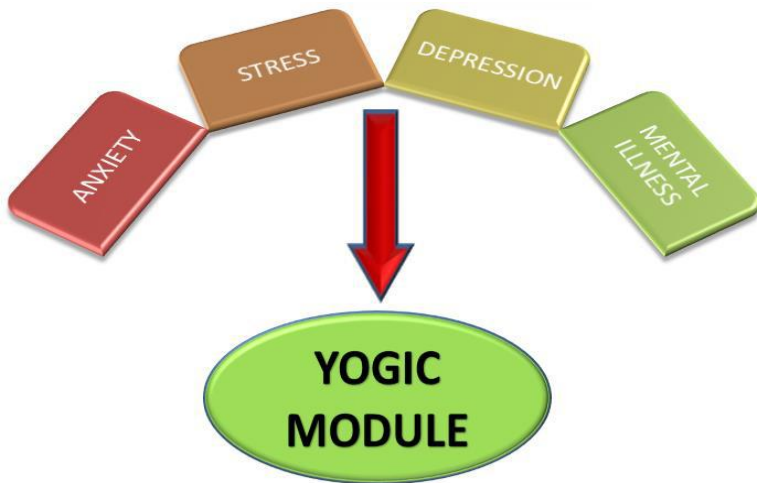
- Drowsiness
- Anxiety
- Restless
- Depression

D. Common Infections

- HIV
- Tuberculosis
- Sexually Transmitted Diseases
- Parasitic infections

E. Lifestyle or Eating Disorders

- Obesity
- Lethargy
- Laziness
- Weakness
- Malaise



Solution

Yogic module is a perfect antidote to this onslaught. It strengthens and stretches every link of bodily chain, dissolves tension and eradicates stress bringing us back to wholeness. Instead of being divided we become united. We find balance and harmony. This allows us to survive & thrive in all aspects of our lives, career, relationship, athletics, school studies and much more.

Yogic Module



Certain Steps are to be Followed while Performing Yogic Module

- Do in early morning with empty stomach.
 - Keep same time and place.
 - Posture should be comfortable
- A) **Asana** The term asana means sitting in a particular posture, which is comfortable and which could be maintained steadily for long time. Asana gives stability and comfort, both at physical and mental level. When a person does asana he concentrates on his posture & this helps him to clear mind. Following asana are supposed to be done.
- 1) **Surya Namaskar:** Means salute to sun, is a yoga practice incorporating a sequence of gracefully linked asana. The nomenclature refers to the symbolism of sun as a soul and source of all life.

Steps- Subjects have to balance their weight equally on both feet joined together. Inhale & fold hands like in prayer position take folded hands straight up towards the sky and recline body backwards making an arch of the back. Now exhale and slowly bring hands down and bend forward to touch the either side of feet, making sure that legs do not bend at knee joint. Now inhale and push right leg back stretch as much as possible while the left leg to be kept in folded position. Looking up take the left leg parallel to the right one and bring the body in a straight line. Next touch knees to the ground and raise hips slightly up. Inhale and bring legs in front by folding them at knee and resting the abdomen over the thighs and straighten hands holding the face in between both the hands. Now exhale completely and lie down flat on the ground. After that, inhale and raise from the abdomen only get up & same positions are to be repeated as performed earlier from step 2 to 6 ^[8].



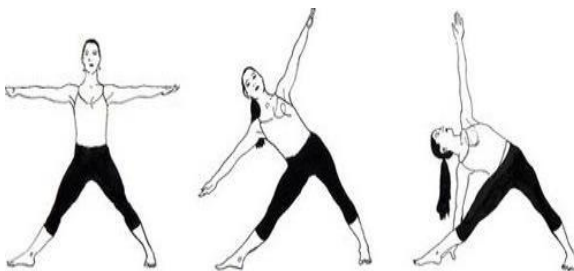
Benefits

- Strengthening of entire body
- Stimulates nerves brain, spinal cord
- Builds up memory, concentration and focus thus improves brain function.
- Cures blood pressure.
- Strengthens entire digestive system
- Stimulates glandular activity
- Cures menstrual disorders
- Improves posture
- Helps in weight loss

Limitation •One should avoid practising Surya Namaskar in case of high blood pressure, fever, heart diseases, hernia, slipped disk, intestinal tuberculosis and sciatica.

2) Trikonasana: The name comes from Sanskrit word tikona meaning triangle.

Steps- Keep legs apart and spread the arms to the side and separate the feet. Then inhale and bent down towards the right and touch feet with the palm. Exhale and return to the original position. Follow the same procedure on the left side ^[9].



Benefits

- Improves blood circulation reduces blood pressure.
- Reduces stress and anxiety.
- Cures digestion
- Calms mind.
- Strengthens and stretches hips, back, arms, thigh and legs

Limitation •Practice of this asana should be avoided in case of backache and abdominal inflammation.

3) Tadasana: Is a mountain pose basic standing posture.

Steps- Stand tall by raising their feet about 2 inches, parallel and flat on the floor. Shift body weight back a little to secure the heels firmly on the floor and concentrate down on the feet. Inhale and hands up now bend to the right from abdomen looking forward. Tightened up the upper body and relaxed the lower muscles of the ankles, then the calves, knees, thighs, hips and abdomen. Repeat the same procedure for left side and regain the original position. Stay in this pose for 1-5 minutes or longer ^[10].



Benefits

- Strengthens the spine.
- Strengthens thighs, knees and ankles

- Tones leg muscles, tendons, ligaments.
- Hip flexibility is achieved.
- Firm's abdomen and buttocks.
- Improves posture
- Relieves sciatica
- Reduces flat feet
- Eyes, ears being benefitted.

Limitation •those suffering from weak leg muscles, spine deformity, migraine and giddiness.

4) Vrikshasana: In Sanskrit 'Vriksha' means tree and asana means a posture. It is known as tree pose.

Steps- Stand straight, with both your hands high up in the air. Feel the stretch in both your arms and your torso. Shift your weight slowly to your left leg, planting it firmly on the floor. Take a deep breath and bend your right knee. With your right hand, hold your right ankle and draw the right foot upwards. Place the sole of your right foot against the inner part of the left thigh and press the foot's heel into the inner part of the left groin. Keep the toes of the right foot pointing towards the floor? Ensure that your pelvis is straight and its center is directly over the firmly planted left foot. Rest your hands around the pelvic rims. Stretch your torso as if you are lengthening your tailbone and press the right foot into the left thigh while resisting the pressure from the outer part of the left leg. Bring your hands in front of the chest, folding them in the Anjali mudra. Remain in this pose for a few minutes and breathe deeply. Now begin to unfold slowly and come into the mountain pose. Repeat with the legs reversed ^[11].



Benefits

- Improves posture
- Improves balance
- Strengthens legs, thighs, arms and legs
- Increases awareness and concentration
- Brings stability in breathing pattern
- Firms abdomen, buttocks and relieves sciatica

Limitation •those suffering from arthritis, vertigo and obese people.

- 5) **Sukhasana:** Meaning of Sukhasana in Sanskrit sukh means pleasure and asana means pose. It is also called as a decent pose or pleasant pose.

Steps- Take a flat base to sit on. Legs to be stretched out ahead, cross the shins and widen knees so that each foot slips beneath the opposite knee. Bend the knees and fold the legs towards the torso. Thighs crossed so that the shins would form a small triangle & a gap between the pelvis and feet. Now palms of both hands to be placed on the knees down and the spine should be lengthened towards the floor. Hold this pose as long as comfortable ^[12].



Benefits

- Calms your mind.
- Enhances peacefulness.
- Removes stress and anxiety, fatigue.
- Stretches and lengthens spine.
- Improves posture.

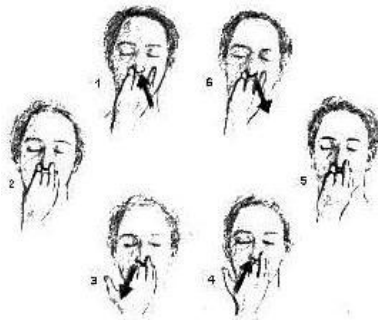
Limitation •Persons suffering from backache and cervical spondylitis should avoid this asana.

B) Pranayam: Pranayam consists of the breathing techniques which are related to the control of breath or respiratory process and popularly known as 'yogic breathing', involves a conscious manipulation of breathing pattern. Pranayam are breathing exercises focusing on breathe helps body shift to the ease of flight mode.

1) Anulom Vilom: Also called as alternate nostril breathing technique. It is a breath exercise.

Steps- Close eyes and relax. Sit in this position for a couple of minutes till settled down.

Close right nostril with right thumb and breathe in from the left nostril. Hold the breath for a couple of seconds and open right nostril simultaneously close left nostril with middle and ring finger and breath out from right nostril. Same should be repeated for left side ^[13].



Benefits

- Enhances power of mind
- Treats snoring
- Cures blood pressure
- Improves blood circulation
- Decreases stress and anxiety
- Improves inner strength of body
- Cures lung problems
- Increases bone strength
- Treats constipation
- Controls obesity

Limitation •those suffering from cardio-vascular problems, high blood pressure should avoid this pranayam.

- 2) **Kapalbhati:** The word Kapalbhati is made up of two words kapal means skull and bhati means shining. It is an important part of Shatkarma which acts as a cleansing technique.

Steps- Sit straight with spine erect and crossed legs in front. Take deep breath and exhaled quickly, making a puffing sound while doing it. Focus on exhaling forcefully and not on the inhalation. At the time of exhalation drew the abdominal muscles inward simultaneously no other parts of body should move. Now inhale normally and continue the procedure for 10 breaths and then take a break ^[14].

Benefits

- Clear sinuses within skull
- Strengthens lungs
- Enhances blood circulation
- Improves digestion
- Improves kidney functions
- Removes toxins
- Helps in loss of wt.

Limitation •Those suffering from cardio-vascular problems, high blood pressure, hernia, vertigo and gastric ulcer complaints, should avoid practicing Kapalabhati.

- 3) **Bhramari:** It is derived from pranayama an ancient breathing technique and is translated from Sanskrit as “Bee Breath”.

Steps- Take a sitting posture and close mouth. Close ears with thumb and keep forefingers on forehead. Close eyes give gentle pressure of remaining three fingers on eyelids. Breathe in inhale fully. Now without opening mouth make sound OM and breathe out slowly and fully repeat this for 3-5 times ^[15, 16].



Benefits

- Better concentration of mind
- Relaxation of mind feeling of happiness
- Good for Alzheimer's
- Reduces anxiety, tension and anger
- Relieves blood pressure, migraine
- Strengthens airways
- Regulates endocrine system
- Promotes good sleep

Limitation-During ear infection, this pranayama should not be practised.

- People suffering from cardiac diseases should also avoid the practice.

Meditation

To achieve harmony between the physical, mental, intellectual and spiritual personalities of man meditation is being widely used. It is the highest spiritual discipline designed to help the individual develop a state of mind which is positive or benevolent towards oneself and others. Meditation is a power to choose good and positive thoughts over those which are negative and wasteful ^[17].



Steps

- 1) **Initiation:** Subjects were asked to look at a point of red light which is a symbol of Almighty God Shiva and hear an audio clip on positive thoughts.
- 2) **Concentration:** After about 10mins the subject gets focused on the point of red light and his mind gets absorbed into those positive thoughts.
- 3) **Realization:** Finally, the subject gets into the feeling of original qualities of the soul namely peace, purity, love, bliss, happiness, knowledge and power with ultimate absorption in supreme bliss.

Benefits

During meditation, person concentrates on breathing and removes attention from worldly worries and “de-stress” himself. This decreases release of adrenaline, i.e. decrease sympathetic activity and hence decrease in HR, blood pressure, including respiratory rate.

- During daily practice of meditation by concentrating, on breathing the basic activity of bulbopontine complex is modified in such a way as to slow down its rhythm by voluntarily prolonging the phases of inspiration and expiration by stretching to their fullest extent ^[18].
- Helps lungs to work to their maximal extent to take oxygen and give out carbon dioxide maximally ^[19].

Discussion and Conclusion

According to WHO- “Health is a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity” (WHO 1964) ^[20]. Contribution of yoga in providing health to individuals who practice yoga in the day to day life is huge. Regular practice of yoga builds mental lucidity and coolness, boost body awareness, relieves stress patterns, relaxes the minds and sharpens concentration. Yoga provides tools through which one can manage the feeling of helplessness and depression ^[21]. Yoga in modern life helps in improving postures, increases the intake of oxygen enhances the functioning of the different system of our body such as the respiratory, digestive, endocrine, reproductive and excretory system. Yoga is highly suggested for people in competitive, stressful working atmospheres.

Many researchers through their work have quoted that the persons enlightened through the practice of yogic exercises could enjoy better health and remain free from illness. Thus yogic exercises have potential value in contributing preservation of health. Growing popularity of yoga and its benefits for health is a need to incorporate yogic module for holistic health by following specific objectives:

- Integral growth and perfection of an individual
- Social transformation
- A united and awakened India
- Propagation of yoga by human unity where each nation should offer conscious true genius efforts to bring best of positive health for all.

Yogic module will thus help to liberate human beings from three fold sufferings; physical disease, mental in- harmonies and spiritual ignorance.

Helps to move towards tomorrow & participate in the birth of new world, in making of new humanity. Thus yogic module for health will be the unique privilege and challenge of today. Yogic module for health goes beyond the physical status to incorporate pranayam, chanting, meditation, shuttle anatomy, philosophy, mythology and life style components. Thus the principle object of this invention is to overcome imbalances occurring in the body related to mental, emotional and physical health which would develop stress followed by illness and diseases. So as to achieve better physical and mental well-being any one can do yogic module.

Beneficiaries: Yogic module will be beneficial for general population and society.

References

- 1) Vinay AV, Venkatesh D, Ambarish V. Impact of short-term practice of yoga on heart rate variability. *Int J Yoga*. 2016; 9:62-6.
- 2) Ross A, Thomas S. The Health Benefits of Yoga and Exercise: A Review of Comparison Studies. *The Journal of Alternative and Complementary Medicine*. 2010; 16(1):3-12.
- 3) Woodyard C. Exploring the therapeutic effects of yoga and its ability to increase quality of life *Int J Yoga*. 2011; 4(2):49-54.
- 4) Iyengar BK. *Illustrated Light on Yoga*. New Delhi: Harper Collins Publishers, 2005.
- 5) Santaella DF, Devesa CR, Rojo MR, Amato MB, Drager LF, Casali KR *et al*. Yoga respiratory training improves respiratory function and cardiac sympathovagal balance in elderly subjects: A randomised controlled trial. *BMJ open*. 2011; 1(e000085):1-8.
- 6) Pazare K, Biswas DA, Meshram AW. Modulation of anaerobic biomarker and lung functions by Rajyoga meditation in young badminton players. *Int J Med Sci. Public Health* 2013; 2(3):654-9.
- 7) Tessema T. Significance of yoga in modern life. *International Journal of Yoga, Physiotherapy and Physical Education*. 2017; 2(5):123-125.
- 8) Bhutkar PM, Bhutkar MV, Taware GB, Doijad V, Doddamani BR. Effect of Surya Namaskar practice on cardio-respiratory fitness parameters: A pilot study. *Al Ameen J Med Sci*. 2008; 1(2):126-129.
- 9) Iyengar BKS. *Yoga: The Path to Holistic Health*. Dorling Kindersley. *Med Sci*. 2008; 1(2):126-9.

