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GYMNASTICS INJURIES

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Gymnastics Injuries

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Gymnastic Disciplines

Gymnastics is comprised of several competitive disciplines grouped under the umbrella of the Fédération Internationale de Gymnastique (FIG):

- Men's and Women's Artistic Gymnastics (apparatus) MAG-WAG (Olympic disciplines)
- Rhythmic Gymnastics – RG (Olympic discipline)
- Trampoline Gymnastics – TRA (Olympic discipline)
- Acrobatic Gymnastics – ACRO
- Tumbling Gymnastics – TUM
- Aerobic Gymnastics – AER

A number of accidents are common to these disciplines for the sole reason that their rules and characteristics are almost the same.

- acrobatic sequences
- positions of balance
- extreme articular positions
- a final element termed dismount, landing or exit
- choreographic and artistic elements
- practising gymnasts, often adolescents, during the biological growth period for certain disciplines

It is clear that many of the factors that trigger these accidents in other sports are present in gymnastics as well (neglectful physical, technical and psychological preparation, general hygiene, diet, etc.).



In gymnastics, we are mostly concerned with **technical factors**, in that all disciplines come with exceedingly rigorous technical requirements for elements demanding extreme precision; with **MENTAL FACTORS**, in that these exercises come with a high risk factor; the quality of **gymnastics equipment** is also essential to accident prevention: quality of apparatus, landing mats, floors. **TECHNICAL REQUIREMENTS** provided in the rules and code of points (a veritable bible which lists the value of each exercise) may play an important part in the onset of specific chronic pathologies or accidents.

Despite the fact that acrobatic elements are becoming increasingly spectacular and sensational, with rotations throughout, the number of accidents is relatively limited; certain accident statistics have shown that artistic gymnastics sits somewhere between 6th and 9th position in major sports (based on accident reports supplied by insurance companies).

Gymnastics generates a large variety of **chronic pathologies** which impact the peripheral and spinal **articulations**; these conditions worsen in cases affecting the growth plate, particularly in girls.

Chronic pathologies of this kind often contribute to the onset of acute pathology, just as acute pathologies can become chronic.

The characteristics of a given apparatus and the requirements of gymnastics disciplines lead to specific mechanical constraints; being familiar with these constraints is a step toward understanding the origins of acute and chronic pathologies.

THE TREATMENT of acute pathology and FIRST AID techniques require no further specificities in gymnastics than in other sports. However, it is important to keep in mind that in trampoline, giving first aid to a gymnast and his or her subsequent evacuation must be done on a fully unstable and pliable piece of fabric. A study is currently being conducted on possibly inserting a rigid surface under the fabric.

Accidents can also happen to coaches, notably when they are moving close to the gymnastic area during a particularly difficult exercise, such as under the horizontal bar, behind the uneven bars, during a tumbling sequence, etc. The most common accident is a full or partial rupture in the tendon of the brachial biceps.

MEN'S ARTISTIC GYMNASTICS

This discipline is comprised of 6 apparatus with different biomechanical constraints requiring dynamic and static effort, flexibility, momentum, strength, speed of execution and rhythm to varying degrees, while associating work in choreography.

Gymnasts are allowed to compete in one or more specialities, or at the 6 apparatus (All-around competition) as they wish, and depending on their physical and technical capabilities or a compulsory competition format. Specialised gymnasts who work at a single apparatus may present distinctive morphological characteristics specific to the requirements of a given apparatus, notably at the rings.

Chief **chronic pathologies** in men's artistic gymnasts are as follows:

- **LUMBAR SPINE**: lumbago often intensifies in cases of isthmus lysis and spondylolisthesis. (Predisposing apparatus: floor and vault, due to drop landings from considerable heights: horizontal bar).
- **SHOULDER**: pathologies most often occur in relation to exercises at the rings, less frequently at the horizontal bar.
- pathology of the labrum glenoidale predominately
- inflammation of the long tendon of the biceps and at the supraspinal level
- acromio-clavicular pathology
- **WRIST**: chronic pain in wrist (pommel horse), scaphoid pathology, stress fractures
- **KNEE**: chronic sprain of the LCL (floor, vault)
- **ANKLE**: chronic sprain (floor, vault)
- **HAND AND WRIST**: a gymnast's hands and wrists are generally dry and callous, often cracked and infected, but today and as a result of new protective measures, we rarely witness the deep and bleeding dermal lesions resulting from tears at the apparatus which were common in the past (horizontal bar, parallel bars).

