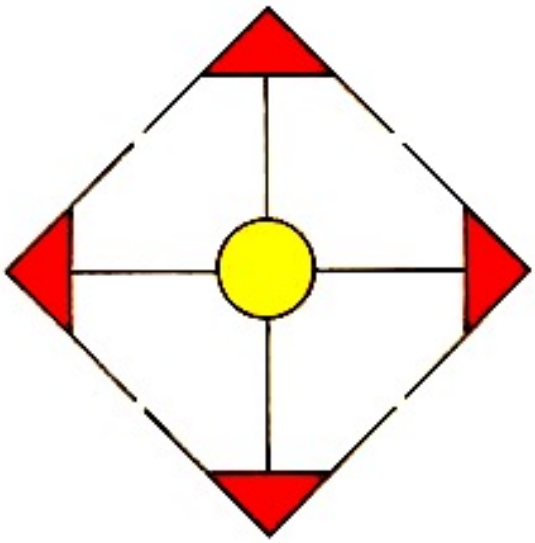
THE MECHANISMS OF THE ORGANISM



DANIEL McGOWAN

THE MECHANISMS OF THE ORGANISM

AN IN-DEPTH ANATOMICAL ANALYSIS
OF CERTAIN ELEMENTS OF THE BODY
THAT COMBINE TO FORM AN INTEGRAL WHOLE

DANIEL McGOWAN

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INTRODUCTION

The title of this book, "THE MECHANISMS OF THE ORGANISM," has been chosen because it is a phrase often used by Frederick Matthias Alexander in the books he wrote during his lifetime:-

MAN'S SUPREME INHERITANCE
CONSTRUCTIVE CONSCIOUS CONTROL
THE USE OF THE SELF
THE UNIVERSAL CONSTANT IN LIVING

I like the phrase because it has an olde worlde feel about it indicative of his time, 1869-1955, and has a much livelier ring to it than the stark "body-mechanics." It also indicates that in his work he dealt with people as living organisms and not dead bodies that have been dissected to discover the inner workings of the human being. Dissection will tell you a great deal about the map of the body, but will not reveal how the mechanisms of the organism function as an integral whole, the word "integral" meaning, "necessary to make a whole complete." Alexander discovered the missing link that is "necessary to make a whole complete," and that link is the co-ordinated, dynamic, consciously controlled use of the mind and body. I have written mind and body because his work is primarily about educating the mind to change the body in a way that will allow it to move in a graceful, dynamic, and mechanically appropriate manner that does not violate the laws of movement of the body. In his long study he realised he had thought himself into uncoordinated, harmful use of the self and if he could do that, he could think himself back out of it again.

The discoveries he made about the use of the self are now known all over the world as the "Alexander Technique." Unfortunately, this title does not convey any sense of his "method" as a way of being, a means of learning how to become a consciously controlled human being who is no longer the slave of subconscious, harmful, psychophysical habits of thinking and doing. There is no need for me to give a detailed account here of how he did this, because he explains it fully in his book, "THE USE OF THE SELF."

One of the most significant of his findings was the relationship of the head to the neck, and the head and neck to the torso. He discovered in himself that this relationship was badly misused and out of alignment. It took him many years of meticulous study to re-align and coordinate this relationship and restore its integrity. In doing so he found that, as a result of this dynamic change, the rest of the body was positively affected: the relationship of the spine to the pelvis, the lower leg to the upper, the increased power of the ribcage, thus improving the mechanisms of breathing etc. From this he found that the head-neck-torso relationship is the primary control of the human body.

Before beginning my study in the mid 1970s' of Alexander's constructive conscious control, I had a background in structural and mechanical engineering. I was, therefore, from the start of my lessons, fascinated by the body as a mechanism. I studied many anatomy books and soon realised that to read and understand the diagrams was an art in itself: an art made more difficult because so many of the illustrations lacked clarity, and there were numerous inconsistencies, sometimes within one book in itself, and sometimes one book and another. None of the books dealt with the mechanisms of the organism as a whole as expounded by F.M Alexander.

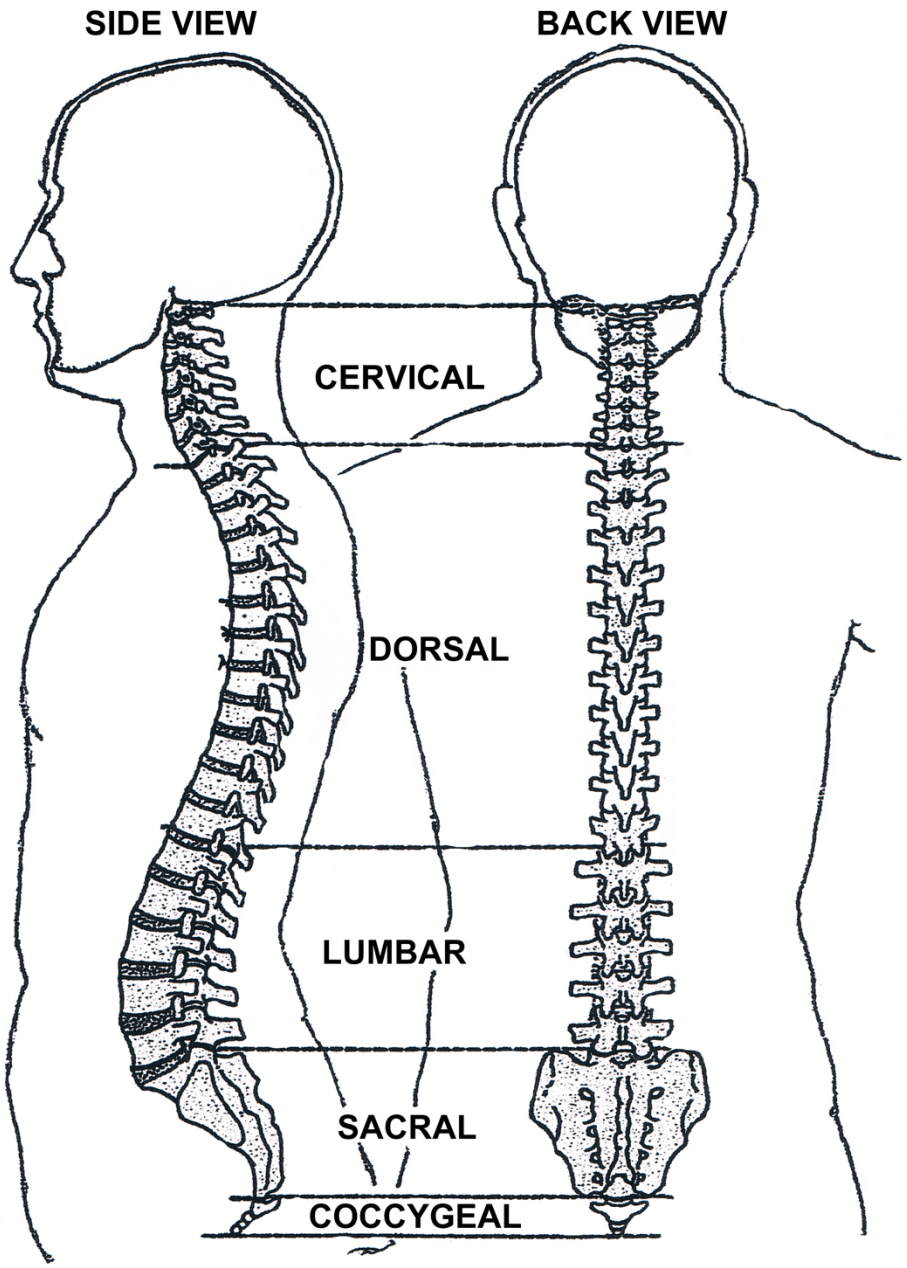
In the year 2000, I published a book entitled, "GOING MENTAL," which was a mixture of the theory of mentalism and the functioning of the mechanisms of the organism. I produced anatomical illustrations of the body showing its mechanical functioning as a whole in standing. The illustrations in "THE MECHANISMS OF THE ORGANISM" are a supplement to the contents of "GOING MENTAL," and the two books combined portray my knowledge so far of the body as an integral whole.

Daniel McGowan March, 2016.

All statements in this book about the mechanisms of the organism are made from ***the fundamental requirement of the spine being at its optimal length, and therefore, functioning at its greatest efficiency as the central column of support for the suspension system of the torso, as well as the stable base from which each leg is alternately and momentarily suspended in walking and running.***