- 10) Malhotra V, Singh S, Singh K, Sharma S, Madhu S, Gupta P *et al.* Effects of yoga asanas and pranayama in non-insulin dependent diabetes mellitus. *Indian Journal of Traditional Knowledge.* 2004; 3(2):162-167.
- 11) Kadachha D, Soni N, Parekh A. Effects of Yogasana on Balance in Geriatric Population. *Int J Physiother Res.* 2016; 4(2):1401-07.
- 12) Kulal R. An Experimental Study To Find The Effectiveness Of Yoga Therapy On Hypertension Among Geriatric Clients Of Selected Old Age Homes At Udupi District, Karnataka. *International Journal for Innovative Research in Multidisciplinary Field.* 2017; 3(7):188-192.
- 13) Pradnya D. Impact of Short Term Training of Anulom Vilom Pranayam on Blood Pressure and Pulse Rate in Healthy Volunteers. *Int. J Res. Ayurveda Pharm.* 2013; 4(2):253-256.
- 14) Dinesh T, Gaur G, Sharma V, Madanmohan Harichandra K, Grrishma B. Effect of 6 Weeks of Kapalabhati Pranayama Training on Peak Expiratory Flow Rate in Young, Healthy, Volunteers. *Sch. Acad. J Biosci.* 2013; 1(4):111-114.
- 15) Pandey S, Mahato NK, Navale R. Role of self-induced sound therapy: Bhramari Pranayama in Tinnitus. *Audiological Medicine.* 2010; 8(3):137-141.
- 16) Vialatte FB, Bakardjiian H, Prasad R, Cichocki A. EEG Paroxysmal Gamma waves during Bhramari Pranayama: a yoga breathing technique. *Consciousness and Cognition.* 2009; 18(4):977-88.
- 17) Meshram K, Meshram A. Usefulness of Rajyoga meditation in assessment of general well-being of badminton players an experimental study. *Int J Pharm Biol Sci.* 2016; 7(1):161-6.
- 18) Sawane MV, Gupta SS. Resting heart rate variability after yogic training and swimming: A prospective randomized comparative trial. *Int J Yoga* 2015; 8:96-102.
- 19) Yadav RK, Das S. Effect of yogic practice on pulmonary functions in young females. *Indian J Physiol Pharmacol.* 2001; 45(4):493-6.
- 20) World Health Organization (WHO). Constitution of World Health Organization. <http://www.who.int/about/mission/en/>, Accessed, 2017.
- 21) Verma *et al.* The importance of yoga in the twenty-first century. *International Journal of Physical Education, Sports and Health.* 2015; 2(2):1-2.

Chapter - 3

Fibres for Sportswear and Influence of Smart Materials on Sports Performance

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Chapter - 3

Fibres for Sportswear and Influence of Smart Materials on Sports Performance

Zahoor ul Haq Bhat, D. Sultana and Showkat Bashir

Abstract

The progression of fibre developments has gone through the phases of conventional fibres, highly functional fibres and high-performance fibres. Polyester is the single most common fibre used for sportswear and active wear. Other fibres suitable for active wear are polyamide, polypropylene, acrylics and elastane. Wool and cotton fibres are still finding applications in leisurewear. Synthetic fibres can either be modified during manufacture, e.g. by producing hollow fibres and fibres with irregular cross-section, or be optimally blended with natural fibres to improve their thermo-physiological and sensory properties. Synthetic fibres with improved UV resistance and having anti-microbial properties are also commercially available for use in sportswear. New technologies for producing micro fibres have also contributed towards production of high-tech sportswear.

Keywords: Fibre, polymers, smart materials, micro fibres, sportswear

1. Introduction

Sportswear depicts a multitude of attributes; for instance, it provides functional support, enhances performance, protects athlete from strain/injury, promotes sporting activity, communicates fashion and style and, more importantly, offers the wearer comfort. The most vital factor that fibres/filaments contribute toward wearer comfort is moisture and thermal balance leading to a suitable microclimate next to the skin. Fibres influence the overall comfort of the wearer, mainly in providing a balance between heat loss and body perspiration. In recent years, there has been a tremendous increase in the development of new fibres to cater to the fast growing sportswear and functional clothing market ^[1].

Today, highly functional fibres ^[2] microfibers ^[3], nanofibers ^[4] and smart fibres ^[5] have been used in functional clothing. Many claims have been reported, particularly moisture management, thermoregulation and

performance-monitoring attributes. Fibres used in sportswear and functional clothing are multidimensional and require a number of characteristics apart from possessing a length-to-width ratio for making a yarn. In the fibre industry, the parameters that influence performance are fibre fineness, fibre shape, molecular structure and adding finishes ^[2, 6]. Typical properties of fibres for sportswear include durability, absorbance, high moisture regain, and lightweight, extensible, colorfast, dimensionally stable and washable.

The aim of this chapter is to provide an overview of current smart and intelligent textile technologies. It commences with a broad definition of smart textiles and then explores how such garments can be powered and how information can be collected and transmitted. The chapter will then further present how smart textiles can respond to the changes within the body and adapt to these to enhance comfort and performance, with specific reference to sportswear applications.

2. The Definition of Smart Materials

It is generally considered that the term ‘smart material’ refers to a material that is able to sense changes in its surroundings and react to these changes accordingly. However ^[5], suggests that smart materials can be sub-categorized into three divisions as follows:

- Passive smart materials can be thought of as sensory devices; that is, materials of this type can sense changes in the environment, but do not have the capabilities to react to these changes.
- Active smart materials are able to both sense external stimuli and react accordingly.
- Very smart materials are able to sense, react and adapt themselves according to the changes in their surroundings.

There has been much work on the development of smart materials in the medical industry, where major innovations have been noted in the monitoring of patients. Similarly, the military have found smart materials extremely useful in the monitoring of soldiers in combat, enabling medical aid to be targeted to those whose need is greatest ^[7]. The major part of these developments can be used and adapted to enhance the use of smart materials in the sportswear industry. As the potential applications of smart materials are so diverse, there are many solutions offered to the issues of power supplies, conductive yarns and integrated sensors.

3. Terms Used for Assessing Fibre Performance

In order to understand the characteristics and performance of fibres, it is essential to be familiar with the following technical terms.

Absorbency: Ability to take in moisture (expressed as the moisture regain), which is the amount of water a dry fibre absorbs from the air under standard conditions of 21 °C and 65% relative humidity.

- **Absorption:** A process whereby the liquid is fully absorbed by the fibre through its structure that is quite common among hydrophilic fibres.
- **Adsorption:** A process where liquid is taken up between the fibres on their surface rather than being held within the fibre.
- **Wicking:** The ability of fabric to transfer moisture adsorbed on fibres from one section to another. Wicking can also occur if liquid is absorbed within the fibre. A smooth surface reduces wicking action. Cotton (hydrophilic) and olefin (hydrophobic) fibres both possess a good wicking action. Fine fibres with channels are capable of transporting liquids (e.g. four-channelled INVISTA Coolmax fabric).
- **Moisture Regain:** The ratio of the mass of moisture in a material to the oven dry mass, usually expressed in percentage. A dry fibre placed in a humid atmosphere will absorb moisture.
- **Hydrophilic:** A fibre that has high regain (that absorbs water); also referred to as 'water loving'.
- **Hydrophobic:** A fibre that does not absorb water; referred to as 'water hating'. Regarding the dimensional stability in water, hydrophobic fibres shrink less when washed than hydrophilic fibres. With regard to stain removal, it is easier to remove stains from hydrophilic fibres because water and detergent are absorbed into the fibre.

Fibre absorption affects the overall comfort of the wearer, and some of the relevant terms are discussed below:

- **Skin Discomfort:** Little absorption or wicking and movement of perspiration, resulting in a fabric clammy feeling.
- **Static Buildup:** Fabric clinging to the body or sparks occurring with fabric made of hydrophobic fibres because of no moisture content to help dissipate the built-up charge on fibre surface (dirt also clings onto the fibre surface).
- **Water Repellence:** Fibre that resists penetration of water or wetting but that is not waterproof. Nonabsorbent fibres (polyester, acrylic) help repel water. Water-repellent finishes (use of fluorochemicals) on fabrics are popular.

- **Wrinkle Recovery:** Better wrinkle recovery by hydrophobic fibres when laundered as they do not swell or absorb water.
- **Hygroscopic:** fibres that absorb moisture without feeling wet.
- **Thermo Physiological:** related to optimum balance between the heat loss and heat generated by the body. This depends on the body metabolism, thermal regulation mechanism and individual health condition. One of the important properties of fibres used for functional and active wear clothing is the elasticity and flexibility.
- **Fibre Elasticity:** the ability to increase in length under tension (elongation) and return to original length when tension is released. Stretch and recovery of fibre/fabric makes a comfortable garment and causes less seam stress. Complete recovery prevents bagginess in fabric (knees, elbows), which can be noticed during a stretch and when wearing close-fitting garments. Fibres that elongate 100% are elastomeric fibres and typical examples are spandex, elastell-p, lastol and rubber.
- **Fibre Flexibility:** The ability of fibre to bend easily and repeatedly without breaking. Acetate fibre is a flexible fibre used in garments; glass fibre is a stiff fibre widely used in technical textiles.

Hence, in order to understand the performance of fibres, their characteristics and properties-particularly in the design and development of functional clothing and sportswear-it is necessary to be familiar with various technical terms used in the industry as well as to utilize them during communication.

4. Widely Used Fibre Types for Sportswear

In the past, cotton was widely preferred for a wide range of garments until the advent of synthetic fibres such as polyester, nylon, polypropylene, acrylic, etc. During the 1970s use of polyester fibres in sportswear predominated, continuing in the 1980s and 1990s.

Microfiber: fine-diameter fibres less than 1 denier are often termed microfiber and have valuable properties. They are soft, durable and drape able, possess high absorbency and are used for high-performance end uses, especially sportswear. They are produced through melt spinning with strict process control, resulting in a uniform and high-quality polymer.

Hollow Fibres: hollow fibres are made of a sheath of fibre material with one or more hollow spaces at its centre are resilient, have better recovery, are bulky and provide better thermal insulation by trapping air. Hollow

polypropylene fibres are lightweight and soft and offer good thermal insulation used in thermal underwear ^[7].

Bicomponent Fibres: Bicomponent fibres can be produced with two variants of the same generic fibre, two types of nylon, two types of acrylic or two generically different fibres of polyester or nylon, nylon and elastane. By extruding two polymers in one single fibre, the different properties of both polymers can be extracted. Bicomponent fibres are used in a wide range of functional products including sportswear.

Polyester: is preferred in sportswear because it is lightweight, cheap to produce, dye-fast, durable, easy to care for, quick drying, hydrophobic in nature and has wicking ability.

Elastane: is another synthetic fibre widely preferred for its elasticity (mainly for stretch and recovery). The elastic nature of filaments is used in sportswear to compress muscles, offer stretch for body movements and support in recovering from muscle soreness. A wide range of sportswear products, such as foundation garments, swimwear, base layer products, compression tights, etc. are made of elastane.

Merino Wool: is widely used in sportswear; for instance, superfine Merino wool possesses superior water vapour permeability and quick-drying properties. During strenuous exercise or hot conditions, a Merino wool garment closer to the skin actively transfers moisture vapour away from the body.

5. Smart Materials

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The major part of these developments can be used and adapted to enhance the use of smart materials in the sportswear industry. As the

potential applications of smart materials are so diverse, there are many solutions offered to the issues of power supplies, conductive yarns and integrated sensors.

5.1 Power Supplies

A limiting factor in the development of smart textiles has been the amount of power required to allow the textile ‘system’ to operate. The issue of current supply was met by the batteries of mobile phones and power supply from an AC/DC source. As technology has developed, solar energy was harvested using photovoltaic (PV) cells have been used along with lithium ion batteries which have long life span.

5.2 Conductive Yarns

In order for smart garments to progress from those which cleverly hide wiring within the garment structure, the textile itself needed to become the ‘wiring system’. Early work focused on metallic fibres and yarns, such as copper, steel, nickel and silver, which were known for their conductive properties. However, issues were quickly found with the flexibility of these fibres, thus impacting on the drape and handle and ultimately the comfort of the textile. Further developments involved polymer-based filament yarns. These yarns can be created by the traditional method of melt spinning, with the active conductive polymer component being added.

Another approach to integrating the electronic circuit into the textile is the use of embroidery techniques. Various researchers have explored this field and have used the yarns for embellishment as well as functionality. Another possible solution to the issue of integrated conductivity is that of conductive ink printing. This allows specific circuits to be printed as required, but there is still much development required in this field to ensure such circuits are completely effective and reliable ^[8].

5.3 Integrated Circuits

Sensors as part of a garment need to be innocuous, particularly in sportswear, so as to not distract wearers from their activity, which could be detrimental to performance. Developments in textile technology mean that the textile itself can now be considered as the sensor, rather than trying to discreetly house an external sensor within the body of the garment or textile structure. Using a colorimetric pH indicator, an LED detector and a wireless transmitter, it is able to monitor the rate of fluid loss from the body. Such a system could be useful for athletes to monitor hydration levels (which have a profound effect on performance), particularly in environments where the

temperature and humidity are markedly different from that in which the athlete normally trains and competes.

Piezoelectric fibres (those which generate an electrical potential when under strain) are considered the best types of fibres for this end use. Natural fibres such as silk can display these properties to some degree, but synthetic polymers such as polyvinylidene fluoride (PVDF), polypropylene (PP) and polyethylene terephthalate (PET) can be engineered to display piezoelectric properties ^[9].

6. The Influence of Smart Materials on Sport Performance

Health monitoring has been a key area for the development of smart textiles. Placing textiles directly against the skin and hard wiring them to a monitor has been a technique used for several years in the monitoring of vital signs such as heart and respiratory rates. However, more recent developments have seen advancements in wireless technologies, eliminating the need for hard wiring to an external piece of equipment and thus increasing the potential for mobility of the patient, in turn improving patient comfort and therefore, as some research suggests, decreasing recovery times ^[10].

These technologies are easily transferrable to the field of sportswear. Incorporating the sensors within the body of the garment and wirelessly transmitting information can provide critical information on vital signs and thus the performance of the athlete. This can provide valuable information for the athlete during the preparation phase of the competitive season and training sessions can be tailored to enhance performance, without impeding activity. Similarly, the performance of the athlete can be monitored during competition with analysis of data providing a platform with which to build a strategy for future events. However, it is critical that the sensors cannot be detected by the athlete as this could cause distraction or discomfort and ultimately cause a reduction in performance.