Floor

Gymnasts must make use of the entire floor surface (12m x 12m). Routines are comprised mainly of series of acrobatic elements on the diagonal on as much of the floor space as possible. Tumbling runs, flips and a combination of the two with shows of balance, flexibility (splits, etc.) and strength (handstand position from scale position, etc.).

Acute pathologies in competition affect:

- knee (cruciate ligaments, lateral ligaments with or without accompanying meniscal pathology)
- ankle (lateral ligaments) – Achilles tendon (rupture), dislocation of the ankle, dislocation of the peroneal tendon
- much less common the cervical spine.

Pommel Horse

The entire exercise is performed on the wrists and hands as they make their way over the full surface of the horse in turn, pressing and pivoting on the two pommels; a gymnast performs straight, closed leg circular movements with steady rhythm, interrupted only by scissor elements.

The routine ends with a handstand dismount.

Acute pathologies in competition are very rare and affect nearly exclusively the wrist (acute episodes of pain, sprain).

Rings

This is the apparatus which requires the most muscular strength; it combines rapid, dynamic moves of momentum with static moves of strength and control (cross - Maltese cross scale position etc.) with a number of elements in a handstand position. Routines end with an acrobatic dismount.

Acute pathologies mainly include the shoulder: acute pathology of the labrum glenoidale, the infraspinatus and supraspinatus muscles, joint sprain and acromio-clavicular dislocation.

A poorly executed dismount may cause a sprain to the ankle or knee, and, in rare cases, cervical pathology.

Vault

New apparatus formerly known as the vaulting horse. After an accelerated run on the runway and a flic flac, a gymnast takes off from the springboard to the table in pre-flight (1st vault), briefly touching the table with his hands prior to executing an acrobatic element in flight (2nd vault), then landing on a mat in the same axis (exit). Vaults differ widely and feature saltos and twists in midair.

Acute pathologies in competition include, in the first vault, the thorax and cervical spine and, in landing, the knees, ankles (sprain to the inferior tibio-fibular articulation, dislocation, heel bone pathology) and the cervical spine.

Pathologies may vary and intensify in cases of uncontrolled dismounts in which a gymnast falls off the landing mat, i.e. from the podium to the floor.

Parallel Bars

Gymnasts perform acrobatic and momentum elements with changes in direction, smoothly and dynamically executed both over and under the bars in longitudinal and lateral positions and featuring elements of strength, balance and handstands.

Routines end with an acrobatic landing.

Acute pathologies in competition include:

- frequent sprains and dislocations to the fingers
- sprains to the elbows and wrists
- erosion of the skin on the inner part of the arm from rubbing on the bars if arms have not been properly protected
- Occasionally, ankle or knee sprain due to uncontrolled fall.

Horizontal Bar

Routines are composed of giant forward and backward swings with changes in direction, in-bar skills with pirouettes, kips, release moves with acrobatic elements, saltos, twists and combinations.

Exercises end with acrobatic, stuck landing dismounts from a height of roughly 5 metres.

Acute pathologies in competition primarily include falls due to failure to re-grasp, dismount landings (knee, dislocation or sprain of ankle, pathology of the cervical spine) or direct falls from the bar (head and thorax).

WOMEN'S ARTISTIC GYMNASTICS

This discipline includes four apparatus with an assortment of biomechanical constraints which require varying degrees of dynamic and static effort, flexibility, balance, rhythm and a certain level of choreographic creativity. Gymnasts may compete on 1,2,3 or 4 apparatus depending on competition formats.

Chronic pathologies in women's artistic gymnastics generally compound due to the fact that gymnasts have not always completed osteo-articular growth, notably of the:

- Lumbosacral spine (lumbago – especially if there is a pre-existing lysis or listhesis pathology – frequently osteochondrosis)
- Ankle, foot, knee, hip, (osteochondrosis)
- Wrist, elbow, (osteochondrosis)
- Pelvis: tearing of the iliac and ischial epicondyle (overstretching)
- Frequent bruising to the vertebral spine (roll on beam) and to the anterior superior iliac spine (repeated blows to the pelvis at the uneven bars)

Vault

After a 25 metre running start max and a flic flac the gymnast takes off from the springboard to the table (1st vault), pushing off with his hands to execute an acrobatic figure (2nd vault) and a controlled landing in line with the table, springboard and runway.