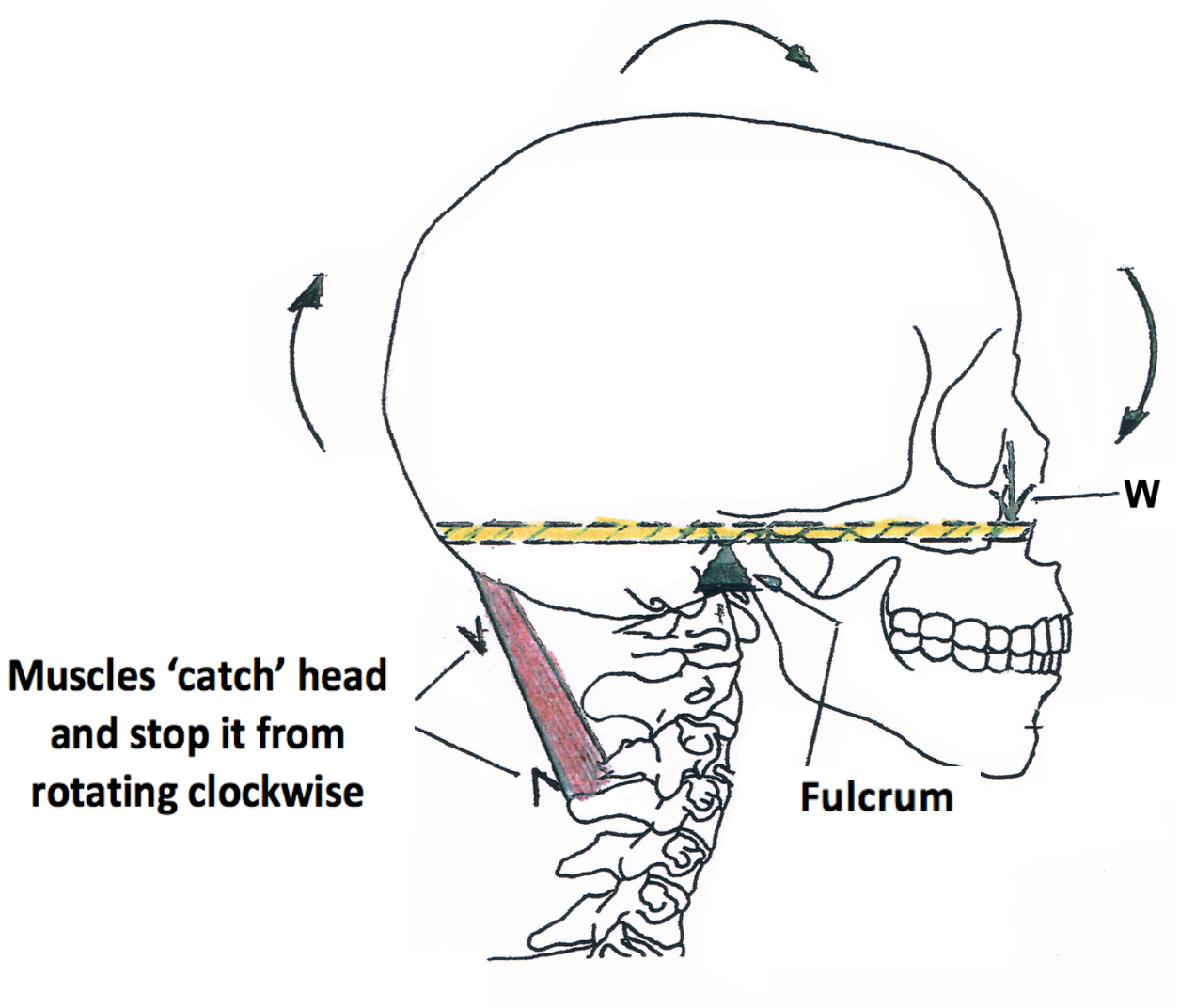
Many people are going through life with warped spines - excessive lordosis and scoliosis in particular - that cause a shortening of stature, which in turn produces a multitude of afflictions and dis-ease in the body. This habitual distorting of the spine - especially in the lower lumbar region - is probably the most common reason for illness in the world.

When it functions at its optimal length, the three natural curves in the spine - cervical, dorsal (or thoracic), and lumbar - make it ten times stronger than it would be if it was straight.



THE SPINE

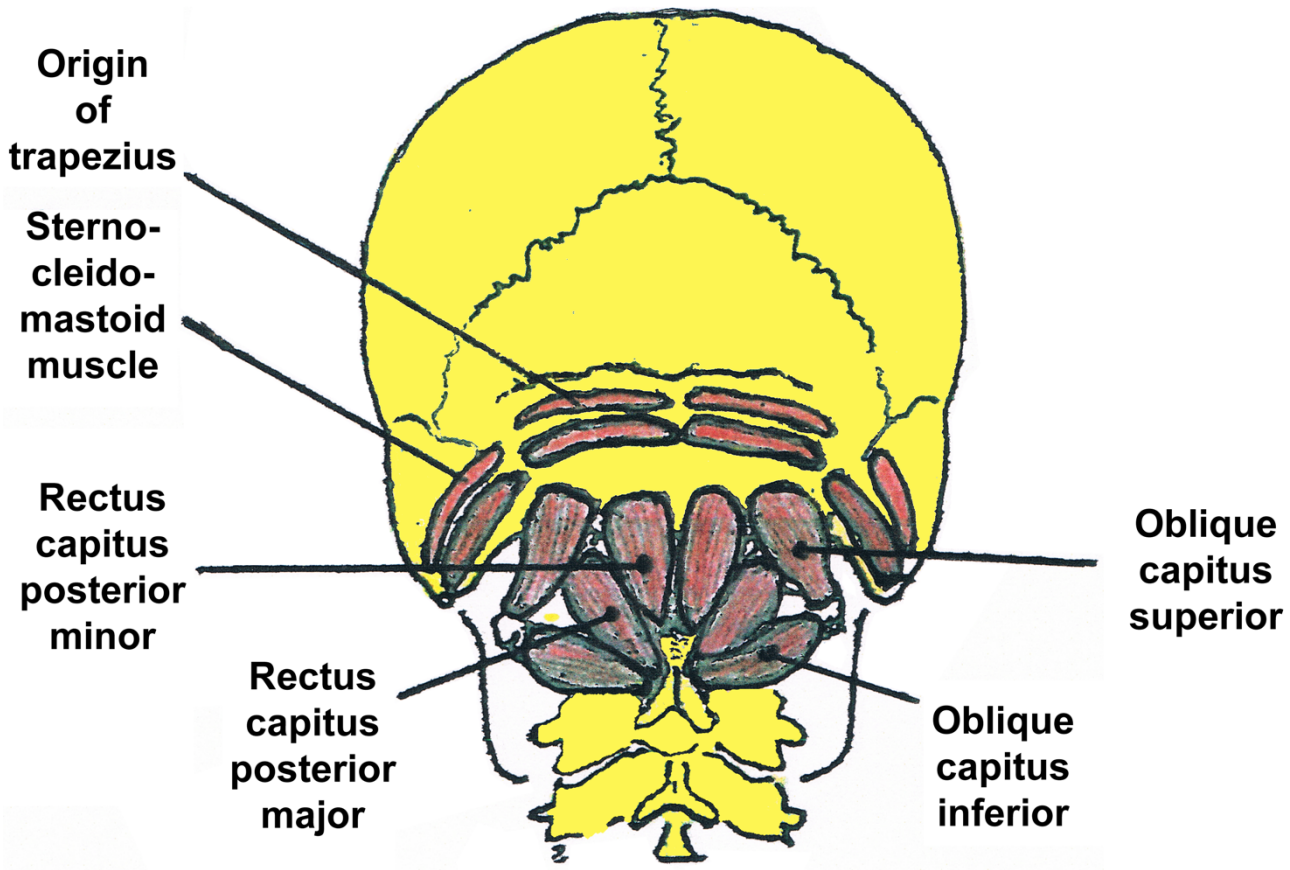
THE HEAD - A FIRST CLASS LEVER



The muscle shown here is purely representative of the several sub-occipital muscles that connect the skull to the top two vertebrae - atlas and axis - of the cervical spine. Refer to page 6 for the connections of these muscles.

Contrary to popular belief, the head is not balanced on top of the atlas - the top vertebra of the spine - but is in a constant state of imbalance that makes it tend to rotate clockwise looking from the right side. This is because most of the weight of the head - represented by the arrow **W -** is forward of the fulcrum, the atlas, represented by the black triangle. The head can be represented as a simple beam like a seesaw, indicated by the yellow hatched part. This constant clockwise rotation around the fulcrum is resisted by the muscles at the back of the neck that connect to the suboccipital region of the head. If the neck muscles are functioning freely, they will contract just enough to catch the head and stop it from rotating too far, thus preventing it from dropping too far at the front. This constant work by the muscles will be done with minimum effort, and will keep them toned up. If this drop-catch situation is consciously maintained, it will impart a dynamic lengthening influence to the whole spine. If, however, through habitual misuse of the body, the muscles become permanently shortened and stiffened, they will keep the head pulled back in this harmful situation and distort and shorten the cervical spine, thus canceling out the optimal dynamic drop-catch situation that the head should naturally have with the neck. This rotating back of the head is a harmful habit done by the vast majority of the human race.