7. Automatic Adjustments

The definition of a true smart material is that it is one able to detect and respond to external stimulus, adapting itself accordingly. There are various types of materials that could fall into this category.

7.1 Shape Memory

Shape memory textiles exhibit the ability to be deformed by external stimuli (usually temperature) into a temporary form and then return to their original shape ^[11]. Such materials are manufactured from polymers that are heated to a specific temperature (the temperature of deformation) at which

they are set into shape. The material is then allowed to cool. During use, if the material is heated to its temperature of deformation, it will then lose its set shape and thus change the properties it imparts. This process is entirely repeatable as the changes are within the morphology of the structure and not due to the degradation of the polymer ^[12]. In sportswear applications, such textiles can be useful in the thermoregulation of the body. The fabric structure opens as the body temperature rises, allowing heat and moisture to travel away from the body and facilitating cooling. As the environment and body cool, the structure closes, thus trapping air between the garment and the body and allowing thermal insulation to occur ^[13].

7.2 Phase Change

Phase change materials are those which have the ability to change state when absorbing or releasing thermal energy, thus acting as thermo regulators in fabric and garment form. Typically, these materials are based on a wax type of compound encapsulated within a fibre, although this is not the only type of material and technique that can be used. Alongside paraffin waxes, compounds such as hydrated inorganic salts, linear long chain hydrocarbons and polyethylene glycols have been considered in the development of textiles with enhanced thermoregulatory properties, with techniques such as lamination and coating being explored by researchers as alternatives to fibre encapsulation. The critical factors required for a phase change material to be effective in a textile clothing application are as follows:

- I) A melting point between 15 °C and 30 °C.
- II) A small difference between melting and solidification points.
- III) Stability during repeated melting and solidification.
- IV) Excellent thermal conductivity.

Additionally, health and safety factors such as low toxicity, resistance to flammability and effects on the environment are key considerations. Ultimately, for the mass market, cost is the deciding factor ^[14]. As body and environmental temperatures rise, the compound absorbs the thermal energy and, as it does so, changes state from solid to liquid, drawing heat away from the body and allowing cooling to occur. Conversely, as temperature drops, the compound emits thermal energy and it transforms from liquid to solid state, allowing heating of the surrounding area. Careful engineering of the garment is required to ensure it is the body that benefits from the movement of thermal energy and not the surrounding atmosphere¹⁵. Currently, the amount of phase change material that can be incorporated into textile weights common in garments (approx. 150-400 g2) is such that only

approximately 15 minutes of effectiveness can be achieved. However, this could be of use in sportswear applications for garments worn immediately after warm-up to ensure muscles are not allowed to cool before activity. There has been some development using this technology in heavyweight garments such as those used in extreme sports in colder climates; gloves for snowboarding and skiing have successfully used phase change materials to impart thermal comfort ^[16].

7.3 Chromic Effects

Materials experiencing a change of color due to external stimuli are known as chromatic. The specific category of chromatic function is dependent on the stimulus as follows:

- Photo chromic-color change due to light
- Electro chromic-color change due to electrical currents
- Piezo chromic-color change due to mechanical deformation
- Solva chromic-color change due to moisture
- Thermo chromic-color change due to heat

Thermo chromic textiles have been used to some degree in the medical industry in the monitoring of body temperature and could be used in sportswear in a similar way and aid performance monitoring. Similarly solva chromes could aid sportswear performance, being used to monitor the production of perspiration and thus advise the wearer on necessary rehydration.

8. Specific Applications in Sportswear

8.1 Athletics

Professional athletes require perfect conditions in both their own bodies and the external environment to perform at their optimal level ^[17].

Smart textiles can offer monitoring techniques in the training environment which are noninvasive and therefore do not distract wearers from their performance ^[18]. However, monitoring of the body's response to exercise is not in demand exclusively by professional sportspeople. Sport as a recreational activity is commonplace, with many participants having a keen interest in monitoring their performance. Many companies have recognized this 'High Street demand' for such monitoring devices and several are now available for use in both the leisure and professional sportswear market. The T-shirt type garment is constructed from a knitted fabric base containing elastane to improve fit and comfort properties. In the front portion of the

garment, ECG electrodes and a respiratory monitor are knitted into the fabric structure alongside the circuitry, which is created from silver-coated polyester yarns. The vest can provide real-time monitoring and data output, which can enable athletes to understand and adapt their performance and training regimes ^[19]. In a similar way, NuMetrex has developed the ‘sports bra’. The sensors and conductive components are all inherent in the garment, thus minimizing any distractions that could be caused by the monitoring equipment. The information is transmitted wirelessly to a watch via a clip-on transmitting device, enabling the wearer to monitor heart rate in real time.

8.2 Ski Wear

The sport of skiing involves periods of high activity (skiing downhill) followed by those of relative inactivity (resting at the end of the ski run, or the lift climb to the top of the slope). Ski wear therefore must be thermoregulatory-supplying the wearer with both cooling and insulating properties. Phase change materials lend themselves perfectly to the shorter ski runs associated with recreational skiing. “Where the downhill ski runs and lift climbs are short (less than 10-15 minutes), enough phase change material can be incorporated into the clothing to allow effective thermoregulation to take place. Ski clothing is generally thicker than every day wear; however, the wearer still requires clothing that is flexible enough for normal body movement, thus restricting the amount of phase change materials that can be incorporated into clothing covering the arms and legs (and torso to some degree). Areas of the body where heat loss due to conduction is known to be greatest in cold climates are the hands and the feet. In the case of the feet, less apparel flexibility is required; thus the textiles used can be thicker and more phase change materials can be incorporated, increasing the length of the effectiveness of the material. A degree of manual dexterity is still required in skiing; however, more phase change material can be incorporated in the body of the glove to improve insulation without compromising movement. A critical factor in mountain sports is protection from the wind, which can cause accelerated heat loss and hypothermia if the body is not sufficiently shielded. Coupled with this, it is essential that moisture produced by the body is allowed to escape through the garments to allow cooling when required. This moisture must be allowed to escape and not held either on the skin or within the textile structure as this can again accelerate the cooling effects of the surrounding environment. Shape memory polymers, discussed above would serve a useful purpose in this case, with the structure being closed if wind chill is a threat, whilst opening up to allow moisture out if the temperature of the body begins to increase.

9. Discussion

The market for smart textiles is growing, particularly in those industries, such as sportswear, in which there is a need for the wearers to be monitored and the information collected to be analyzed. The fashion industry has yet to find a real use for such technology, and smart textiles are still frequently used as novelty items. There is a danger that the fashion industry will continue to see such developments as a 'gimmick' using the technologies to support structures such as those with LEDs.

Improvements in the flexibility of the fabrics which incorporate the componentry to enable operation of the smart garment are also allowing designers to create garments more easily. In early developments the wiring of the components was the deciding factor in the garment design (as seen with the ICD + jacket), which led to smart garments being heavy and bulky. Conductive yarns, componentry and sensors are now all readily available in flexible forms off the shelf, enabling lighter weight garments to be produced, which are more comfortable to wear ^[20]. The apparel industry still encounters problems with power sources for smart textiles and as such is limited in the progression of the technology until a viable option is found ^[21]. Some encouragement should be taken from the mobile phone industry where much work is being done to improve battery life whilst reducing battery size. Companies such as Apple and Samsung are market leaders in the smart phone arena where their products are providing an increase in functionality with no increase in battery size ^[22]. Alternative power sources should not be disregarded. Traditional recharge-able batteries, which draw their charge by being plugged into the mains supply for a period of time, could be replaced with more sustainable alternatives. Solar power has seen great leaps forward in the last few years, with solar cells decreasing in size and, as discussed in the previous section, increasing in flexibility. The 'charge whilst you wear' concept would be appealing to consumers, who are quick to highlight their frustrations with the traditional methods of recharging batteries. In order for the smart textile to become a reliable product for the diagnostic and medical aspects of the sports industry, improvements in wireless integrity still need to be made. There is a perception that wireless technologies are still not as reliable as their hard-wired counterparts and, in order for such textiles to gain credibility, absolute reliability of data transmission is critical ^[23]. Whilst this is based largely on perception rather than hard fact, wireless technologies do have room for improvement. Finally, the environmental impact should be considered. In a world where a conscious effort is being made to reuse and recycle, is there really a place for textiles which contain added technology? And what shelf life do these garments have? It could be

suggested that in terms of performance sportswear, there will always be a need to monitor athletic performance-be that through heart rate, blood pressure, respiratory rate or one of the other functions discussed previously in this chapter. However, as the technologies are developing at such a rate, will this mean garments can be upgraded as the technology develops, or will current garments be deemed obsolete in a couple of years' time? In this case, does this mean that garments now will go to a landfill site or can they be recycled? An argument could be put forward that, as the garments are the sensors and are transmitting the raw data, it is the processing software that will change and, as such, the garment will have a longer life than that initially thought. This issue will only be brought to light as the smart textile market widens.

10. Conclusion

Fibres form the basic constituent of a garment and garment performance relies on choosing the right type of fibre composition by keeping up to date with modern developments in this field. During the last decade or so, the world production of man-made fibres increased from 49% in 1992 to 68% in 2012 and this trend is bound to continue as the demand for performance clothing increases. This is due to the fact that, compared to natural fibres, man-made fibres are engineered to meet specific requirements of the end user.

Smart materials have an important part to play in the future of sportswear. There have been many developments since the integration of electronics into a garment in the late 1990s and, although the novelty factor of this garment was quickly dismissed by the consumer, it served as a basis for innovation. Developments in military and medical applications easily translated into sportswear products. Sports performance monitoring was the first to be considered and the development of integrated sensors and piezoelectric fibres enabled professional athletes to monitor their activity in real time, recording their data for analysis and enabling training sessions to be adapted accordingly.

In addition to performance monitoring, smart textiles have also been developed to enhance comfort, with shape memory and phase change materials being used. These technologies have allowed apparel with exceptional thermo-regulatory properties to be established which adapt in line with wearers' individual needs.

References

1. Rigby D. Development of performance fibres and fabrics- A proactive approach. World Sports Active wear (WSA), 1998, 13-17.

2. Hongu T, Phillips GO. New fibres, 2nd ed. Cambridge, UK: Woodhead Publishing Ltd., 1997.
3. Purane SV, Panigrahi NR. Microfiber, microfilaments and their applications. *AUTEX Research Journal*. 2007; 7(3):148-158.
4. Brown P, Stevens K. Nanofibers and nanotechnology in textiles. Cambridge, UK: Woodhead Publishing, 2007.
5. Tao X. Smart technology for textiles and clothing-Introduction and overview. In *Smart fibres, fabrics and clothing*, Tao, X. (Ed.). London: Woodhead Publishing, 2001.
6. Kadolph SJ. Quality assurance for textiles and apparel, 2nd ed., Fairchild Publications, New York, 2007.
7. Park S, Jayaraman S. Smart textiles: Wearable electronic systems. *Materials Research Society Bulletin*. 2003; 28(8):585-589.
8. Ravandi SA, Valizadeh M. Properties of fibres and fabrics that contribute to human comfort. In *Improving comfort in clothing*, ed. Song, G. Cambridge, UK: Woodhead Publishing Ltd., 2011.
9. Moonen P, Yakimets I, Huskens J. Fabrication of transistors on flexible substrates: From mass-printing to high-resolution alternative lithography strategies. *Advanced Materials*. 2012; 24:5526-5541.
10. Vatansever D, Siores E, Hadimani R, Shah T. Smart woven fabrics in renewable energy generation. In *Advances in modern woven fabrics technology*, Vassiliadis S. (Ed.) 2011. Intechopen.com.
11. Kim Y, Lewis A. Concepts for energy-Interactive textiles. *MRS Bulletin*, 2003, 592-596.
12. Hu J. Shape memory textiles. London: Woodhead Publishing, 2007.
13. Schoeller. C-change: The bionic climate membrane [online], 2013. <http://www.schoeller-textiles.com/en/technologies.html> (accessed September 29, 2013).
14. Mondal S. Phase change materials for smart textiles- An overview. *Applied Thermal Engineering*. 2007; 28:1536-1550.
15. Lam Po Tang S, Stylios G. An overview of smart technologies for clothing design and engineering. *International Journal of Clothing Science and Technology*. 2005; 18(2):108-128.
16. Outlast. Outlast, 2013. [Online], <http://www.outlast.com/> (accessed September 29, 2013).

17. Hassan M, Qashqary K, Hassan HA, Shady E, Alansary M. Influence of sportswear fabric properties on the health and performance of athletes. *Fibres and Textiles in Eastern Europe*. 2012; 20(4):82-88.
18. Cho G. *Smart clothing: Technology and applications*. London: CRC Press. Columbia, 2010, 2013.
19. Smart Life. Smart life, 2013. [Online], <http://www.smartlifetech.com> (accessed September 29, 2013).
20. Ohmatex. Ohmatex, 2013. [Online], <http://www.ohmatex.dk> (accessed November 18, 2013).
21. O'Mahony M, Braddock SE. *Sportstech: Revolutionary fabrics, fashion and design*. London: Thames & Hudson, 2002.
22. Apple. Apple, 2013. [Online], <http://www.apple.com/uk/> (accessed September 29, 2013).
23. Hunter B. Smart textiles face tough challenges. *Innovation in Textiles*, 2008. [Online], <http://www.innovationintextiles.com/smart-textiles-face-tough-challenges/> (accessed September 29, 2013).
24. Zheng JW, Zhang ZB, Wu TH, Zhang Y. A wearable mobihealth care system supporting real time diagnosis and alarm. *Medical and Biological Engineering and Computing*. 2007; 45:877-885.

Chapter - 4

Yoga Leads To Fitness and Benifits

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Chapter - 4

Yoga Leads To Fitness and Benifits

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Abstract

Yoga is considered, both in the East and the West, as one of the best exercises for physical fitness, and emotional and spiritual well-being. Its benefits are numerous, and it can be practiced by anyone, the young and old alike, besides the fact that it is useful in preventing and even curing many minor and major diseases. Yoga is perhaps the best known way to bust stress, which is the root cause of chronic diseases such as reproductive problems, heart problems, immune system problems, arthritis, depression, and anxiety. Because yoga also helps in healing the mind, the healthy mind can lead to greater physical fitness, and a fit body leads to a healthy life.

The effects of yoga on the mind and body's fitness are amazing. The muscles are exercised by stretching and relaxing. Breathing and blood circulation also improve. One develops stronger muscles, and consequently a stronger body, which makes it more resistant to illnesses, whether viral or related to stress.

The asanas of yoga contribute to fitness of the body by improving the flexibility, lubrication, and strength of the joints, tendons, and ligaments. Another interesting, and no doubt beneficial, aspect is its capability to massage the glands and internal organs, including those which receive little or no stimulation such as the prostate gland. This improves the fitness of the organs and their systems. It also helps in the detoxification of the body and thus increases longevity.