Acute pathologies in competition :

Following the pre-flight to the table, a poorly executed backward salto at entry (1st vault) may result in a direct impact with the frontal part of the table, notably traumatism to the cervical or thoracic spine; after pushing off with the hands (2nd vault) the main acrobatic sequence (in the case of forward or backward salto with or without sagittal rotation) landing may result in trauma to the ankles (sprain - dislocation, fracture), knees (cruciate ligaments, meniscus, lateral ligaments), feet (plantar aponeurosis, calcaneus fractures) and the cervical spine.

Trauma injuries intensify when vaults are unbalanced and gymnasts fall outside of the zone protected by a landing mat.

Certain articular pathologies may affect the growth plates of growing gymnasts (fracture and epiphyseal dislocation).

Uneven Bars

2.20 metres high, the bars are made of wood and the distance between them may vary; the gymnast executes giant forward and backward swings, release and re-grasp moves, changes in direction and acrobatic sequences **on** or **between** the bars. Routines end with an acrobatic dismount.

Acute pathologies in competition :

Falls in front of, behind or between the bars are often the results of an unbalanced position, or at the time of acrobatic release. Poorly executed dismounts may cause pathologies to the ankle (sprain, dislocation), knees (sprain), and less frequently to the elbows (sprain, dislocation) and cervical spine.

Direct hits to the bars may result in haematomas.

Certain articular pathologies may affect the growth plates of growing gymnasts (fracture and epiphyseal dislocation).

Balance Beam

Gymnasts perform on beams that are 5 metres long and 10 cm wide. Routines include alternating leaps (saltos, turns) and balance sequences with choreography.

Acute pathologies in competition :

Acrobatic sequences on the beam may result in falls and direct blows to the beam with subsequent haematomas, muscular or osseous contusions, notably tibia, pelvic and adductor (fall astride the beam).

Acrobatic mounts and dismounts may result in trauma to the lower limbs and the cervical spine.

Certain articular pathologies may affect the growth plates of growing gymnasts (fracture and epiphyseal dislocation).

Women's Floor Exercises

Women's exercises differ from those of men in that they feature musical accompaniment: a gymnast performs an artistic sequence of acrobatic and balance movements lasting 1 minute and 30 seconds on a 12m x 12m floor; acrobatics and choreography are the basis of floor exercises for women.

The most frequent acute pathologies affect the lower limbs (lateral ligaments of the knees and ankles, and of the Achilles tendon, with partial or total rupture), less frequently the elbow (dislocation) and the cervical spine.

Acute tearing of the ischial epicondyle in adolescents is rare; the pathology results from repeated overstretching and affects the ischial crural region.

Certain articular pathologies may affect the growth plates of growing gymnasts (fracture and epiphyseal dislocation).

Acrobatic Gymnastics (ACRO)

ACRO is a sporting activity in which collective and individual acrobatic elements are performed, combined through choreographic sequences, without apparatus, and with five types of events:

Men's pairs– women's pairs – mixed pairs – groups (women) groups of four partners (men).

Acrobatics include base (the gymnast which carries or supports the others), top and flyer positions (the acrobat).

A 2'30" routine offers static elements (static pyramids, strength, balance) and dynamic elements (vault, salto, dynamic pyramids, etc.), combined exercises and numerous displays of balance.

For this discipline alone, **morphology differs** in relation to the unique positions of the base or flyer, whose performances vary in **physical demands**, causing a **wide range of subsequent pathologies**.

Pathologies tend to be acute for flyers and chronic for bases.

Chronic pathologies are mainly lumbar spinal (lumbago, crural sciatica). Also seen are tendinopathies at the wrists and elbows.

Acute pathologies in competition arise primarily from acrobatic elements and falls for tops or flyers, some of whom reach great heights (i.e. 4th man at the top of the pyramid); these include knee sprains, dislocations of the ankle, sprains to the forefoot, heel bone pathology, and traumatism to the cervical spine in some cases. For the base gymnast, we have muscular pathologies to the upper articular limbs and lumbo-sacral spine (episode of acute lumbago).

Tumbling (TUM)

TUM is practised on an extremely soft 25 metre long dynamic track.

Following a running start, a gymnast performs 8 acrobatic elements without change in rhythm; hand or feet to track contact only is allowed. An exercise closes with an exit on the landing mat.

The most frequent **chronic pathologies** involve the Achilles tendon (chronic tendonitis with microtears), posterior leg muscles and in certain cases, the knee, wrist and lumbar spine.