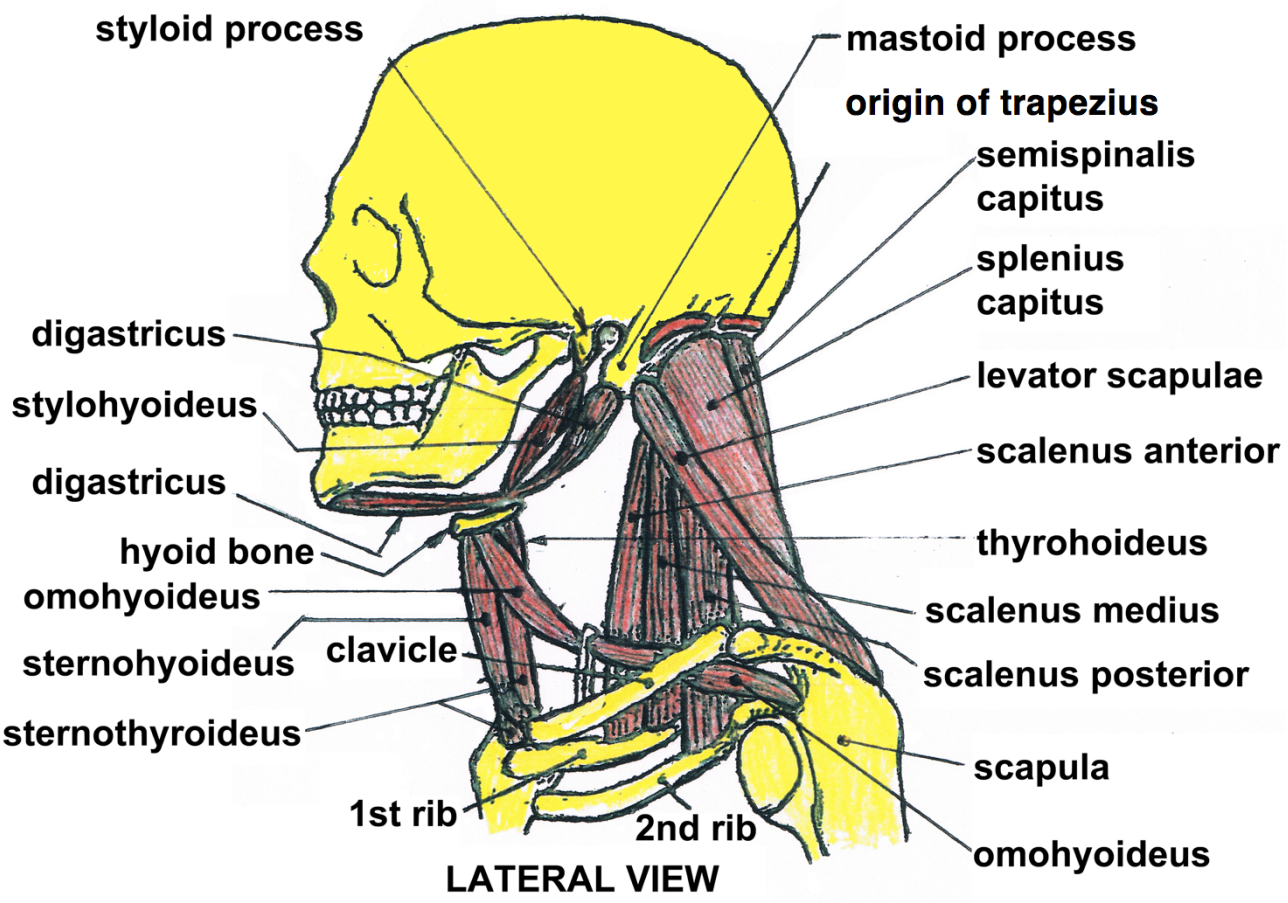
THE HEAD - A FIRST CLASS LEVER CONTD.



This rear view shows the sub-occipital muscles, such as the rectus capitus posterior major, that connect the head to the top two vertebrae of the spine - the atlas and axis. The sub-occipital muscles are the fine tuners that immediately react to stop the head from rotating and dropping forward. This is the repeated drop-catch adjustment that occurs with minimum effort when the neck muscles are free to allow it. It is the prerequisite for good use of the body mechanism as an integral whole. If the larger muscles above the sub-occipitals such as the trapezius - the most superficial muscle - become stiff and shortened through habitual misuse of the body, they will nullify the fine tuning of the drop-catch mechanism. Refer to page 4.

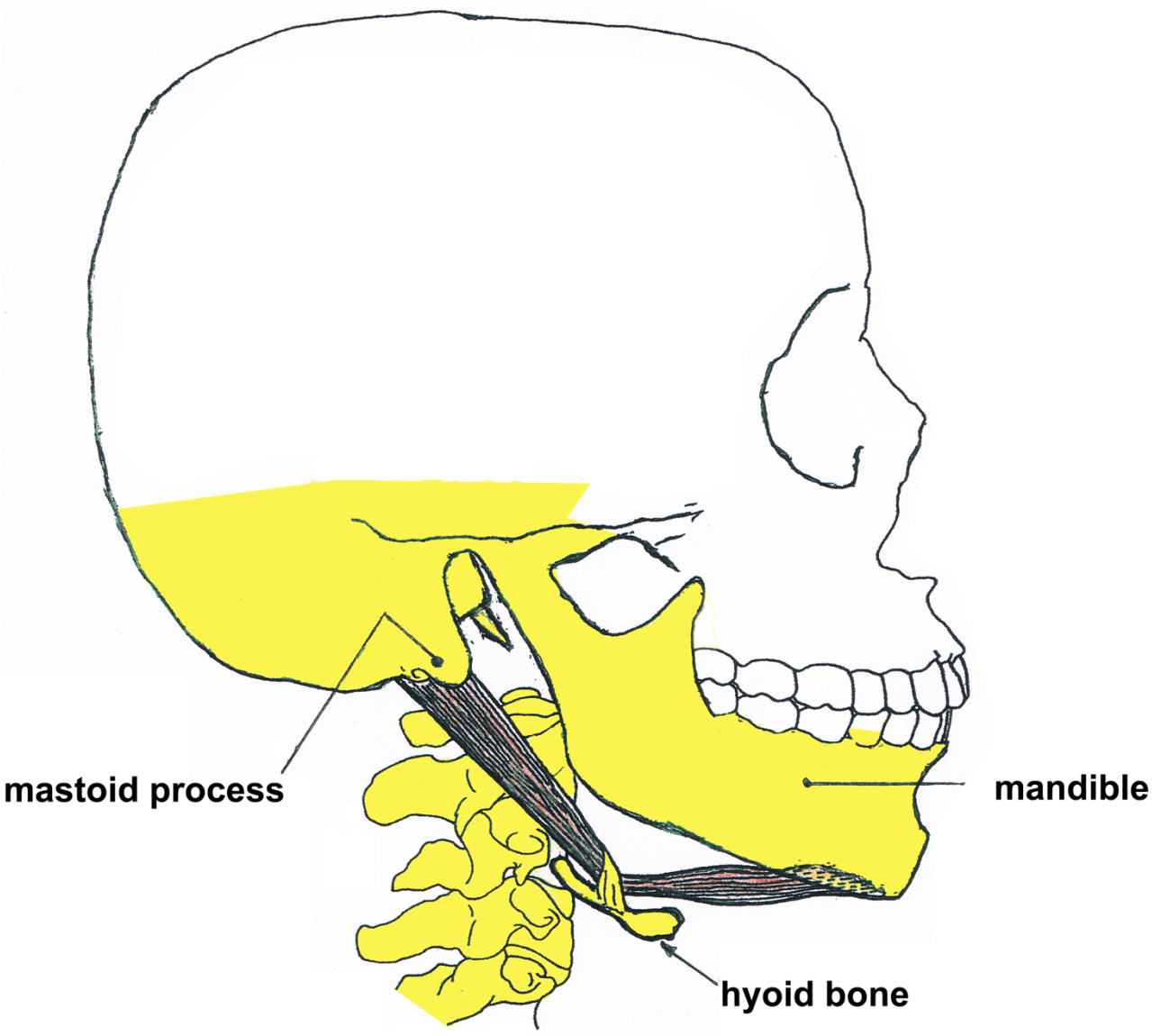
SUSPENSION SYSTEM OF THE RIBCAGE AND VARIOUS OTHER PARTS LOCATED IN THE NECK

In this section we will consider how the neck muscles suspend the ribcage, the trachea, the oesophagus, etc. from the head and the cervical spine. We will start at the neck and work our way down to the ribcage.



The muscles shown in this diagram are illustrated in detail in the following pages.

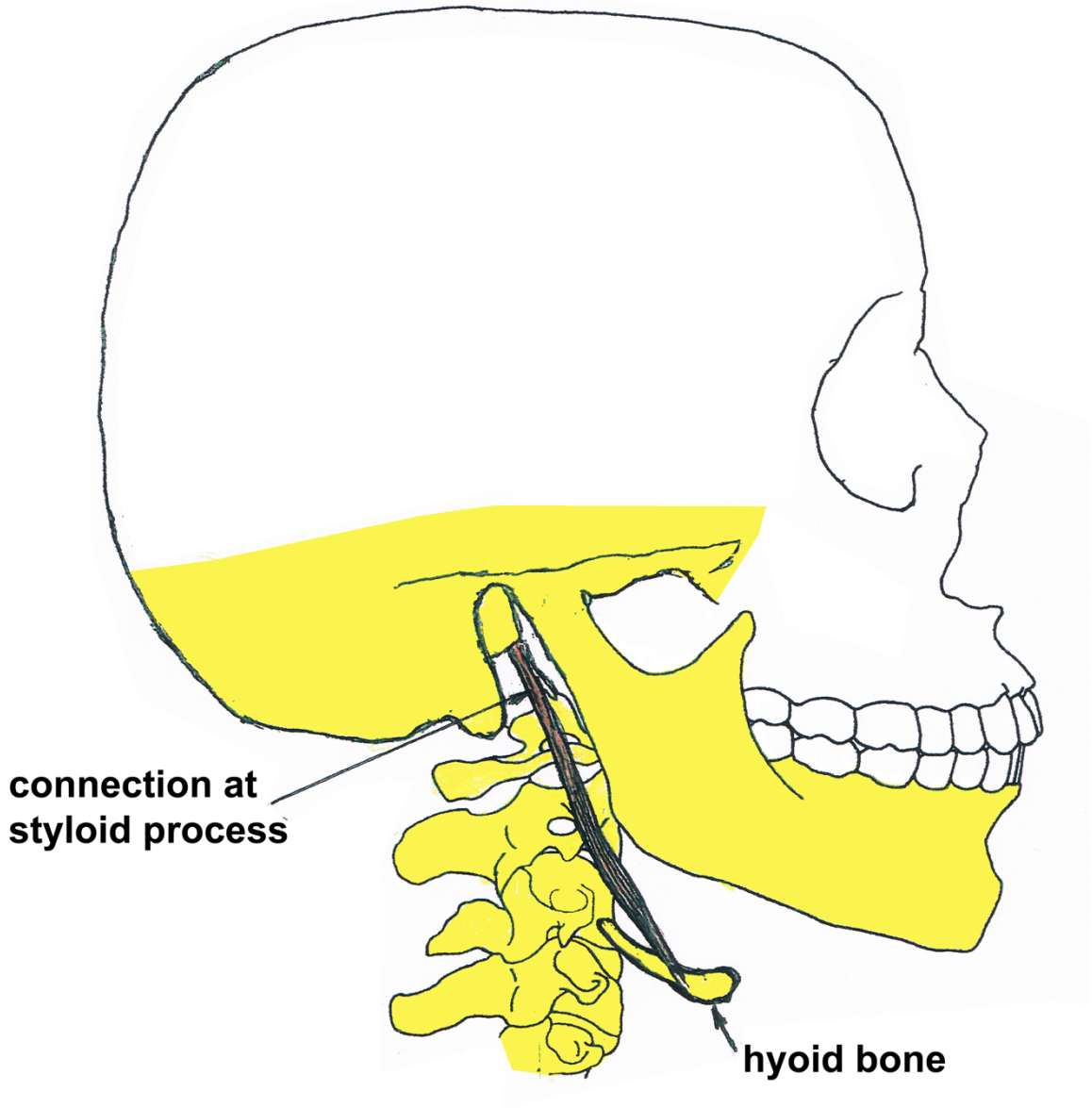
DIGASTRICUS



The mastoid-hyoid length of this muscle suspends the hyoid bone from the mastoid process of the head. The hyoid bone forms a “sling” around the trachea and the oesophagus, thus suspending them from the mastoid and stylus processes of the head.