Keywords: Yoga, mental benefits, physical benefits, physical injuries

Introduction

Yoga is considered, both in the East and the West, as one of the best exercises for physical fitness, and emotional and spiritual well-being. Its benefits are numerous, and it can be practiced by anyone, the young and old alike, besides the fact that it is useful in preventing and even curing many minor and major diseases. Yoga is perhaps the best known way to bust

stress, which is the root cause of chronic diseases such as reproductive problems, heart problems, immune system problems, arthritis, depression, and anxiety. Because yoga also helps in healing the mind, the healthy mind can lead to greater physical fitness, and a fit body leads to a healthy life.

The effects of yoga on the mind and body's fitness are amazing. The muscles are exercised by stretching and relaxing. Breathing and blood circulation also improve. One develops stronger muscles, and consequently a stronger body, which makes it more resistant to illnesses, whether viral or related to stress.

Relaxation of the body and its fitness are achieved by yoga through breathing techniques known as pranayam, and strong but gentle asanas (poses). The exercises target the parasympathetic nervous system, a component of the autonomic nervous system that deals with the rest-and-repose mechanism of the body. Therefore, optimal function of this component would ensure that the damage sustained from too much stress is kept under control. Stress can show up through a sudden increase in heart rate, shallow breathing, excessive sweating, and affect physical fitness as well. Though these are normal body reactions, when an excess of these are triggered by stress it can be a sign of trouble and can upset one's physical and mental fitness. Yoga is an effective insurance against stress-causing work overload. It restores the body to its natural balance and fitness.

Stress also causes increased cortisol levels in the body, which lead to suppression of the immune system, which in turn lead to chronic diseases and also sleep disturbances, loss of appetite, and loss of sex drive. Besides, wear and tear of our organs leading to loss of physical fitness can also be attributed to stress.

This is where the amazing benefits of yoga can be tapped. Its relaxation techniques can counteract the stress, and improve the performance of the circulatory, digestive, reproductive, immune, and glandular systems, boosting overall fitness.

The asanas, or physical poses, enhance the circulation of blood and fluids to different parts of the body. Its breathing exercises improve the function of the lungs, and it also calms the mind. People who practice it regularly become less dependent on medication for their fitness. Though all this may sound very appealing, one must remember that yoga's positive effects do not start to show overnight. They are felt in the long run, and even patients can start feeling healthier than ever before.

It is arguable whether the many practitioners of yoga caused scientists to research its health benefits, or the positive results of these studies influenced

more people to adopt this ancient art of fitness. Either way, the studies have shown that it really can cause improvement in terms of the physical and biochemical fitness of the body.

The asanas of yoga contribute to fitness of the body by improving the flexibility, lubrication, and strength of the joints, tendons, and ligaments. Another interesting, and no doubt beneficial, aspect is its capability to massage the glands and internal organs, including those which receive little or no stimulation such as the prostate gland. This improves the fitness of the organs and their systems. It also helps in the detoxification of the body and thus increases longevity.

As for mental fitness, it enhances awareness of the self and the environment, improves self-esteem, affords the opportunity for self-realization, improves social skills, concentration, memory and attention.

At yoga's core is the concept of union. The practice aims to unify the spirit, mind, and body through regular physical and breathing exercises. It is debatable whether yoga practitioners actually achieve this state of union because it is not something that science can test.

Yoga has been in existence for thousands of years, mainly in India and Asia and, more recently, in western countries. Many people have experienced its benefits which include self-healing, serenity, and harmony with all living things.

Danial Fonseca (2012), Essentials of Yoga Physical Education

It seems a common and popular idea about Yoga nowadays is that of Yoga as physical exercise, or the practice of Yoga *asanas* (postural training). Yoga is then commonly taken as a system of physical education with a spiritual component, although the truth is the reverse: Yoga is a spiritual system with a physical component. The practice of asanas is yet only a small part of the complete system of Physical Culture & Education known as Hatha Yoga.

Other practices of this system are: *pranayamas* (control of prana through the control of breath), *shatkarmas* (cleansing processes) and *mudras* (psychic gestures) & *bandhas* (energy locks).

Potential benefits of Yoga for adults

While much of the medical community regards the results of yoga research as significant, others point to many flaws which undermine results. Much of the research on yoga has taken the form of preliminary studies or clinical trials of low methodological quality, including small sample sizes,

inadequate blinding, lack of randomization, and high risk of bias. Long-term yoga users in the United States have reported musculoskeletal and mental health improvements, as well as reduced symptoms of asthma in asthmatics. There is evidence to suggest that regular yoga practice increases brain GABA levels, and yoga has been shown to improve mood and anxiety more than some other metabolically-matched exercises, such as walking. The three main focuses of Hatha yoga (exercise, breathing, and meditation) make it beneficial to those suffering from heart disease. Overall, studies of the effects of yoga on heart disease suggest that yoga may reduce high blood-pressure, improve symptoms of heart failure, enhance cardiac rehabilitation, and lower cardiovascular risk factors. For chronic low back pain, specialist Yoga for Healthy Lower Backs has been found 30% more beneficial than usual care alone in a UK clinical trial. Other smaller studies support this finding. The *Yoga for Healthy Lower Backs* programme is the dominant treatment for society (both cheaper and more effective than usual care alone) due to 8.5 fewer days off work each year. A research group from Boston University School of Medicine also tested yoga's effects on lower-back pain. Over twelve weeks, one group of volunteers practiced yoga while the control group continued with standard treatment for back pain.

The reported pain for yoga participants decreased by one third, while the standard treatment group had only a five percent drop. Yoga participants also had a drop of 80% in the use of pain medication.

There has been an emergence of studies investigating yoga as a complementary intervention for cancer patients. Yoga is used for treatment of cancer patients to decrease depression, insomnia, pain, and fatigue and to increase anxiety control. Mindfulness Based Stress Reduction (MBSR) programs include yoga as a mind-body technique to reduce stress. A study found that after seven weeks the group treated with yoga reported significantly less mood disturbance and reduced stress compared to the control group. Another study found that MBSR had showed positive effects on sleep anxiety, quality of life, and spiritual growth in cancer patients.

Yoga has also been studied as a treatment for schizophrenia. Some encouraging, but inconclusive, evidence suggests that yoga as a complementary treatment may help alleviate symptoms of schizophrenia and improve health-related quality of life.

Implementation of the Kundalini Yoga Lifestyle has shown to help substance abuse addicts increase their quality of life according to psychological questionnaires like the Behavior and Symptom Identification Scale and the Quality of Recovery Index.

Yoga has been shown in a study to have some cognitive functioning (executive functioning, including inhibitory control) acute benefit.

Physical Injuries

Since a small percentage of yoga practitioners each year suffer physical injuries analogous to sports injuries; caution and common sense are recommended. Yoga has been criticized for being potentially dangerous and being a cause for a range of serious medical conditions including thoracic outlet syndrome, degenerative arthritis of the cervical spine, spinal stenosis, retinal tears, damage to the common fibular nerve, "Yoga foot drop," etc. An exposé of these problems by William Broad published in January, 2012 in *The New York Times Magazine* resulted in controversy within the international yoga community. Broad, a science writer, yoga practitioner, and author of *The Science of Yoga: The Risks and the Rewards*, had suffered a back injury while performing a yoga posture. Torn muscles, knee injuries, and headaches are common ailments which may result from yoga practice.

An extensive survey of yoga practitioners in Australia showed that about 20% had suffered some physical injury while practicing yoga. In the previous 12 months 4.6% of the respondents had suffered an injury producing prolonged pain or requiring medical treatment. Headstands, shoulder stands, lotus and half lotus (seated cross-legged position), forward bends, backward bends, and handstands produced the greatest number of injuries.

Some yoga practitioners do not recommend certain yoga exercises for women during menstruation, for pregnant women, or for nursing mothers. However, meditation, breathing exercises, and certain postures which are safe and beneficial for women in these categories are encouraged.

According to Dr. Nevins, other Physical Benefits Include

- Increased flexibility.
- Increased muscle strength and tone.
- Improved respiration, energy and vitality.
- The maintenance of a balanced metabolism.
- Weight reduction.
- Cardio and circulatory health.
- Improved athletic performance.
- Protection from injury.

Top 10 Benefits of Yoga in Daily Life

Weight loss, a strong and flexible body, glowing beautiful skin, peaceful mind, good health-whatever you may be looking for, yoga has it on offer. However, very often, yoga is only partially understood as being limited to asanas (yoga poses). As such, its benefits are only perceived to be at the body level and we fail to realize the immense benefits yoga offers in uniting the body, mind and breath. When you are in harmony, the journey through life is calmer, happier and more fulfilling.

With all this and much more to offer, the benefits of yoga are felt in a profound yet subtle manner. Here, we look at the top 10 benefits of yoga practice.

- 1) **All-Round Fitness:** You are truly healthy when you are not just physically fit but also mentally and emotionally balanced. As Sri Sri Ravi Shankar puts it, “Health is not a mere absence of disease. It is a dynamic expression of life-in terms of how joyful, loving and enthusiastic you are.” This is where yoga helps: postures, pranayama (breathing techniques) and meditation are a holistic fitness package.
 - Yoga-Personal fitness mantra
 - Weight-loss formula
 - Mind soother
 - Tool for better communication
 - Creativity machine
 - Doubt repeller
 - Time planner
- 1) **Weight Loss:** What many want! Yoga benefits here too. Sun Salutations and Kapal Bhati pranayama are some ways to help lose weight with yoga. Moreover, with regular practice of yoga, we tend to become more sensitive to the kind of food our body asks for and when. This can also help keep a check on weight.
- 2) **Stress Relief:** A few minutes of yoga during the day can be a great way to get rid of stress that accumulates daily - in both the body and mind. Yoga postures, pranayama and meditation are effective techniques to release stress.
- 3) **Inner Peace:** We all love to visit peaceful, serene spots, rich in natural beauty. Little do we realize that peace can be found right

within us and we can take a mini-vacation to experience this any time of the day! Benefit from a small holiday every day with yoga and meditation. Yoga is also one of the best ways to calm a disturbed mind.

- 4) **Improved Immunity:** Our system is a seamless blend of the body, mind and spirit. An irregularity in the body affects the mind and similarly unpleasantness or restlessness in the mind can manifest as an ailment in the body. Yoga poses massage organs and strengthens muscles; breathing techniques and meditation release stress and improves immunity.
- 5) **Living with Greater Awareness:** The mind is constantly involved in activity-swinging from the past to the future-but never staying in the present. By simply being aware of this tendency of the mind, we can actually save ourselves from getting stressed or worked up and relax the mind. Yoga and pranayama help create that awareness and bring the mind back to the present moment, where it can stay happy and focused.
- 6) **Better Relationships:** Yoga can even help improve your relationship with your spouse, parents, friends or loved ones! A mind that is relaxed, happy and contented is better able to deal with sensitive relationship matters. Yoga and meditation work on keeping the mind happy and peaceful; benefit from the strengthened special bond you share with people close to you.
- 7) **Increased Energy:** Do you feel completely drained out by the end of the day? Shuttling between multiple tasks through the day can sometimes be quite exhausting. A few minutes of yoga everyday provides the secret to feeling fresh and energetic even after a long day. A 10-minute online guided meditation benefits you immensely, leaving you refreshed and recharged in the middle of a hectic day.
- 8) **Better Flexibility & Posture:** You only need to include yoga in your daily routine to benefit from a body that is strong, supple and flexible. Regular yoga practice stretches and tones the body muscles and also makes them strong. It also helps improve your body posture when you stand, sit, sleep or walk. This would, in turn, help relieve you of body pain due to incorrect posture.
- 9) **Better Intuition:** Yoga and meditation have the power to improve your intuitive ability so that you effortlessly realize what needs to be done, when and how, to yield positive results. It works. You only need to experience it yourself.

Yoga in Everyday Life: Physical Fitness, Sports, Workplace, Health Care and Medical Research

Yoga in Sports and Physical Fitness

Yoga has become one of America's most popular exercise regimens for staying fit. Seventy-five percent of health clubs in the United States offer yoga classes. Athletes are also increasingly using yoga to limber up for other sports, such as golf.

Furthermore, yoga asana competitions, which have long been held in India, are becoming increasingly popular in America. Bikram Choudhury has established regional and international Bishnu Charan Ghosh Cup championships and he is also leading a campaign to have competitive yoga included in the Olympics.

Yoga in the Workplace

It is becoming increasingly common for major corporations to provide yoga for their employees as a means of reducing stress and promoting general health. Entrepreneurial yoga teachers have formed businesses to service this market. One such company, Yoga at Work, states on its Web site, "Join a rapidly growing list of major companies like Nike, HBO, Apple, Forbes, General Electric, PepsiCo and Chase Manhattan that rely on yoga to keep their employees healthy, happy, focused, fully engaged in their work."

According to a blog entry titled "Mandatory Yoga at Work" by law professor Paul Secunda, the *National Law Journal* reports that "employers are increasingly mandating that employees have healthy lifestyles, or face repercussions. Mandatory wellness programs are popping up everywhere, lawyers say, requiring everything from cholesterol screening to weight-loss plans and yoga classes. Several employers are starting to reward employees with extra cash for meeting certain company health goals. Others are fining those who refuse to take part in programs."

Yoga in Health Care and Medical Research

A 1990 study showed that yoga combined with other healthy practices was effective in treating arterial blockage. In recent years further research of yoga has yielded some tentatively positive results for relieving carpal tunnel syndrome, asthma and other pulmonary conditions, substance abuse, depression, anxiety, insomnia, multiple sclerosis, lower back pain, and obesity. Further claims have been made for yoga's beneficial effects in preventing or managing numerous additional afflictions. It is becoming increasingly common for mainstream physicians and psychiatrists to

prescribe or recommend yoga as therapy, and for hospitals and physical therapists to incorporate it in their treatment regimens.

There are some proven health benefits to yoga practice, but most of those claims have only anecdotal support; thus, they should not be magnified out of proportion. Further, the press has noted a “surge of muscle and ligament sprains, disk injuries, and cartilage tears,” “mild to moderate sprains of the knees, shoulder, neck, or back,” and “soft-tissue and joint injuries” associated with yoga, with some of the injuries sustained being quite serious.

A *New York Times* article raises the question whether yoga’s negative effects may at times outweigh its positive ones: “‘The extreme range of motion yoga develops does not necessarily have an advantage, and it may be counterproductive,’ said Dr. Shirley Sahrmann, a professor of physical therapy at the Washington University School of Medicine in St. Louis. Like dancers, practitioners of yoga cultivate overly flexible spines, which often cause problems in resting posture. ‘In my business,’ Dr. Sahrmann said, ‘I have more problems with people who have excessive mobility than limited mobility.’”