The most typical acute pathologies in competition include **full or partial tearing of the Achilles tendon, and pathologies resulting from the stretching or partial tearing of the posterior leg muscle or Gastrocnemius** (also known as tennis leg).

The track being rather narrow, a gymnast might lose his balance, walk on the edge and **exit the track**, which may result in a variety of osteoarticular pathologies, particularly to the lower limbs (sprain, dislocation of the ankle) and the feet (heel bone pathology, rupture of the plantar aponeurosis, sprain to the forefoot).

A poorly executed final exit on the mat may bring on a variety of articular pathologies mainly to the **lower limbs**, more rarely to the **cervical spine**.

Aerobics (AER)

An exercise lasts about 2 minutes, involves choreography and is really an anaerobic activity; it combines difficulties featuring dynamic and static strength, jumps and leaps, displays of balance and flexibility; rhythm and the quality of choreography are equally taken into consideration in judging.

Competitions are divided into categories for men and women, with exercises for individuals, pairs, trios and groups.

Chronic pathologies include pain in the wrists, often without a precise diagnosis (painful, swollen wrists) and less frequently in the elbow (epicondylitis, epitrochleitis) and the lumbo-sacral spine (lumbago).

Acute pathologies in competition :

Acute osteoarticular and muscular pathologies are rather rare; they primarily include sprain to the wrist, and in the case of adolescents, fractures to the growth plate. Also observed is a sprain type pathology to the ankles and muscular pathology to the lower limbs.

The practise of aerobic gymnastics requires intensive cardio-vascular training, and in cases where a gymnast presents insufficient physical preparation, or where an underlying cardiac pathology has been overlooked, symptoms of varying degree may appear from a feeling of general discomfort to a cardiovascular emergency (rarely the case in high level sport practise where pathologies are generally detected early on).

Trampoline Gymnastics (TRA)

Individual gymnasts or pairs (synchronised trampoline) perform on a 4m x 2m piece of woven fabric fitted into a 5m x 3m frame by steel springs. 10 different acrobatic elements, after each rebound.

The most frequent **chronic pathologies** involve the lumbo-sacral spine (lumbago - sciatica), the ankles and knees (chronic sprains).

Acute pathology in competition:

Trampoline gymnastics gives rise to certain accidents which are often very serious and the large majority of which could be avoided through better technical stringency and a more progressive learning process to foster the mastery of certain elements.

The deceptive ease of rebound on a trampoline sometimes causes beginners to take thoughtless risks without a sufficient technical base. Exiting the fabric or landing on the frame supporting the fabric generates a variety of osteoarticular pathologies, notably to the ankle and the foot (sprain, fracture); an accident of this kind is sometimes followed by a fall to the floor, which also causes a variety of pathologies mainly to the ankles and legs.

Stuck or hyper-lordosis landing may bring on **episodes of acute lumbago**.

The most feared accident in TRA is landing in hyperflexion, or more rarely still, in hyperextension of the head on the trampoline, which can fracture or dislocate the cervical spine and have very serious neurological consequences.

It is important to note that performing first aid on and evacuating an injured gymnast is problematic, especially with injuries to the spine. The fabric is unstable, and for this reason it would be wise to construct a rigid surface that could be slid under the gymnast or placed under the fabric on legs of some kind.

Rhythmic Gymnastics (RG)

The discipline is practised with individual gymnasts or in groups of 5 gymnasts.

Gymnasts use a different apparatus for each exercise (2 for certain group exercises). These are: rope, hoop, clubs, ribbon and ball.

A gymnast handles an apparatus primarily with her bare hands, but also with her feet and body.

She performs fast and varied movements during throws (leaps, rolls on floor, etc.). Certain static positions require full use of the peripheral articulations, particularly the spinal articulations.

Choreography is highly important in this discipline.

Chronic pathologies are rather frequent.

They primarily affect the lumbo-sacral spine (lumbago, lumbo-sciatic syndrome), the pelvis (tearing or chronic inflammation of the anterior superior iliac spine and of the ischial epicondyle, especially in growing young girls), ankles (chronic sprain) and feet (chronic sprain and fatigue fracture).

Accidents in competition are very rare. Pathologies affect the ankles, knees (sprain), posterior leg muscles, in some cases the feet (fall of the clubs may cause a fracture to the toe or, on rare occasion, pathology of the plantar aponeurosis).

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