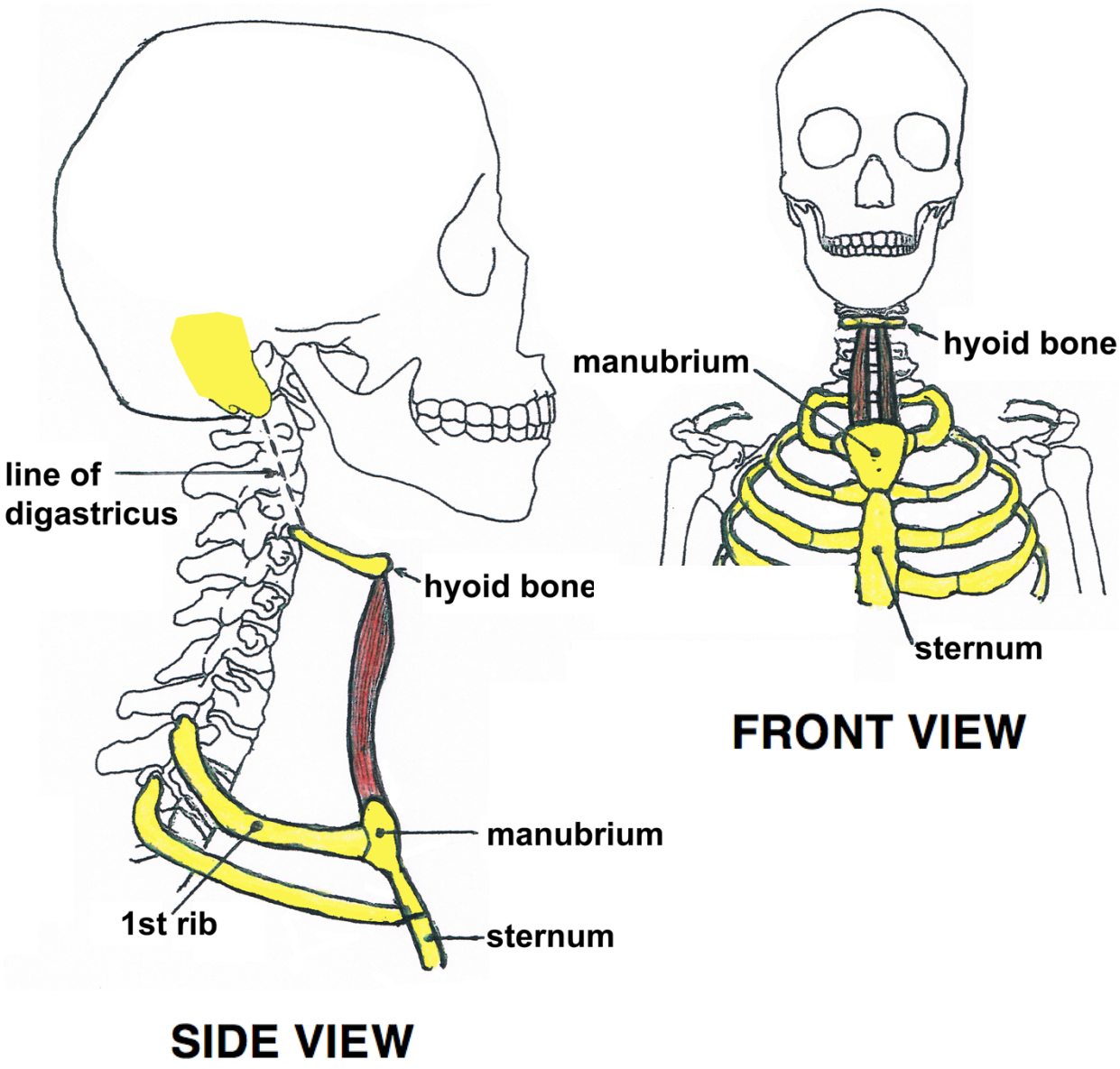
The hyoid-mandible length assists in opening the jaw.

STYLOHYOIDEUS



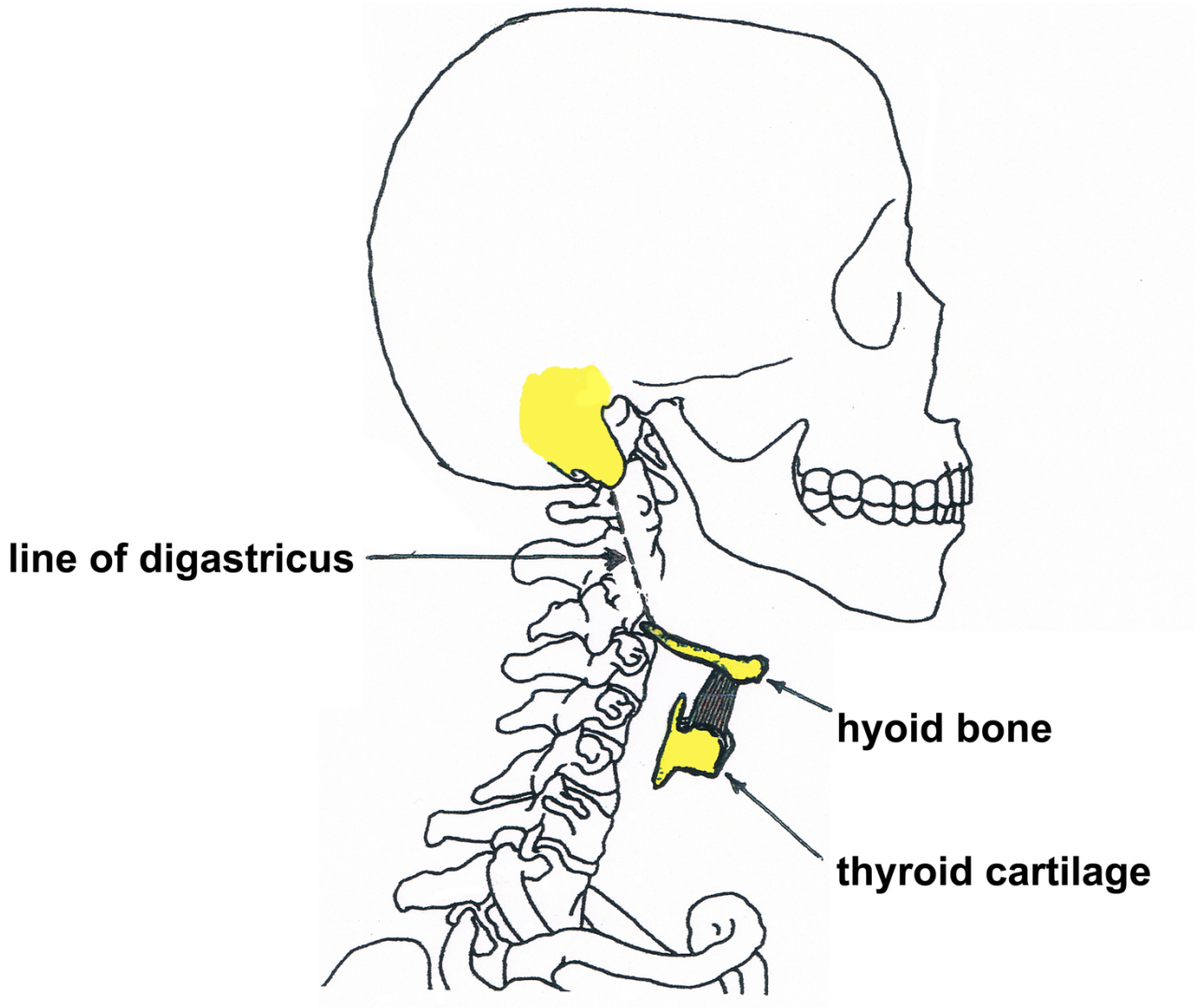
This muscle works closely with the digastricus, but connects to the styloid process of the head.