Yoga’s effect on behavior is not always positive, either. At Ringerike Prison in Oslo, Norway, a trial yoga program was stopped after some prisoners became more aggressive and agitated, while others developed sleeping problems. “[The warden] said that deep breathing exercises could make the inmates more dangerous, by unblocking their psychological barriers.”

Utilizing Yoga Exercises for Sports

Keeping in mind the health benefits of Yoga, it has been made part of the school and colleges curriculum under physical education. Physical education degree is given to physical education teacher to impart the exercises of yoga in schools and colleges to students.

Yoga exercises help in reducing childhood obesity, ADD/ADHD, autism and dyslexia. There is need for physical education in continuing education to the higher grades for these children. There are fewer disciplinary problems in school and colleges as students learn with the help of yoga to regulate their senses and control their emotions. They learn the importance of reverence and grow understanding for each other. There are many children who normally do not participate in any type of sports activity. Yoga brings these children out of their shells and gives them the platform to build balanced lives for themselves. Children, who regularly practice yoga, perform better at academics, get better grades and are well behaved.

Many parents and Catholics believe that yoga leads people to search for mysticism and the nuances of Hindu religion. Children are easily influenced and this goes against the dictum of Christianity. This is the reason why yoga was not incorporated into the physical education of many schools and colleges. But this trend is changing now as yoga teachings can easily be redesigned according to a particular culture. Yoga can be customized to remove the religious overtones and its practice can be converted into a pure form of physical exercise. The basic exercises remain the same only chanting, meditation and prayers can be practiced differently. This should remove the fear of parents and this is the reason that many more schools are adopting yoga teachings in schools. There is no doubt about the benefits of yoga exercises and it should be accepted as a form of sports in schools and colleges.

A regular practice can offer all kinds of mental and physical health benefits. Some, like improved flexibility, are clearly evident. Others, including mental clarity and stress reduction, may be more subtle but are just as powerful. When put together, all the benefits below contribute to an increased feeling of well-being, which helps explain why so many people find yoga so addictive.

Physical Benefits of Yoga

Flexibility: Moving and stretching in new ways will help you become more flexible, bringing greater range of motion to tight areas. Over time, you can expect to gain flexibility in your hamstrings, back, shoulders, and hips. As we age, flexibility naturally decreases, which leads to pain and immobility. Yoga can ameliorate this process.

Strength: Many yoga poses require you to support the weight of your own body in new ways, including balancing on one leg (such as in Tree Pose) or supporting yourself with your arms (such as in Downward Facing Dog). Holding poses over the course of several breaths also builds strength.

Muscle Tone: As a by-product of getting stronger, you can expect to see increased muscle tone. Yoga helps shape long, lean muscles.

Balance: Improved balance is one of the most important benefits of yoga as you get older. Poses where you stand on one leg and, for more advanced students, inversions, are great ways to build core strength.

Joint Health: People with arthritis often see marked improvement in their pain and mobility with regular gentle yoga practice. People with Carpal Tunnel Syndrome can also benefit from specific types of yoga exercises.

Pain Prevention: Increased flexibility and strength can help prevent the causes of some types of back pain. Many people who have back pain spend a lot of time sitting at a computer or driving a car. That can cause tightness and spinal compression, which you can begin to address with yoga. Yoga also improves your alignment, both in and out of class, which helps prevent many other types of pain.

Better Breathing: Most of us take shallow breaths and don't give much thought to how we breathe. Yoga breathing exercises, called pranayama, focus the attention on the breath and teach us how to take deeper breaths, which benefits the entire body. Certain types of breath can also help clear the nasal passages (helpful for people with allergies) and even calm the central nervous system, which has both physical and mental benefits.

Mental Benefits of Yoga

Mental Calmness: Yoga asana practice is intensely physical. Concentrating so intently on what your body is doing has the effect of bringing a calmness to the mind. Yoga also introduces you to meditation techniques, such as watching the breath and how to disengage from your thoughts. These skills can prove to be very valuable in intense situations off the mat, like childbirth, a bout of insomnia, or when having an anxiety attack.

Stress Reduction: Physical activity is good for relieving stress, and this is particularly true of yoga. Because of the concentration required, your daily troubles, both large and small, seem to melt away during the time you are on the mat. This provides a much-needed break from your stressors, as well as helping to put your problems into perspective. The emphasis yoga places on being in the moment can also help relieve stress, as you learn not to dwell on past events or anticipate the future. You will leave a yoga class feeling less stressed than when you started. Reducing stress can also make a big difference for people struggling with infertility.

Body Awareness: Doing yoga will give you an increased awareness of your own body. You are often called upon to make small, subtle movements to improve your alignment. Over time, this will increase your level of comfort in your own body. This can lead to improved posture and greater self-confidence.

References

1. Beashel P, Taylor J. Advanced Studies in Physical Education and Sport. UK: Thomas Nelson & Sons Ltd., 1996.

2. Beashel P, Taylor J. *The World of Sport Examined*. UK: Thomas Nelson & Sons Ltd., 1997.
3. Bizley K. *Examining Physical Education*. Oxford; Heinemann Educational Publishers, 1994.
4. Daneshjoo Abdolhamid, Abdul Halim Mokhtar, Nader Rahnama, Ashril Yusof. The Effects of Injury Preventive Warm-Up Programs on Knee Strength Ratio in Young Male Professional Soccer Players. *PLoS ONE*, 2012, 7(12).
5. Davis B *et al.* *Physical Education and the Study of Sport*. UK: Harcourt Publishers Ltd., 2000.
6. Devereux G. *Dynamic yoga: The ultimate workout that chills your mind as it charges your body* (Thorsons, London), 1998.
7. Farhi D. *Yoga mind, body and spirit: A return to wholeness* (New leaf: New Zealand), 2000.
8. Galligan F *et al.* *Advanced PE for Edexcel*. Oxford; Heinemann Educational Publishers, 2000.
9. Hewitt J. *The Complete Yoga Book* (Rider, London), 1977.
10. Ingjer F, Stromme SB. Effects of active, passive or no warm-up on the physiological response to heavy exercise. *European Journal of Applied Physiology*. 1979; 40:273-282.
11. Iyengar BKS. *Light on Yoga*, Thorsons, 2000.
12. Iyengar BKS. *Yoga: The path to holistic health* (Dorling Kindersley, London), 2001.
13. Mcardle W *et al.* *Essentials of Exercise Physiology*. 2nd ed. Philadelphia: Lippincott Williams & Wilkins, 2000.
14. Mira S, Meththa S. *Yoga: The Iyengar Way* (Dorling Kindersley, London), 1990.
15. Parsons S *et al.* Development of speed, agility, and quickness for tennis athletes. *Strength & Conditioning Journal*. 1998; 20(3):14-19.
16. Sivananda Yoga Vedanta Centre, *Yoga, Mind and Body* (DK, London), 1996.
17. Soligard T, Myklebust G, Steffen K *et al.* Comprehensive warm-up programme to prevent injuries in young female footballers: cluster randomized controlled trial. *BMJ* 337, 2008.

18. Sturgess S. The Yoga Book (Element), 1997.
19. Swami Muktibodhananda Hatha Yoga Pradipika (Yoga Publications Trust, Munger, Bihar, India), 1993.
20. Swami Satyananda Saraswati Asana, Pranayama, Mudra, Bandha (Yoga Publications Trust, India), 1996.
21. Swenson D. Ashtanga yoga: The Practice Manual (Ashtanga yoga production, Houston), 1999.

Chapter - 5
Role and Importance of Physical Education in the
Modern Society

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Chapter - 5

Role and Importance of Physical Education in the Modern Society

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Abstract

Physical education is an integral part of educational program design to promote the optimum development of an individual physically, socially, emotionally, mentally, and spiritually through total body movement in the performance of properly selected physical activities.

Physical Education is the process by which changes in the individual are brought about through movement's experiences. Physical Education aims not only at physical development but is also concerned with education of the whole person through physical activities.

Physical education plays a critical role in educating the whole student. Research supports the importance of movement in educating both mind and body. Physical education contributes directly to development of physical competence and fitness. It also helps students to make informed choices and understand the value of leading a physically active lifestyle. The benefits of physical education can affect both academic learning and physical activity patterns of students. The healthy, physically active student is more likely to be academically motivated, alert, and successful.

Keywords: Physical education, positive conceptions, mis-conceptions, cognitive

Introduction

Physical education is an integral part of educational program design to promote the optimum development of an individual physically, socially, emotionally, mentally, and spiritually through total body movement in the performance of properly selected physical activities.

Physical Education is the process by which changes in the individual are brought about through movement's experiences. Physical Education aims not only at physical development but is also concerned with education of the whole person through physical activities.

Physical education is very much needed in today's active world where people hardly find any time for themselves. It is a very broad concept which has many known benefits and merits. It not only helps in bringing physical fitness but also in mental as well as emotional development of a person through various medium of physical exercises. In today's competitive world, a person need to be an all-rounder and healthy and Physical Education helps in fulfilling that dream.

As H.C. Buck quoted "physical education is a part of general educational programme, which is considered with growth, development and education of children through the medium of big muscle activities. It is the education of the whole student by means of physical activities."

Physical education plays a critical role in educating the whole student. Research supports the importance of movement in educating both mind and body. Physical education contributes directly to development of physical competence and fitness. It also helps students to make informed choices and understand the value of leading a physically active lifestyle. The benefits of physical education can affect both academic learning and physical activity patterns of students. The healthy, physically active student is more likely to be academically motivated, alert, and successful.

In the preschool and primary years, active play may be positively related to motor abilities and cognitive development. As children grow older and enter adolescence, physical activity may enhance the development of a positive self-concept as well as the ability to pursue intellectual, social and emotional challenges.

Throughout the school years, quality physical education can promote social, cooperative and problem solving competencies. Quality physical education programs in our nation's schools are essential in developing motor skills, physical fitness and understanding of concepts that foster lifelong healthy lifestyles.

If the aim of Education is enrichment of personality, Physical Education contributes too much extent. If the aim of Education is self-realization, again no doubt physical Education provides opportunities to develop the sense of self-realization. To achieve and realize the aim and objectives of Education, physical Education plays an important role and assists in developing those objectives more practically. Therefore, it is said that physical education is an integral part of general education process.

Whole Educational processes become more easy and efficient when physical Education put its contributions. Physical education is an essential

part of total education process. Secondary Education Commission (1952-53) enlisted four aims of education i.e.

- i) Development of democratic approach,
- ii) Improvement of vocational efficiency,
- iii) Development of personality and
- iv) Development of qualities of leadership.

Physical education puts its great contribution in developing these qualities in an individual.

Two statements ‘A sound mind lies in a sound body’ and ‘physical Education an integral part of total Education’, one statement empowers the other statement. A complete personality is consisted of healthy body and healthy mind.

In other words it can be said physical educations assist whole educational process in developing all round personality. Only theoretical approach may produce a sound mind, but for a sound body physical approach is required.

Therefore only class room education itself cannot be considered as a complete educational programme until and unless physical education is regarded as an integral part of the programme.

Relationship of physical education with general education is well recognized and understood. It is therefore, physical education found essentially place in regular curriculum of every education institution.

Positive Conceptions Regarding Physical Education in the Society

- “High quality physical education can encourage young people to develop knowledge, understanding and skills across a range of physical education, sport and health-enhancing experiences. More than that, it can develop in them the desire and commitment to continue to enjoy, improve and achieve in line with their own personal capacities throughout their lifetime” (HMIE, 2008).
- “In more than a few primary and secondary schools, physical education experiences are not part of a well-planned curricular framework but are often mainly opportunities for physical activity and recreation. Such opportunities are not always fully developing pupils’ skills and understanding in a way that will allow them to become more successful and confident learners” (HMIE, 2008).
- “Key to physical education’s contribution to developing responsible citizens is the promotion of respect for the involvement of others...

Through participation in physical education and other physical activities, pupils can be encouraged to take more of a part in the social, cultural and sporting life of the school” (HMIE, 2008).

- “NikeGO PE event highlighted a curriculum called new PE, which delivers 30 minutes of constant physical activity in schools, ensuring that kids no longer have to stand in line for a turn or participate in elimination games... NikeGO PE provides elementary schools with tools to build a smart and effective approach to physical education, including a unique curriculum, teacher training and equipment” (Nike Raises Awareness of the Importance of Physical Education in Los Angeles Schools Through..., 2007).
- “Children spend a considerable amount of time in school, and schools are a powerful motivator for helping them adopt healthy lifestyles. Several studies demonstrate school-based PE programs are one of the most effective ways to facilitate activity in our youth” (Nike Raises Awareness of the Importance of Physical Education in Los Angeles Schools Through..., 2007).
- “Nike seeks to increase the quality and quantity of PE in schools. The realities of the times we live in demand that we strengthen physical education in our schools and ultimately bring full-time PE, taught by PE specialists, back to every school in the United States” (Nike Raises Awareness of the Importance of Physical Education in Los Angeles Schools Through..., 2007).
- “Properly implemented physical education has been demonstrated to have a positive impact on the fitness levels and motor skill development of students, and such education may lead to the habituation of lifelong physical activity” (Southern California Elementary Physical Education Specialists and Non- Specialists: Beliefs and Behaviors of the Ideal Purpose and Actual Function of Elementary Physical Education, 2004).
- “Certified PE specialists provide more PE and higher quality PE than classroom teachers” (Physical Education Matters, 2007).
- “Professional development in activity-focused PE should be one of the highest priorities for improving PE, because of substantial evidence for its effectiveness. Professional development is particularly needed for the classroom teachers, who continue to be the main instructors of PE in elementary schools” (Physical Education Matters, 2007).

- “Physical education specialists during critical developmental years at the elementary level are vital for developing the skills, knowledge, attitude and health benefits for an active, healthy lifestyle.” (Mandigo, 2003).
- “Non-physical education specialists reported lower levels of confidence, enjoyment, preparation and knowledge and less professional development opportunities than physical education specialists.” (Mandigo, 2003).
- “Principals may be more inclined to devote more time in their schools to physical education if it is taught by a specialist.” (Mandigo, 2003).
- “The nature and quality of delivery of the physical education curriculum are fundamental to the future of the subject.” (Hardman & Marshall, 2000).
- “Physical education teachers can also have a direct impact by developing more opportunities for physical activity throughout the school day.” (McKenzie, Marshall, Sallis & Conway, 2000).
- “Quality physical education also requires qualified teachers... potential safety issues.” (Principal magazine, 2003).
- A physical education teacher plays an important role in guiding students to explore. (Chen & Cone, 2003).
- “UNESCO Charter for Physical Education & Sport, Article 4, advocates that personnel professionally responsible for physical education and sport should be appropriately qualified, having ‘adequate levels of specialization.’” (Hardman & Marshall, 2000).

Misconceptions Regarding Physical Education in the Society

People are mostly unaware about all these advantages and hold many misconceptions regarding physical education and neglect the very benefits of it. Many parents believe that physical education has only to do with playing games and sport and there is no emotional development of the child, which is so very wrong. It is true that there are a lot of physical activities but parents are unable to understand that these activities actually sharpens the mind of their child and helps them to be more confident and active.

People also believe that physical education is just a waste of money and time. Parents put more pressure on studies and complete neglects games and sport. As a result the children become lazy, inactive and unable to compete with the world and are left behind. Physical education actually helps the

child to concentrate more on studies and remain healthy and fit. People also feel reluctant to spend money on physical education and most believe there is no opportunity or future in physical education. But they are so very wrong, a good sportsman always earn a lot of money. Physical education is not wastage of money, rather is a way of making more money.

Another most common misconception is that people believe that physical education makes people aggressive and violent but in actual fact, it helps in bringing about discipline and manners in a person.

Benefits of Physical Education

Physical education has many benefits and advantages but the foremost aim of physical education is the development of a person. Firstly, physical education improves the health and fitness of a person through various activities and not only that, it also maintains these trials throughout the lifetime of the person. It also provides vast knowledge about various communicable and health hazard diseases and physical education provide efficient ways to keep these diseases at bay. Physical education brings in more alertness of mind and concentration as they are an essential and vital part of any physical activities and also helps in reducing the reaction time of a person.

Physical education also promote emotional and mental development by helping in overcoming stress, anxiety, tension and various other emotional related problems. As a result a person feels less exhausted and happier. It also helps in improving and promoting leadership qualities in a person. A person comes across various participants and when they meet and interact, it helps in improving the social skills and also gets rid of shyness or any fear of communication with people. As a result a person feels more self-confident and can easily tackle any problem, thus helping in building up socialization.

Physical education enhances the characters of a person and making them fit for a society and enables them to face hardship, endure defeat and take proper decisions and risks, which is very much needed in today's competitive world. It also brings in a sense of fraternity, sportsmanship, co-operation, sympathy, courtesy, loyalty and many more among fellow participants. Many people also believe that physical education has the ability to develop the human body in good proportions.

Benefits of Physical Education at School Level

Physical education is unique to the school curriculum as the only program that provides students with opportunities to learn motor skills, develop fitness and gain understanding about physical activity. Physical benefits gained from physical activity include: disease prevention, safety and

injury avoidance, decreased morbidity and premature mortality, and increased mental health. The physical education program is the place where students learn about all of the benefits gained from being physically active as well as the skills and knowledge to incorporate safe, satisfying physical activity into their lives.

Elementary Level

In the elementary grades, the physical education program emphasizes the development of fundamental locomotor, non-locomotor, and manipulative skills through the main content areas of educational games, dance, and gymnastics. The movement framework, (i.e., body, space, effort, and relationship) is also a part of the core content and is the basis for developing, expanding, and refining children's range of motor skills and awareness. Quality instruction by physical education professionals is critical if children are to develop fundamental motor patterns (e.g. jump, throw, skip, hop, catch, and kick). The motor skill foundations established during the elementary grades may enhance children's social, cognitive and physical development and increase the likelihood of continued interest and participation in physical activity. Fitness at elementary grades is supported by a rich experience in many basic movement forms.

Middle School Level

The middle school student is ready to experience a wide variety of applications of fundamental movements, including traditional sports, adventure activities (e.g., rock climbing, ropes, kayak, skiing), and lifetime or leisure-oriented activities (e.g., roller-blading, biking, dance). It is during this period when students are capable of refining, combining and applying a variety of sport-related and lifetime skills. Students may explore after-school opportunities for specialized or/and competitive physical activity programs.

Rapid growth during the pre-adolescent years may affect students' interests, choices, and activity patterns. Therefore physical education programs offer a variety of activities to meet and expand student interests. Fitness development becomes more systematic. Students develop specific fitness components, set goals and assess personal fitness levels.

High School Level

High school students become increasingly more independent as their daily lives become more complex and diversified. High school students begin to make decisions and choices in taking increased responsibility for themselves. Quality high school physical education programs provide students conceptual and practical understanding of: 1) health-related physical fitness, and 2) how to maintain a health-related level of physical fitness.

Physical education plays a vital part in helping high school students maintain and refine the skills and knowledge needed to select physical activities to use throughout their lives.

Cognitive Benefits to Children's

Children learn through a variety of modalities (e.g., visual, auditory, tactile, physical). Teaching academic concepts through the physical modality may nurture children's kinesthetic intelligence. Academic constructs have greater meaning for children when they are taught across the three realms of learning, including the cognitive, affective and psychomotor domains. Greater depth and relevance can be achieved when the subject matter constructs are related to each domain of learning. Research has demonstrated that children engaged in daily physical education show superior motor fitness, academic performance, and attitude towards school versus their counterparts who did not participate in daily physical education. Physical education learning experiences also offer a unique opportunity for problem solving, self-expression, socialization, and conflict resolution.

Elementary Level

Research suggests that young children learn through active engagement with the "stuff" of their world. Children in elementary school acquire knowledge through physical exploration of their environment. Physical education may provide children with learning experiences essential to the formation of mental schemes (i.e., mental patterns or systems that describe the ways people think about the world; building blocks of thinking). Children form more effective schemes by physically interacting with their environment. Quality physical education programs facilitate exploration of movement in various contexts that enhance acquisition of knowledge.

Middle School Level

Middle school students are intensely curious, prefer active to passive learning, and definitely favor interaction with peers during learning activities. The early adolescent exhibits a strong willingness to learn things they consider useful. They enjoy using skills to solve real life problems. Quality physical education programs provide a medium through which middle school students can refine and expand upon their physical repertoire of skills. It has been shown that students miss fewer days of school because of illness and exhibit greater academic achievement because of the physical vitality gained in physical education.

High School Level

During the high school years students should be given more in-depth learning opportunities so they can understand the mechanical, physiological

and social psychological aspects of physical activity. High school students' growing ability to compare and contrast, analyze, and synthesize information enables them to apply movement principles in new and meaningful ways. Students can more fully understand the role of physical activity in preventive health and analyze the pros and cons of various types of physical activity in lifelong health.

Affective Benefits

Physical competence builds self-esteem. Quality physical education programs enhance the development of both competence and confidence in performing motor skills.

Attitudes, habits, and perceptions are critical prerequisites for persistent participation in physical activity. Appropriate levels of health-related fitness enhance feelings of well-being and efficacy.

Elementary Level

Quality physical education programs can contribute to the development of self-esteem among children. Children who are more active may have greater social success and positive relations with peers. Children need many opportunities to experience personal feelings of success and achievement in physical activity settings. Explorations of various movement capabilities contribute to feelings of joy and accomplishment.

Middle School Level

Quality middle school physical education programs provide students unique opportunities for demonstrating leadership, socialization, and goal setting skills. Involvement in physical activity has shown a consistent relationship with mood, self-esteem, and other indices of psychological well-being in early adolescence. Student preferences become more specialized at this age and the preference influences students' motivation to continue in physical activities. A youngster's feelings of perceived competence also affect future participation and self-esteem. Despite the physiological changes that occur at this age, students are generally willing to work cooperatively toward common goals because the desire for peer group acceptance is strong. Risk taking is attractive and students accept the challenge of setting and achieving personal goals. Physical education programs have a unique opportunity to provide learning experiences that enhance middle school students' self-esteem.

High School Level

During this phase of development, students begin to select activities based more on personal interests. Other factors affecting students' choices of

physical activity may be their level of health-related physical fitness, body type, geographical location, and socio-economic group or circle of peers. Physical education programs must continue to enhance students' fitness development and offer an array of activities from which students can select.

Attitudes, habits, and perceptions are critical prerequisites for persistent participation in physical activities. To help students achieve self-realization through physical activity, the physical education program can guide student choices and help them become self-directed in the selection of activities that are satisfying. The importance of commitment and dedication in achieving success may be emphasized in physical education.

Physical activity habits and preferences are not static, but are continually in a state of flux throughout one's lifetime. High school is a time when students can establish habits and attitudes about the role physical activity will play in their lifetime. This is the time for students to explore their preferences related to physical activity and perhaps specialize based on abilities and interests.

Physical Activity Improves the Quality of Life

Regular physical activity improves functional status and limits disability during the middle and later adult years. Physical activity contributes to quality of life, psychological health, and the ability to meet physical work demands. Physical education can serve as a vehicle for helping students to develop the knowledge, attitudes, motor skills, behavioural skills, and confidence needed to adopt and maintain physically active lifestyles. The outcomes of a quality physical education program include the development of students' physical competence, health-related fitness, self-esteem, and overall enjoyment of physical activity. These outcomes enable students to make informed decisions and choices about leading a physically active lifestyle.

In early years children derive pleasure from movement sensations and experience challenge and joy as they sense a growing competence in their movement ability. Evidence suggests that the level of participation, the degree of skill, and the number of activities mastered as a child directly influences the extent to which children will continue to participate in physical activity as an adult.

In early adolescence participation in physical activity provides important opportunities for challenge, social interaction, group membership, as well as opportunities for continued personal growth in physical skill. Participation for high school students continues to provide enjoyment and challenge as

young people express preferences for activities that meet their specific interests. A comprehensive, well-implemented physical education program is an essential component to the total education of students. Physical education prepares students to maintain healthy, active lifestyles and engage in enjoyable, meaningful leisure-time pursuits.

References

1. Barton GV, Fordyce K, Kirby K. The importance of the development of motor skills to children. *Teaching Elementary Physical Education*. 1999; 10(4):9-11.
2. Calfas K, Taylor W. The effects of physical activity on psychological variables in adolescents. *Pediatric Exercise Science*. 1994; 6:302-314.
3. California Department of Education. Caught in the middle: Educational reform for young adolescents in California public schools. Edith Cowan University (August). *Youth Studies*. 1987, 1991; 10(3):1-8.
4. Eggen P, Kauchak D. *Educational psychology: A window on classrooms* (4th Ed.). Upper Saddle River, NJ: Prentice-Hall, Inc., 1999.
5. Evans J, Roberts G. Physical competence and the development of children's peer relationships. *Quest*. 1987; 39:23-25.
6. Gruber JJ. Physical activity and self-esteem development in children: A meta-analysis. *The Academy Papers*. 1985; 19:30-48.
7. Hannaford C. *Smart Moves*. Arlington, VA. Great Ocean, 1995.
8. Keays J, Allison R. The effects of regular moderate to vigorous physical activity on student outcomes: A review. *Canadian Journal of Public Health*. 1995; 86:62-66.
9. Mohnsen BS. *Teaching middle school physical education: A blueprint for developing an exemplary program*. Champaign, IL: Human Kinetics, 1997.
10. Pate RR, Trost SG, Dowda M Ott, Ward AE, DS Saunders R, Felton G. Tracking of physical activity, physical inactivity, and health related physical fitness in rural youth. *Pediatric Exercise Science*. 1999; 11:364-376.
11. Rink JE. *Teaching physical education for learning* (3rd Ed.). New York: McGraw-Hill, 1998.
12. The National Centre for Chronic disease Prevention and Health Promotion, Centres for Disease Control and Prevention. *Guidelines for*

- school and community programs to promote lifelong physical activity among young people. *Journal of School Health*. 1997; 76(6):202-219.
13. The National Association for Sport and Physical Education (NASPE). *Moving into the future. National standards for physical education: A guide to content and assessment*. St. Louis: Mosby, 1995.
 14. The National Association for Sport and Physical Education (NASPE). *Sport and physical education advocacy kit II (Speak II)*, 1999.
 15. The U.S. Department of Health and Human Services (USDHHS). *Physical activity and health: A report of the Surgeon General*. Atlanta, GA: USDHHS, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.

Chapter - 6

Strength Gains: Neuromuscular Adaptation to Resistance Training

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Chapter - 6

Strength Gains: Neuromuscular Adaptation to Resistance Training

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Abstract

Systematic strength training produces structural and functional changes, or adaptations, in the body. The level of adaptation is evidenced by the size and strength of the muscles. The magnitude of these adaptations is directly proportional to the demands placed on the body by the volume (quantity), frequency, and intensity (load) of training, as well as the body's capability to adapt to such demands. Training rationally adapts to the stress of increasing physical work. In other words, if the body is presented with a demand rationally greater than it is accustomed to and enough recovery time is given to trained physiological systems, it adapts to the stressor by becoming stronger. Until a few years ago, we believed that strength was determined mainly by the muscles' cross-sectional area (CSA). As a result, weight training was used to increase "engine size" - that is, to produce muscular hypertrophy. However, though CSA is the single best predictor of an individual's strength. Strength training researches since the 1980s have shifted the focus to the neural component of strength expression. Therefore both neural as well as muscular adaptation to resistance training plays an important role in gaining strength.

Keywords: Neuromuscular, hypertrophy, cross-sectional area, strength

Introduction

For many years, strength gains were assumed to result directly from increases in muscle size (hypertrophy). This assumption was logical because many people who regularly strength trained developed visually larger muscles. This does not mean that muscle size is unimportant in the ultimate strength potential of the muscle. The ability to generate force depends on the number of cross-bridges within sarcomeres, which in turn depends on the amount of actin and myosin. Besides this, there is strong evidence that neural control of the muscle is altered with resistance training, allowing for a

greater force production. The following figure no.1 shows the generalized resistance training response for neural facilitation and muscle hypertrophy. Therefore, there are two aspects of strength gains i.e. neural aspects and muscular aspects because the adaptation or changes to these aspects by resistance training are equally responsible for gaining strength which is discussed in detail as below:

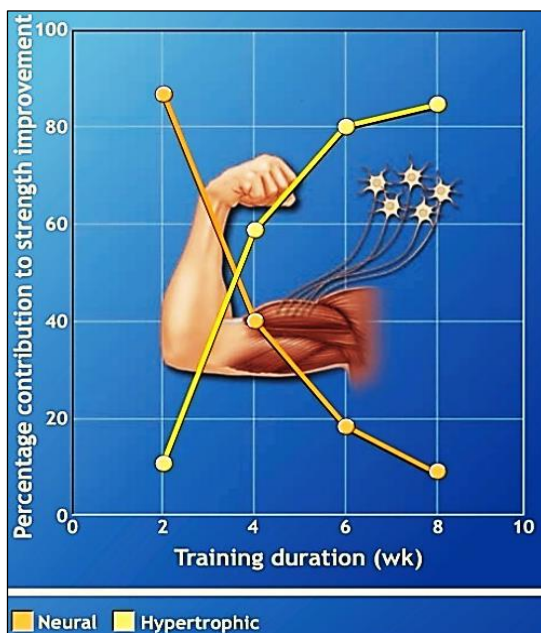


Fig 1

Neural Aspects of Strength Gains

Adaptive alteration in nervous system function that elevate motor neuron output largely account for the rapid and large strength increases early in training, often without an increase in muscle size and cross-sectional area. Neural adaptations play a particularly important role in the dramatic muscular strength and power improvement of the elderly with resistance training.