STERNOHYOIDEUS



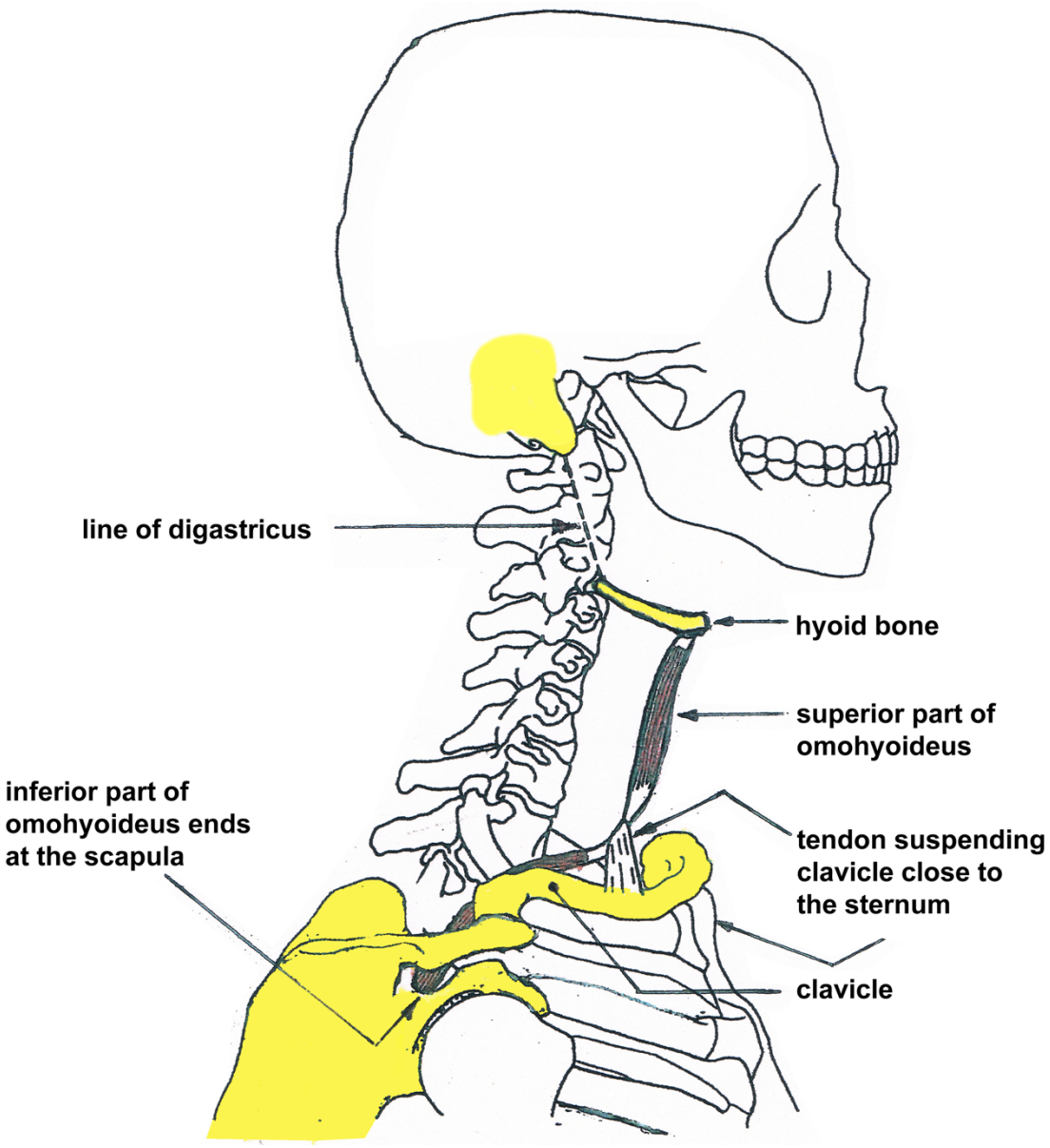
To illustrate this muscle on its own makes it look as if it supporting the hyoid bone from below. It must, however, be read in conjunction with the DIGASTRICUS muscle on page 7. Viewing the two muscles together makes it clear that they both suspend the manubrium of the sternum from the mastoid process of the head via the hyoid bone. The same situation occurs if the STERNOHYIODUS is read in conjunction with the STYLOHYOIDUS on page 8, except this time the suspension system functions from the styloid process of the skull. The STERNOHYOIDEUS plays a role in breathing because it helps to draw the sternum of the ribcage up in inspiration.

THYROHYOIDEUS



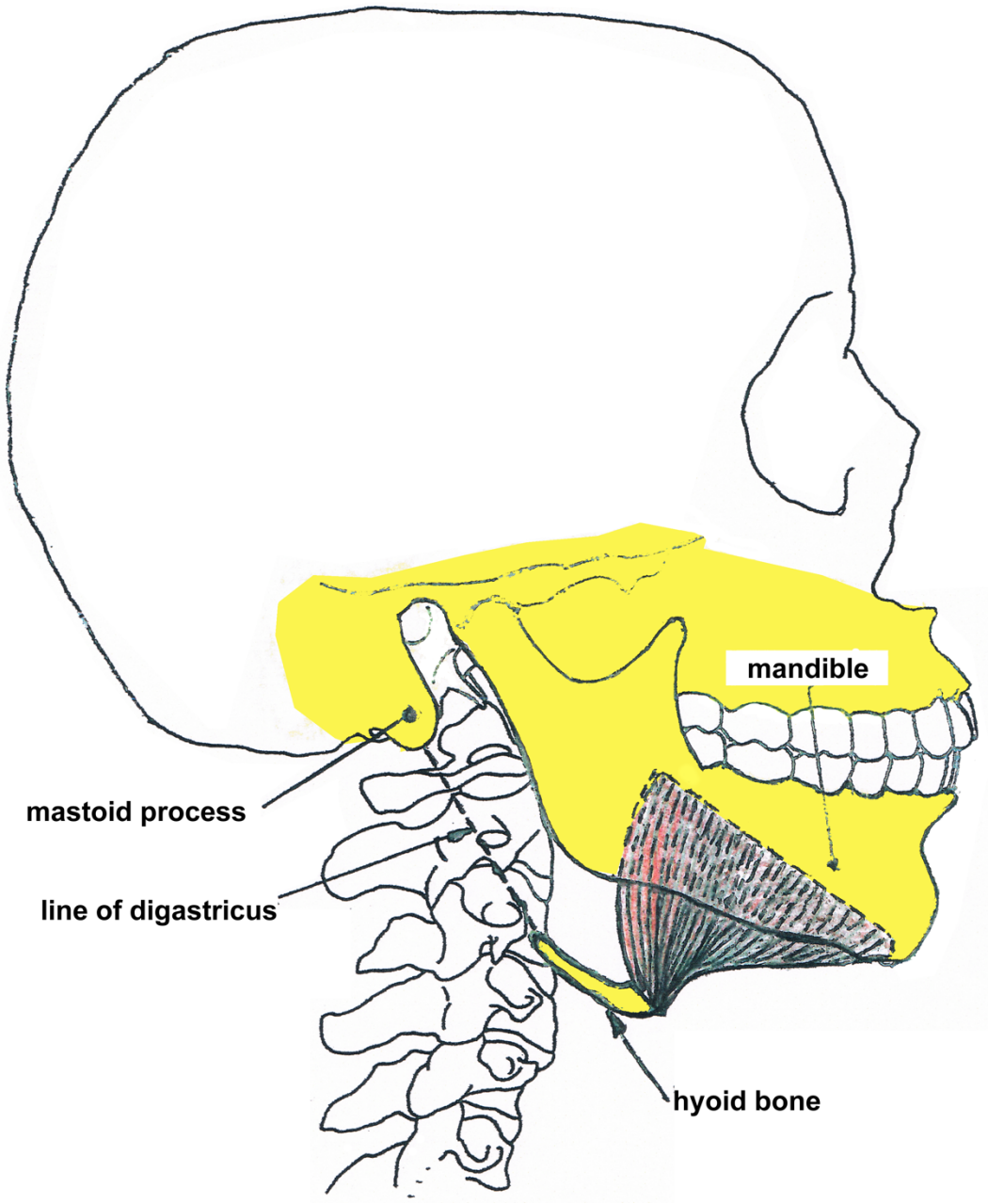
This muscle suspends the thyroid cartilage from the hyoid bone, which in turn is suspended from the mastoid process of the skull by the DIGASTRICUS muscle on page 7.

OMOHYOIDEUS



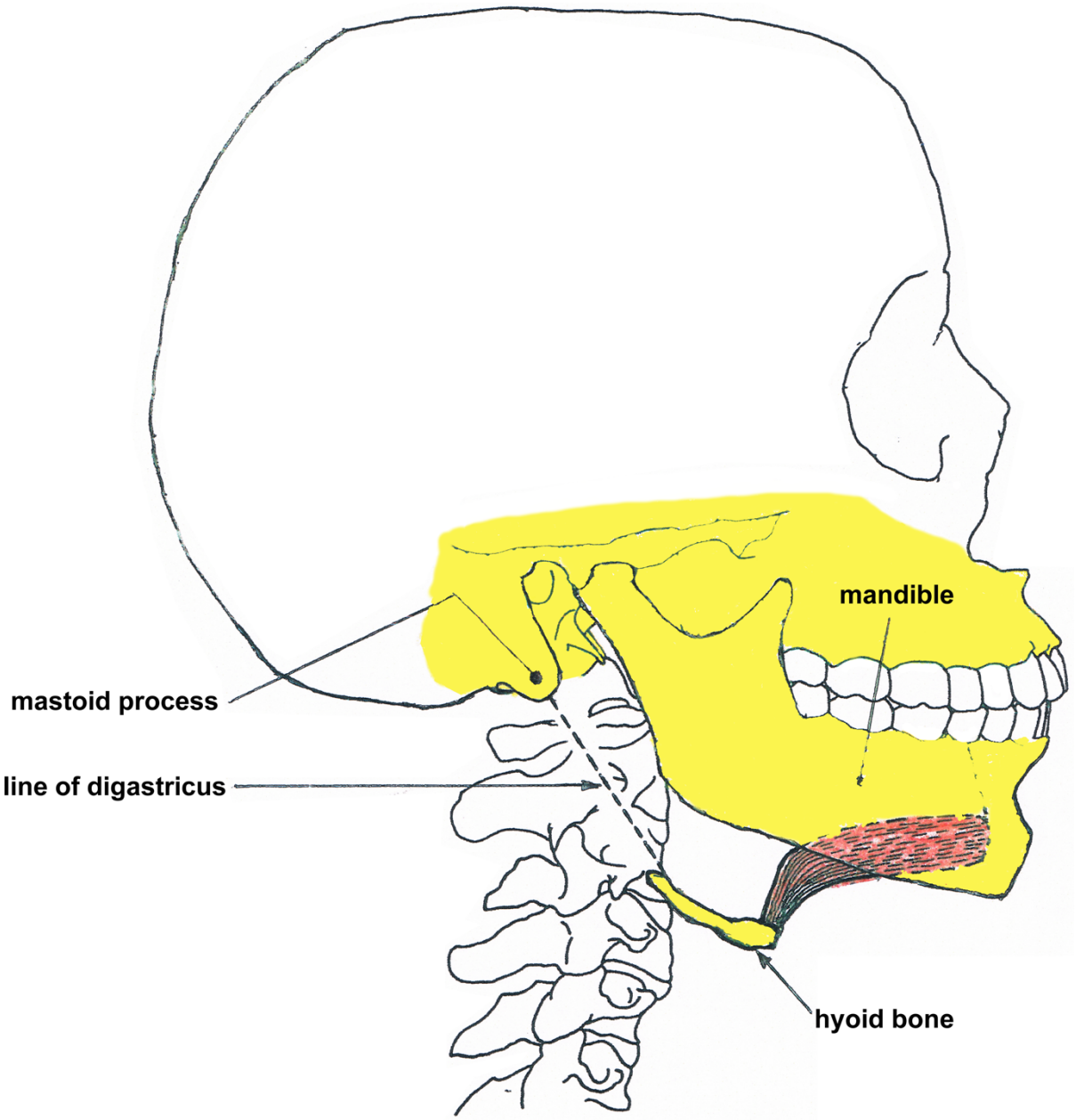
To illustrate this muscle on its own makes it look as if it is supporting the hyoid bone from below. It must, however, be read in conjunction with the DIGASTRICUS muscle on page 7. Viewing the two muscles together makes it clear that they both suspend the clavicle, the superior part of the muscle suspending the clavicle by the tendon from the clavicle close to the sternum. The inferior part of the muscle runs from this clavicular tendon to the superior border of the scapula.

MYLOHYOIDEUS



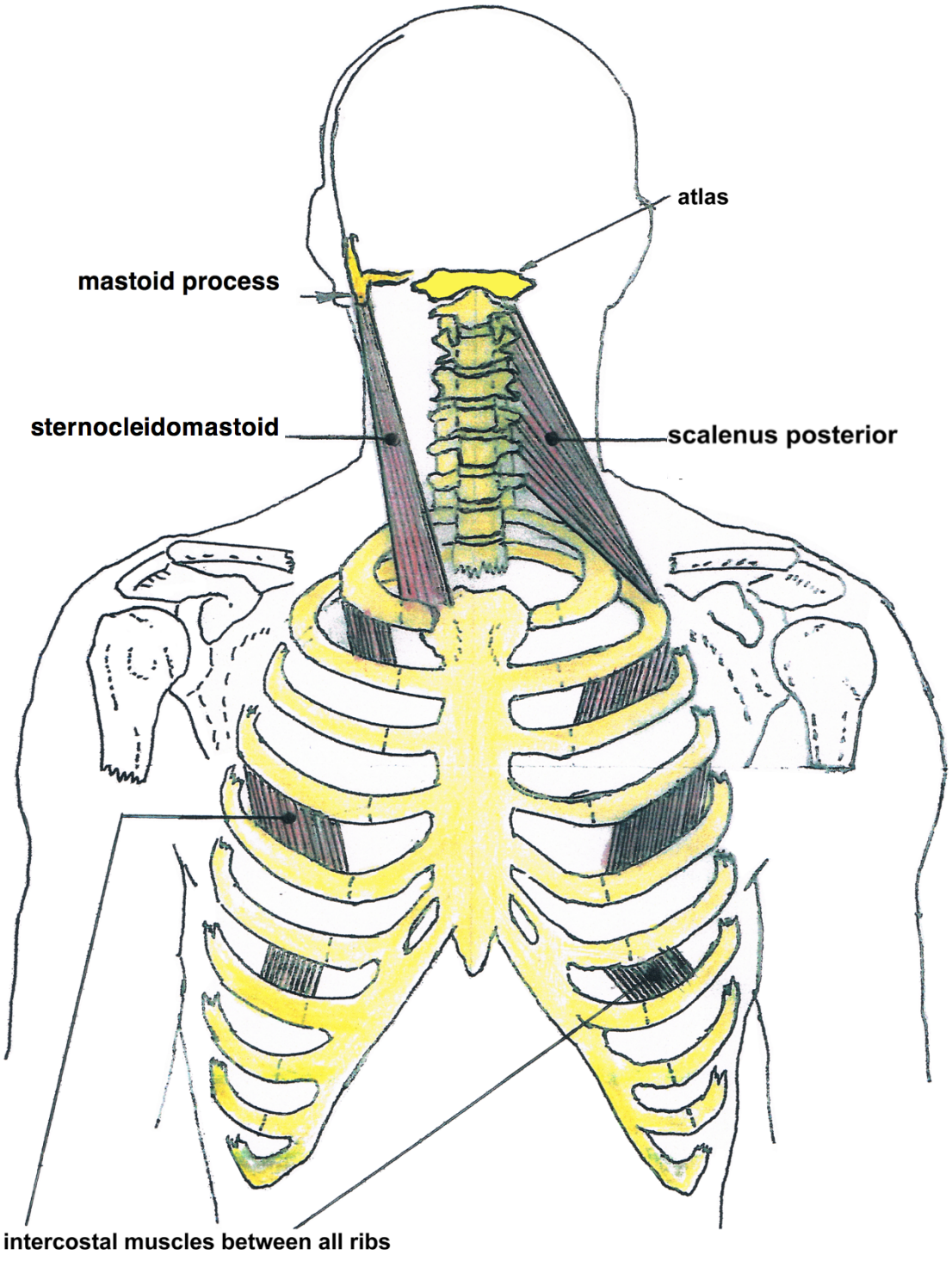
This muscle assists in pulling the mandible down to open the mouth. It does this from the hyoid bone, which is stabilized by the DIGASTRICUS muscle on page 7, which is suspended from the mastoid process of the skull.

GENIOHYOIDEUS



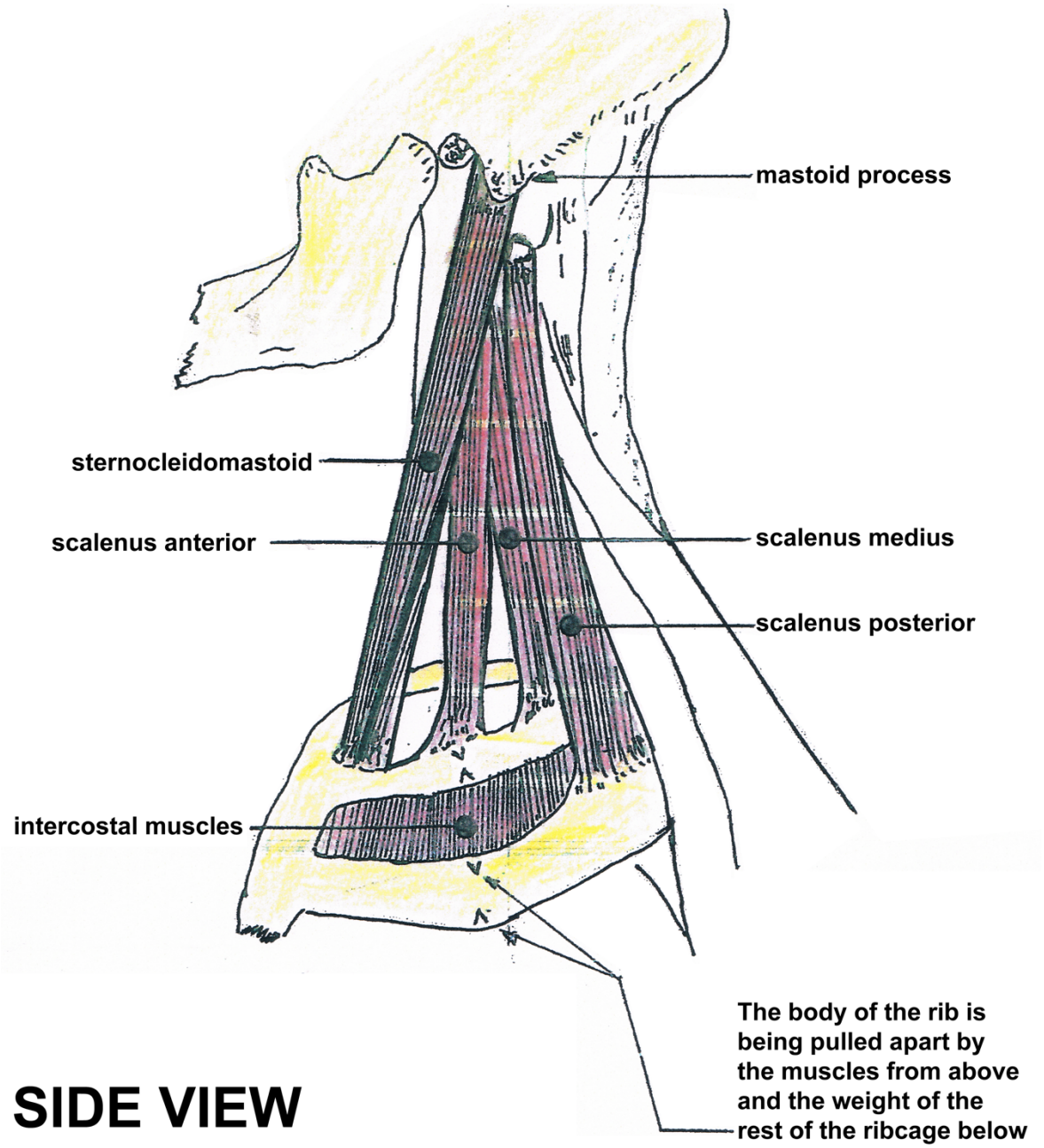
This muscle assists in pulling the mandible down to open the mouth. It does this from the hyoid bone, which is stabilised by the DIGASTRICUS muscle on page 7, which is suspended from the mastoid process of the skull.