Reducing the Influence of Golgi Tendon Organs

Golgi Tendon Organ named for the Italian anatomists (Camillo Golgi) who first described them in the late 1800s. GTO (Golgi Tendon Organ) is encapsulated sensory receptors in which 5 to 15 muscle fibres are contained within each capsule. GTO are located within tendon near the muscle-tendon junction.

Golgi Tendon Organs are sensitive to tension in the muscle tendon complex. Their sensitive is so great that GTO can detect changes in a single muscle fibre. As a muscle contracts, the attached tendon are stretched, resulting in increased tension in the tendon. When a change in tension occurs within a muscle fibre, the collagen fibres surrounding the GTO are pinched, causing distortion and depolarization of the membranes of the primary (Ib) afferent sensory endings, which sends action potentials indicating the level of tension in the muscle to the Central Nervous system.

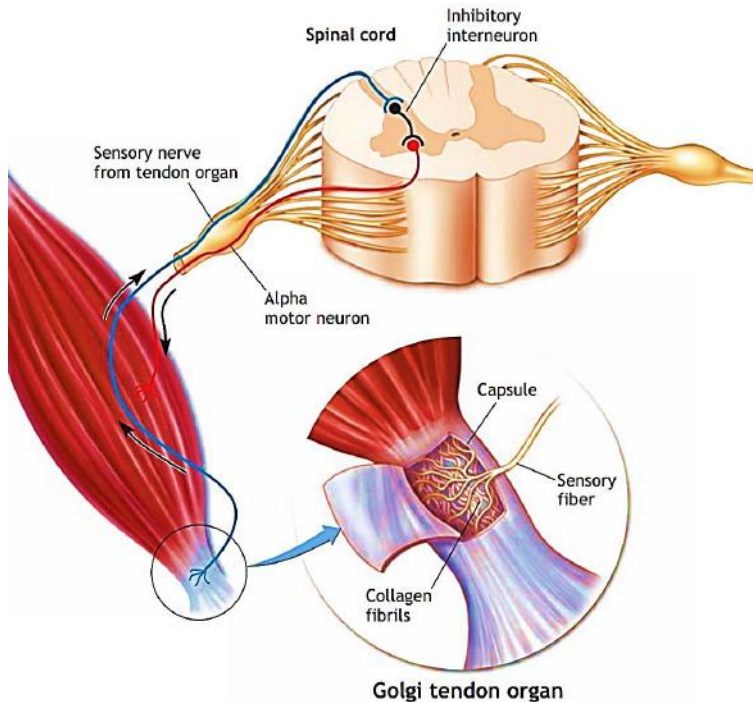


Fig 2

The sensory neurons of the Golgi Tendon Organs pass through the dorsal root to the spinal cord and enter the posterior gray matter, where they branch and synapse the inhibitory interneuron. The interneuron's synapse with alpha motor neurons that innervate the muscle to which the Golgi Tendon Organ is attached as depicted in the figure no. 2. When a great amount of tension is applied to the tendon, the sensory neurons of the Golgi Tendon organs are stimulated. The sensory neurons stimulate the interneuron to release inhibitory neurotransmitters, which inhibit the alpha motor neurons of the associated muscles and cause it to relax. Therefore, these sensory receptors are inhibitory in nature, performing a protective function

by reducing the potential for injury. When stimulated, these receptors inhibit the contracting (agonist) muscles and excite the antagonist muscles. In this way, Golgi Tendon Organs are important in resistance exercise. They function as safety devices, helping to prevent the muscle from developing excessive force during a contraction that may ultimately damage the muscle and tendon.

Some researchers speculate that reducing the influence of Golgi Tendon Organs disinhibits the active muscles, allowing a more forceful muscle action. Resistance training can gradually reduce or counteract these inhibitory impulses, allowing the muscle to achieve a greater force production independent of increases in muscle mass. Thus strength gains may be achieved by reducing neurological inhibition. This theory is attractive because it can at least partially explain superhuman feats of strength and strength gains in the absence of hypertrophy.

Increased Number of Motor Units Recruited

The functional unit of movement, the motor unit, consists of a single alpha motor neuron and the muscle fibres it innervates. The alpha motor neuron appears to determine whether the fibres are type I or type II. The alpha motor neuron in a type I motor unit has a smaller cell body (soma) and typically innervates a cluster of < 300 muscle fibres. In contrast, the alpha motor neuron in a type II motor unit has a larger cell body and innervates >300 muscle fibres. This difference in the size of motor units means type II motor units generate more force than type I motor units because type II motor units contain more muscle fibres than type I, as seen in the figure no. 3.

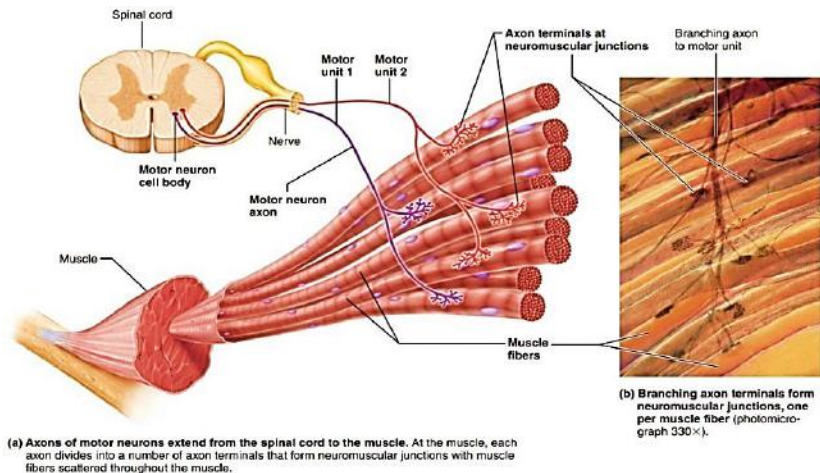


Fig 3

Motor Unit Recruitment describes adding motor units to increase muscle force. As muscle force requirements increase motor neurons are recruited with progressively larger axons. This exemplifies the size principle (an anatomic basis for the orderly recruitment of specific motor units to produce a smooth muscle action.) All of the motor units in a muscle don't fire at the same time. If they did, it would be virtually impossible to control muscle force output. When lifting a barbell, for example, specific muscles act to move the limb at a particular speed under a set rate of tension development. One can lift a relatively light weight at a number of speeds. But as weight increases, the speed options decrease accordingly. When lifting a pencil, one generates just enough force to lift the pencil regardless of how fast or slowly the arm moves.

There is a good evidence to support increased motor unit synchronization with resistance training. Motor units are generally recruited asynchronously; they are not all engaged at the same instant. They are controlled by a number of different neurons that can transmit either excitatory or inhibitory impulses. The motor unit is activated and its muscle fibres contract only when the incoming excitatory impulses exceed the inhibitory impulses and threshold is met or exceeded. Strength gains may result from changes in the connections between motor neurons located in the spinal cord, allowing motor units to act more synchronously. This increased synchronicity means that a greater number of motor units will be firing at any time, facilitating contraction and increasing muscles ability to generate force. Synchronization of motor unit activation could explain early strength gains.

Increased Rate Coding of Motor Units

Rate Coding is a term that describes the regulation of the nervous systems control over the rate at which alpha motor neurons discharge action potentials. In short, frequency of stimulation of the motor units called Rate Coding. It means within a single motor unit, each fibre can produce varying levels of force depending on the frequency at which it is stimulated. When a single, threshold stimulus is received, the motor unit is recruited and responds by producing a response called a simple twitch. Figure No 4. A twitch is the smallest amount of force that can be generated by a single motor unit. Immediately following the stimulus, there is a short latent phase that lasts a few milliseconds that likely allows for the excitation process. The second phase of the twitch is the contraction phase where cross-bridge attachment and sarcomere shortening creates tension in the muscle fibres. If no further stimulus is received, the relaxation phase of the twitch takes place as the cross bridges detach and tension is reduced back to resting levels.

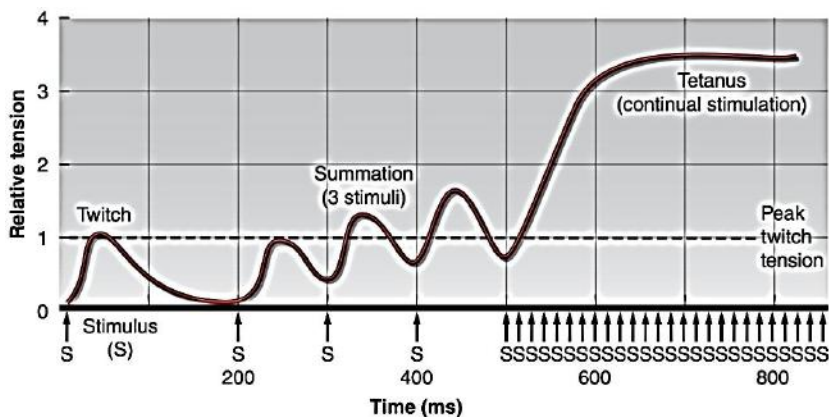


Fig 4

When a motor unit is stimulated via an alpha motor neuron, it receives a wave of successive action potentials. If the action potentials are received before the relaxation phase of the previous stimulus is completed, the tension produced by successive twitches builds on each other (a process called Summation). In other words, a series of three stimuli in rapid sequence, before complete relaxation from the first stimulus, can elicit an even greater increase in force or tension is termed as summation or incomplete tetanus. Figure No.4 when the twitches summate to the point of maximal force production, the muscle experiences fused (complete) tetanus. Figure No. 4 (a state of plateau in force production, where if the stimulatory rate to the neuromuscular junction increases further, no further increase in force will take place).

Therefore, Rate Coding describes the process by which the force production of a given motor unit varies from that of a twitch to that of tetanus by increasing the frequency of stimulation of a motor unit. Gradual increase in the rate of discharge of action potentials to an alpha motor neuron, results in linear increases in force production.

Maximal discharge rates differ across all motor units and depend on the force needs of the task being performed. In activities that require gradual increases in force, maximal discharge rates range from 20 to 60 pulses per second (pps), whereas maximal discharge rates can reach up to 100 pps during rapid, brief contractions. When motor units are activated at 80 to 100 pps, they typically reach maximal force production. When the motor units are stimulated at firing rates faster than a tetanic rate, no greater force is typically produced.

It is through the resistance training as the frequency of stimulation of a given motor unit increases, the muscle eventually reaches the state of tetanus, producing the absolute peak force or tension of the muscle fibre or motor unit. There is limited evidence that rate coding is increased with resistance training. Rapid movement or ballistic-type training appears to be particularly effective in stimulating increases in rate coding.

Increased Neural Drive

Neural drive refers to the combination of motor unit recruitment and rate coding of the units. It starts in the central nervous system and is spread to muscle fibres through peripheral nerves. Electromyography (EMG) using surface electrodes over the muscle measures the total activity within the nerve and muscle and therefore is a good measure of neural drive.

An alternate explanation for neutrally mediated strength gains is simply that more motor units are recruited to perform the given task, independent of whether these motor units act in unison. Such improvement in recruitment patterns could result from an increase in neural drive to the alpha motor neurons during maximal contraction. Trained muscles generate a given amount of sub maximal force with less EMG activity, suggesting a more efficient motor unit recruitment pattern. This increase in neural drive could increase the frequency of discharge (rate coding) of the motor units or reduce inhibitory impulses, allowing more motor units to be activated or to be activated at a higher frequency. Additionally, maximal neural drive appears to increase with resistance training.

Co Activation of Agonist and Antagonist Muscles

In addition to increasing motor unit recruitment or decreasing neurological inhibition, other neural factors can contribute to strength gains with resistance training. One of these is referred to as co activation of agonist and antagonist muscles (the agonists are primary movers and antagonists act to impede the agonists). For example, during forearm flexion the biceps is the agonist and triceps are antagonists. If two were contracting with equal force development, no movement would occur. Thus to maximize the force generated by an agonist, it is necessary to minimize the amount of co activation. Reduction in co activation could explain a portion of strength gains attributed to neural factors, but its contribution likely would be small.

Muscular Aspects of Strength Gains

Table 1

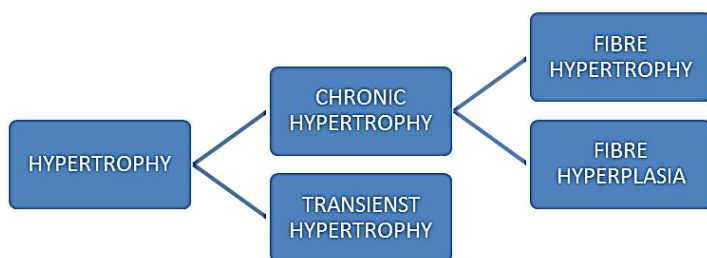
Psychologic disinhibition and learning factors greatly modify muscle strength the early phase of training. Ultimately, anatomic and physiological factors within the joint-muscle unit determine strength capacity. Table no. 1 lists the physiological and performance changes associated with the long-term resistance training. Most of these components adapt to training, with some modifications occurring within several weeks. Resistance training effects on muscle fibres generally relate to adaptations in the contractile structures. Muscular aspects of strength gains are below:	System/Variable	Response
	Muscle fibers	
	Number	Equivocal
	Size	Increase
	Type	Unknown
	Strength	Increase
	Capillary density	
	In bodybuilders	No change
	In power lifters	Decrease
	Mitochondria	
	Volume	Decrease
	Density	Decrease
	Twitch contraction time	Decrease
	Enzymes	
	Creatine phosphokinase	Increase
	Myokinase	Increase
	Enzymes of glycolysis	
	Phosphofructokinase	Increase
	Lactate dehydrogenase	No change
	Aerobic metabolism enzymes	
	Carbohydrate	Increase
	Triglyceride	Not known
	Basal metabolism	Increase
	Intramuscular fuel stores	
	Adenosine triphosphate	Increase
	Phosphocreatine	Increase
	Glycogen	Increase
	Triglycerides	Not known
	$\dot{V}O_{2max}$	
	Circuit resistance training	Increase
	Heavy resistance training	No change
	Connective tissue	
	Ligament strength	Increase
	Tendon strength	Increase
	Collagen content of muscle	No change
	Body composition	
	Percent body fat	Decrease
	Lean body mass	Increase
	Bone	
	Mineral content and density	Increase
	Cross-sectional area	No change
Modified from Fleck SJ, Kraemer WJ. Resistance training: physiological responses and adaptations (part 2 of 4). Phys Sportsmed 1988;16:108.		

Muscle Hypertrophy

Hypertrophy means enlargement or growth and muscle hypertrophy means muscle growth or enlargement of muscle. Size of muscle is directly proportional to the strength or force. Bigger the muscle greater will be the force and vice versa. Now the question arises how does a muscle size increase? An increase in muscle tension (force) with exercise training provides the primary stimulus to initiate the process of skeletal muscle growth or hypertrophy. Changes in muscle size become detectable after only three weeks of training, and the remodelling of muscle architecture precedes gains in muscle cross-sectional area. Two fundamental adaptations necessary for muscle hypertrophy (increased protein synthesis and satellite cell proliferation) are mobilized from the initial phases of resistance training.