SUSPENSION SYSTEM OF THE RIBCAGE FROM HEAD AND NECK



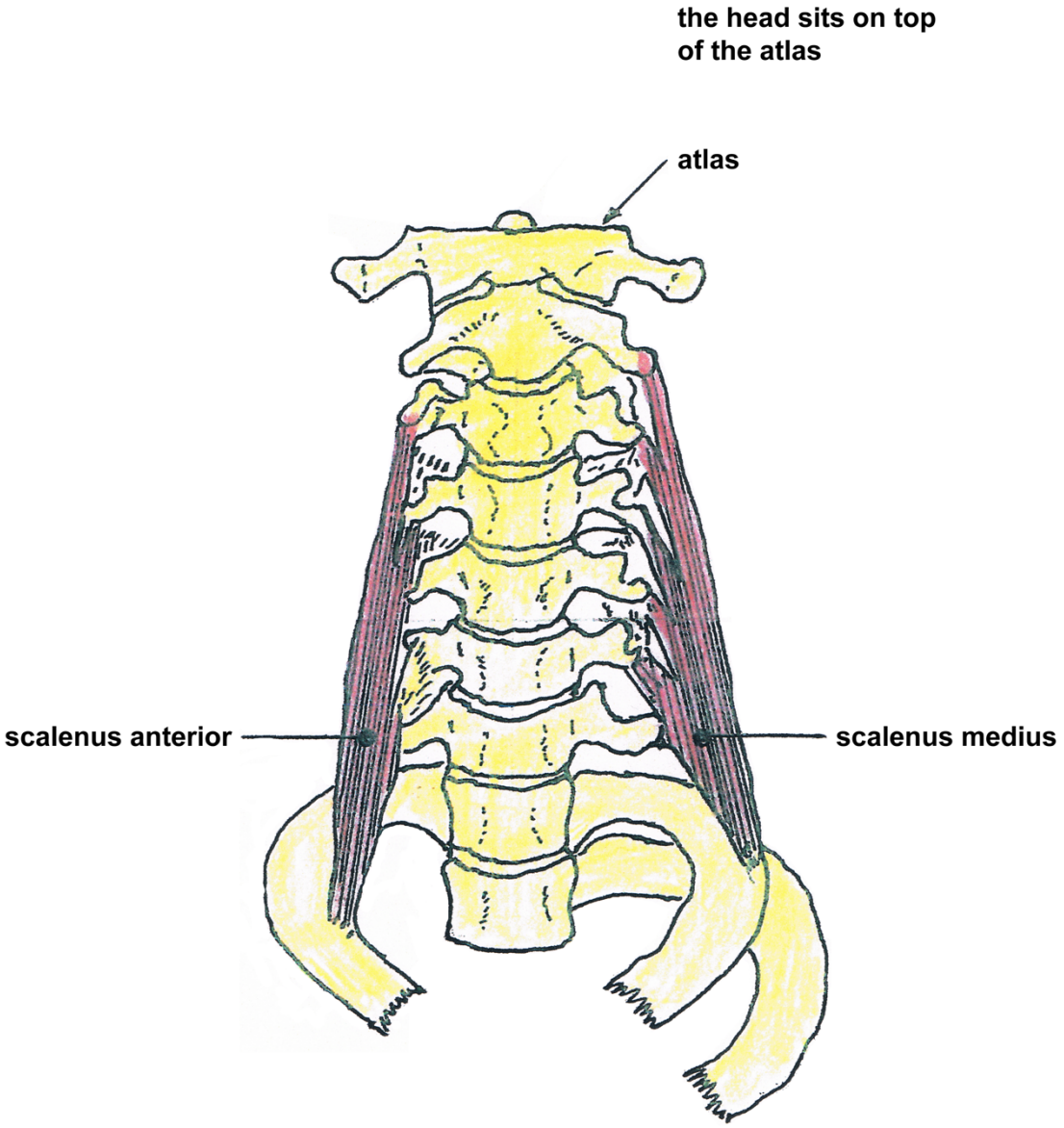
The **sternocleidomastoid** muscles move the head in various directions, but we are only concerned here with their role in breathing. They suspend the ribcage from the mastoid process of the skull, and from there they elevate the ribcage in inspiration. The **scalenus posterior** muscles move the cervical spine in various directions, and in breathing, they elevate the ribcage in inspiration.

SUSPENSION SYSTEM OF THE RIBCAGE CONTD.



The scalenus muscles, **anterior** and **medius**, also move the cervical spine in various directions, and in breathing, they elevate the ribcage in inspiration.

SUSPENSION SYSTEM OF THE RIB CAGE CONTD.



FRONT VIEW

For clarity, the scalenus posterior is not shown. see pages 14 & 15 for this muscle.

The scalenus muscles, anterior and medius move the cervical spine in various directions, and in breathing, they elevate the ribcage in inspiration.

MECHANISMS OF BREATHING

A reminder of the statement on page 3 about the fundamental requirement of the spine functioning at its optimal length is given here, because if it is not, the breathing capacity will be harmfully reduced, which will negatively affect all vital functions of the body. As the ribcage is suspended from the head and neck, it is necessary to consciously restore the spine to its optimal length and regain the integrity of the head-neck-torso relationship.

Varying accounts of how the intercostal muscles of the ribcage, and other muscles, function in breathing are given in different anatomy books and on the internet. These conflicting opinions indicate that the exact function of these muscles is not fully understood by many people.

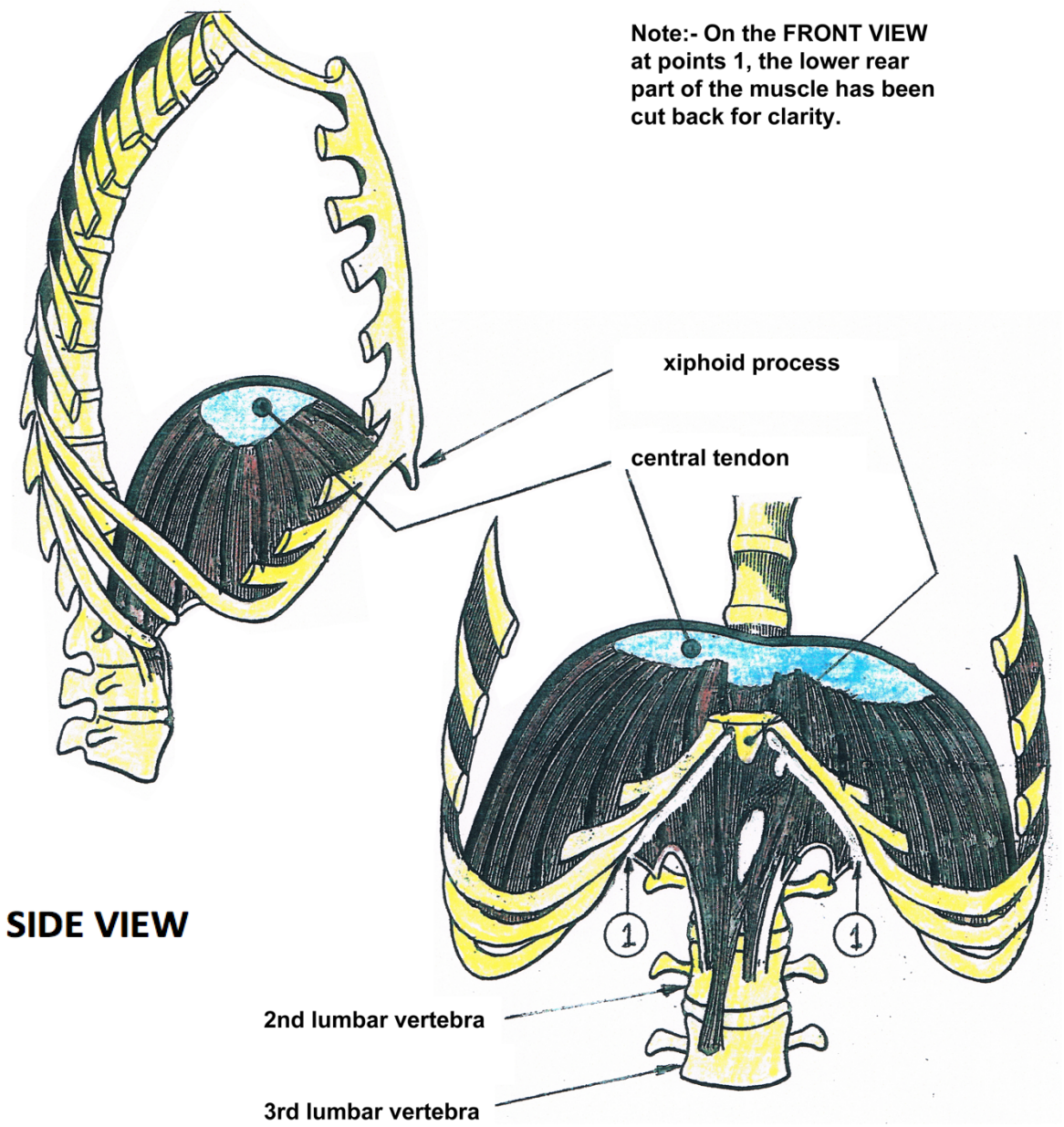
As I also do not fully understand how these muscles perform, I cannot profess to have the knowledge to present a complete description of their role in breathing.