Mechanical stress on components of the muscular system triggers signalling proteins to activate translation of messenger RNA and stimulate protein synthesis in excess of protein breakdown. The acceleration of protein synthesis particularly when combined with the effects of insulin and adequate amino acids availability, increases muscle size during resistance training.

As mentioned previously, improving muscular strength and power does not necessarily require fibre hypertrophy because important neurologic factors initially affect the expression of human strength. The later, slower occurring strength improvements generally coincide with noticeable alterations in a muscle's subcellular architecture. Overload training enlarges individual muscle fibres with subsequent muscle growth. The fast twitch fibres of weight lifters average about 45% larger than fibres of sedentary persons and endurance athletes. The hypertrophic process couples directly to increased mononuclear number and synthesis of cellular components, particularly protein filaments (actin and myosin) that constitute the contractile elements. Resistance exercise creates more efficient translation of mRNA that mediates stimulation of myofibrillar protein synthesis. Therefore, Muscle hypertrophy can be classified into following categories:



Transient Hypertrophy

Transient Hypertrophy is the increased muscle size that develops during and immediately following a single exercise bout. This mainly results from fluid accumulation (edema) in the interstitial and intracellular spaces of the muscle that comes from blood plasma. Transient hypertrophy, as name implies, lasts only for a short time. This fluid returns to the blood within hours after exercise.

Chronic Hypertrophy

Chronic Hypertrophy refers to the increase in muscle size that occurs with long term resistance training. This reflects actual structural changes in the muscle that can result from an increase in the size of an existing

individual muscle fibre (fibre hypertrophy), increase in the number of muscle fibres (fibre hyperplasia), or in both as shown in the figure no. 5. A number of studies have shown greater hypertrophy and strength resulting solely from eccentric contraction training as compared to the concentric contraction training or combined. Eccentric training helps in maximizing increases in muscle fibre cross-sectional area. Further, Higher-velocity eccentric training appears to result in greater hypertrophy and strength gains than slower-velocity training. These greater increases appear to be related to disruptions in the sarcomere Z-lines. This disruption was originally labelled muscle damage but is now thought to represent fibre protein remodelling. Thus training with only concentric actions could limit muscle hypertrophy and increase in muscle strength.

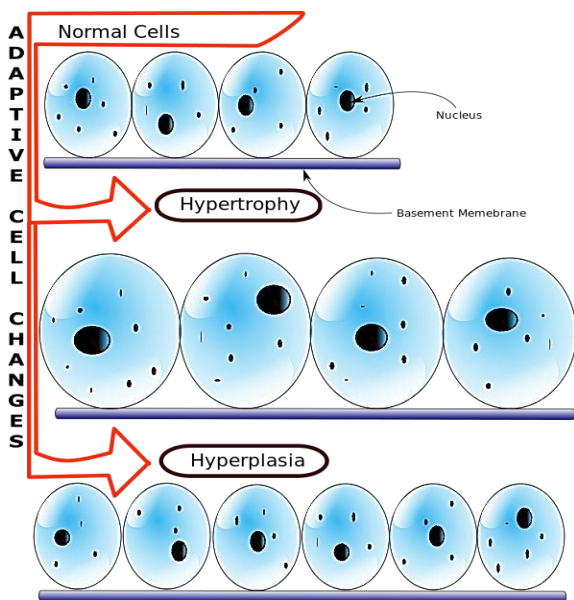


Fig 5

With the traditional training methods the minimum intensity for resistance training that leads to muscle hypertrophy is the intensity of 60% of 1RM or higher to achieve muscle size. More recently, however, research has suggested that low-intensity exercises at <50% of 1 RM can lead to gain muscle size equal to those seen at high intensities, provided that the training is performed to volitional muscle fatigue.

The following section examines the two postulated mechanisms for increasing muscle size with resistance training: fibre hypertrophy and fibre hyperplasia.

Fibre Hypertrophy

Recall fibre hypertrophy is increase in volume of each muscle fibre. As seen in the micrographs in figure no. 6, effective resistance training can significantly increase the cross-sectional area of muscle fibres such dramatic enlargement of muscle fibres from picture a to picture b does not occurs, however, in all cases of muscle hypertrophy.

Muscle fibre hypertrophy is probably caused by increased numbers of myofibrils and actin and myosin filaments, which would provide more cross-bridges for force production during maximal contraction. The size of existing myofibrils does not appear to change. The increase in muscle cross-sectional area results from adding new sarcomeres in parallel to each other.

Individual muscle fibre hypertrophy from resistance training appears to result from a net increase in muscle protein synthesis. The muscle's protein content is in a continual state of flux. Protein is always being synthesized and degraded. But the rates of these processes vary with demands placed on the body. During exercise, protein synthesis decreases, while protein degradation increases. After exercise, although protein degradation continues, protein synthesis increases, leading to a net synthesis of myofibrillar (myosin and actin) protein. A single bout of resistance exercise can elevate net protein synthesis for up to 24 h.

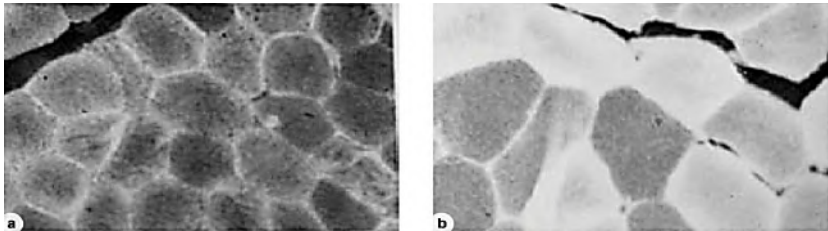


Fig 6

Fibre Hyperplasia

As we already discussed muscle hypertrophy means increase in volume of muscle either by increasing the volume of each existing muscle fibre (fibre hypertrophy) or increasing the number of new muscle fibres see figure no. 7 (fibre hyperplasia). Research on animals suggests that hyperplasia, an increase in the total number of fibres within a muscle, may also be a factor in the hypertrophy of whole muscles. Studies on cats provide fairly clear evidence that fibre splitting occurs with extremely heavy weight training.

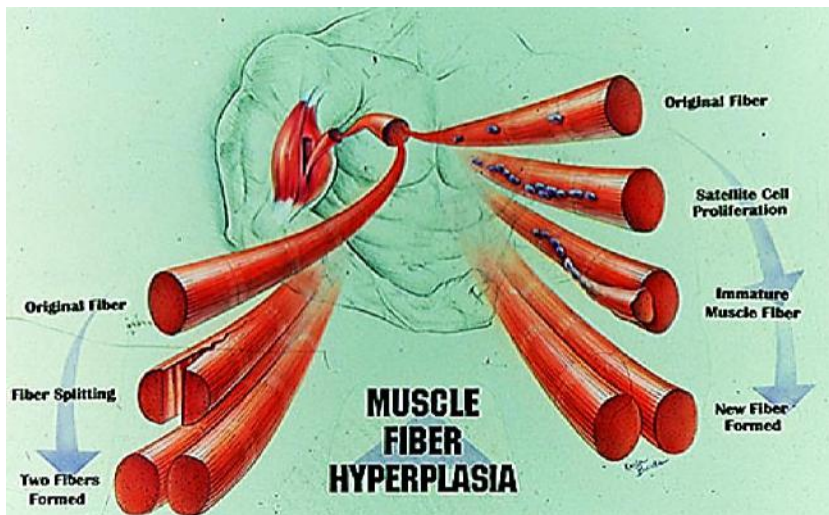


Fig 7

Subsequent studies, however, demonstrated that hypertrophy of selected muscles in chickens, rats, and mice resulting from chronic exercise overload were attributable solely to hypertrophy of existing fibres, not hyperplasia. In these studies, each fibre in the whole muscle was actually counted. These direct fibre counts revealed no change in fibre number.

This finding led the scientists who performed the initial cat experiments to conduct an additional resistance training study with cats. This time they used actual fibre counts to determine if total muscle hypertrophy resulted from hyperplasia or fibre hypertrophy. Following a resistance training programme of 101 weeks, the researchers found a 9% increase in the total number of muscle fibres, confirming that muscle fibre hyperplasia did occur.

Researchers are still uncertain about the roles played by hyperplasia and individual fibre hypertrophy in increasing human muscle size with resistance training. Most evidence indicates that individual fibre hypertrophy accounts for most whole-muscle hypertrophy. However, results from selected studies indicate that hyperplasia is possible in humans.

Only one longitudinal study demonstrated the possibility of hyperplasia in men who had previous recreational resistance training experience. Following 12 weeks of intensified resistance training, the muscle fibre number in the biceps brachii of several of the 12 subjects appeared to increase significantly. It appears from this study that hyperplasia can occur in humans but possibly only in certain subjects or under certain training conditions.

Process of Fibre Hyperplasia and Fibre Hypertrophy

Whether there is hypertrophy or hyperplasia both are depends on specialized cells, called satellite cells. Satellite cells are located on the outside of the muscle fibres between the basal lamina (basement membrane) and the plasma membrane (sarcolemma) of muscle fibres. When muscles undergo intense exercise (especially eccentric action or both eccentric and concentric combined actions), as from a resistance training bout, there is a trauma to the muscle fibres that is referred to as muscle injury or damage in scientific investigations. This disruption or stress to the muscle cell organelles stimulates satellite cells to migrate to the damaged region to possibly fuse existing muscle fibres or produce new fibres, or both. This proliferation of satellite cells to the damaged area can last for up to 48 hours after stressful event.

In other words, Satellite cells are myogenic stem cells which are involved in skeletal muscle regeneration. When you injure, stretch, or severely exercise a muscle fibre, satellite cells are activated. Satellite cells proliferate (i.e., undergo mitosis or cell division) and give rise to new myoblastic cells (i.e., immature cells), mentioned in the figure no. 8. These new myoblastic cells can either fuse with an existing muscle fibre causing that fibre to get bigger (i.e., hypertrophy) or these myoblastic cells can fuse with each other to form a new fibre (i.e., hyperplasia).

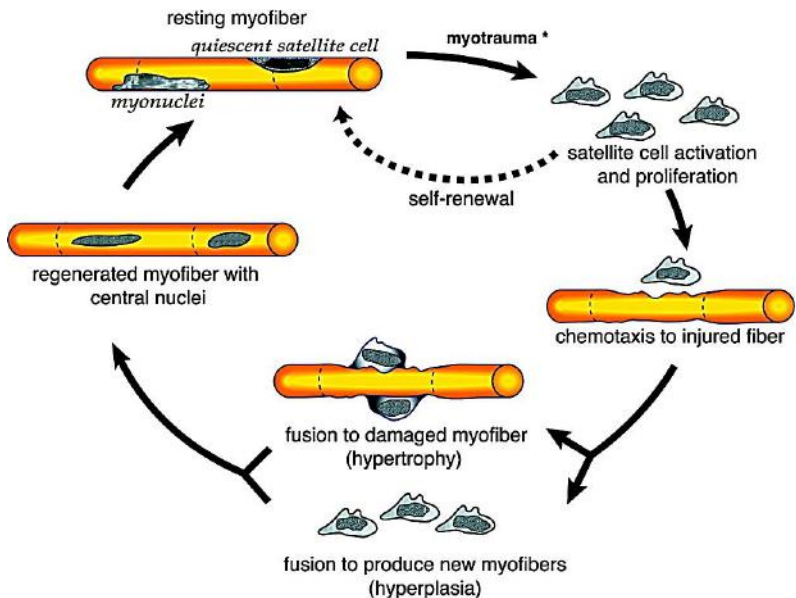


Fig 8

The satellite cells have only one nucleus and can replicate by dividing. As the satellite cells multiply, some remain as organelles on the muscle fibre where as the majority differentiate (the process cells undergo as they mature into normal cells) and fuse to muscle fibres to form new muscle protein strands or myofibrils) and/ or repair damaged fibres. Thus, muscle fibres myofibrils will increase in thickness and number. After fusion with muscle fibre, some satellite cells serve as a source of new nuclei to supplement the growing muscle fibre. With these additional nuclei, the muscle fibre can synthesize more proteins and create more contractile myofilaments, known as actin and myosin, in skeletal muscle cells.

From above discussion we can conclude that there are two primary mechanisms in which new muscle fibres (hyperplasia) can be formed. First, fibre splitting-in which large individual muscle fibres has the capacity to split into two or more daughter cells, each of which can develop into new muscle fibres. Second, activation of satellite cells by intense resistance training as mentioned earlier.

References

1. Antonio J, Gonyea WJ. Muscle fibre splitting in stretch enlarged avian muscle. *Med. Science and Sports Exercise*, 1994, 973-977.
2. Bischoff R. Interaction between satellite cells and skeletal muscle fibres. *Journal of Applied Physiology*. 1990; 109:94-952.
3. Duchateau J, Enoka RM. Neural adaptations with chronic activity patterns in able-bodied humans. *American Journal of Physical Medicine and Rehabilitation*. 2002; 81(11):517-527.
4. Gonyea WJ. Role of exercise in including increases in skeletal muscle fibre number. *Journal of Applied Physiology*. 1980; 48:421-426.
5. Gonyea WJ, Sale DG, Gonyea FB, Mikesky A. Exercise induced increases in muscle fibre number. *European Journal of Applied Physiology*. 1986; 55:137-141.
6. Giddings CJ, Gonyea WJ. Morphological observations supporting muscle fibre hyperplasia following weight-lifting exercise in cats. *Journal of Applied Physiology*/. 1992; 233:178-195.
7. Hawke TJ, Garry DJ. Myogenic satellite cells: physiology to molecular biology. *Journal of Applied Physiology*. 2001; 91:534-551.
8. John P, Bryant C, Comana F. *Exercise Physiology (Foundation of Exercise Science)* 1st Ed., Philadelphia. F.A. Davis Company, 2015.

9. Kenney WL, Wilmore JH, Costill DL. Physiology of Sport and Exercise. 6th Ed., Champaign, IL. Human Kinetics, 2015.
10. McCall GE, Byrnes WC, Dickinson A, Pattany PM, Fleck SJ. Muscle fibre hypertrophy, hyperplasia, and capillary density in college men after resistance training. *Journal of Applied Physiology*. 1996; 81:2004-2012.
11. McArdle WD, Katch FI, Katch VL. Exercise Physiology: Nutrition, Energy, and Human Performance. 7th Ed., Lippincott Williams & Wilkins, Wolters Kluwer, 2010.
12. Schoenfeld BJ. Is there a minimum intensity threshold for resistance training-induced hypertrophic adaptation? *Sports Medicine*. 2013; 43(12):1279-1288.
13. Shepstone TN, Tang JE, Dallaire S, Schuenke MD, Staron RS, Phillips SM. Short term high-vs. Low velocity isokinetic lengthening training results in greater hypertrophy of the elbow flexors in young men. *Journal of applied physiology*. 2005; 98:1768-1776.