The shape and movements of the ribcage are very complex and the changing directions of the **intercostales interni, intercostales intimi and the intercostales external** as they follow the curves of the ribs round, from the sternum at the front to the spine at the back, are difficult to understand. No doubt all three layers of muscles perform their tasks in positions of maximum mechanical advantage. These muscles span between all the ribs.

In conjunction with the muscles already shown in the previous pages, I will illustrate In the following pages a number of muscles that perform the breathing actions: not all muscles, but enough to give a reasonable indication of the mechanisms of breathing.

It may be said that in quiet breathing only certain muscles are involved in the ribcage and abdomen, while in forceful breathing just about every muscle in the torso is involved.

MECHANISMS OF BREATHING CONTD.
DIAPHRAGM

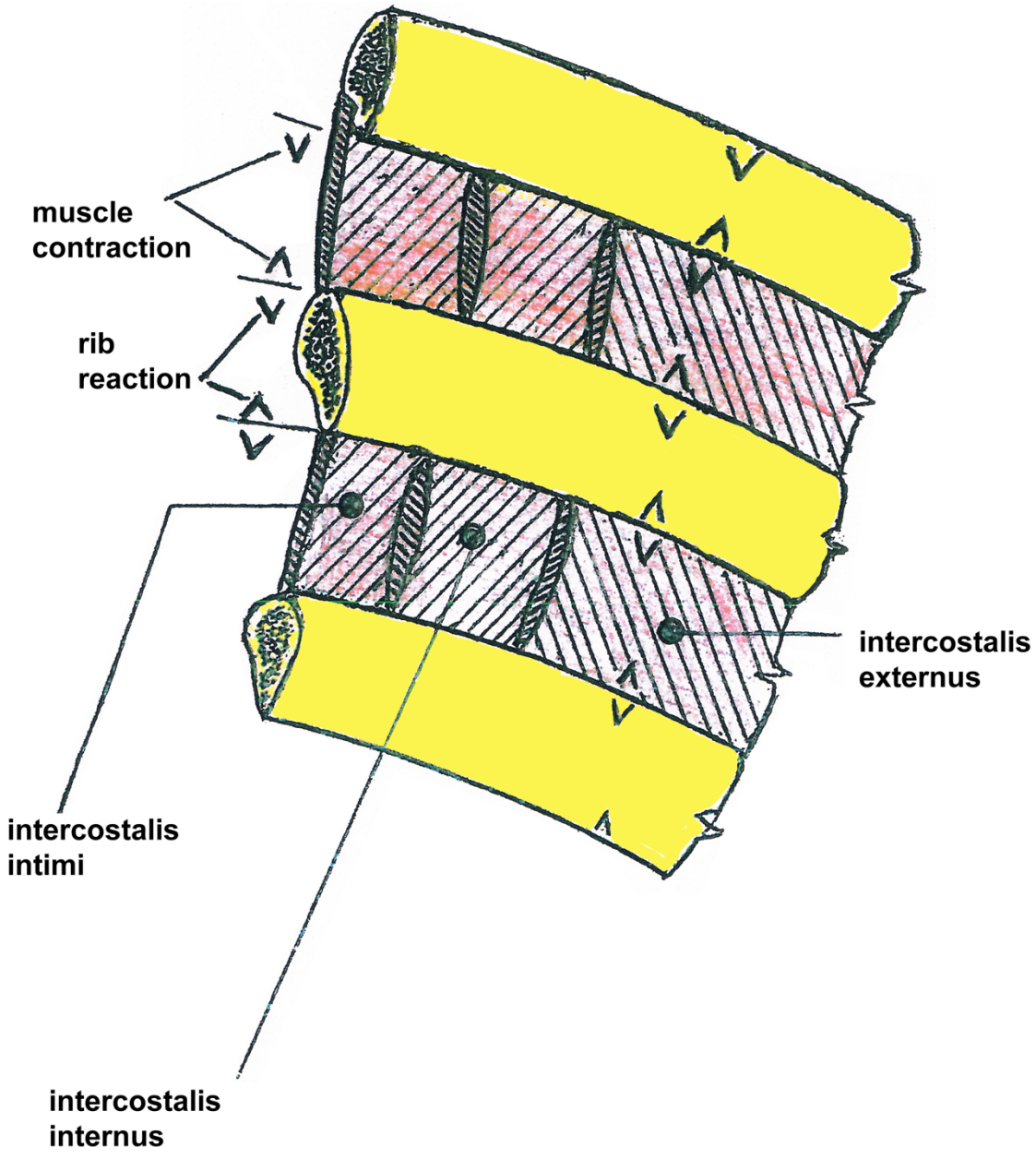


SIDE VIEW

FRONT VIEW

The diaphragm in particular is widely considered to be the principal muscle in breathing. Conflicting opinions exist, however, about what it does in quiet and forceful breathing. Some hold the view that it is used in inspiration, others advocate it is a muscle of expiration. From my studies I am inclined to think it is a muscle of expiration, but I may be misunderstanding something. Clarification from anyone would be greatly appreciated.

MECHANISMS OF BREATHING CONTD.
INTERCOSTAL MUSCLES

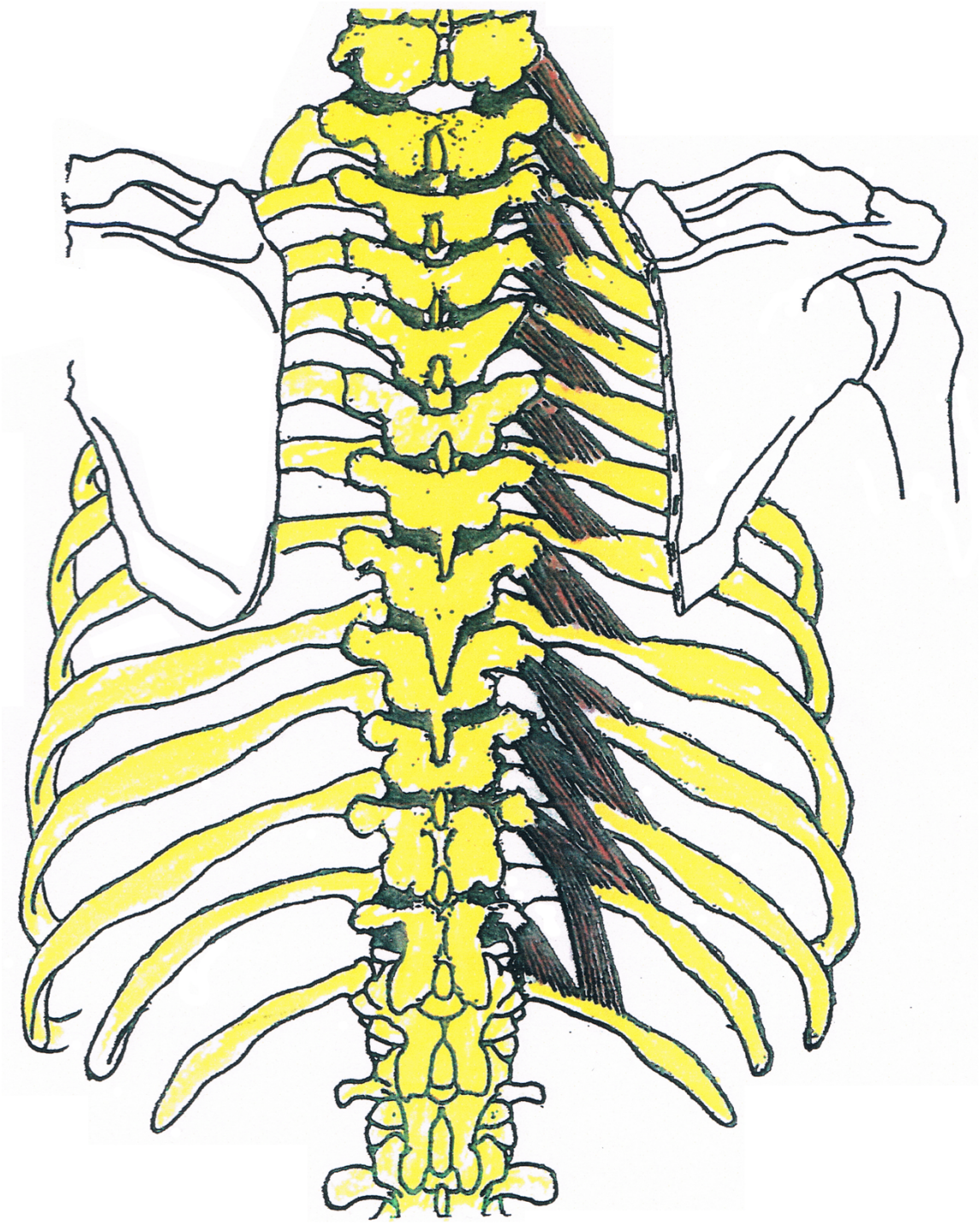


The ribs themselves play an important role in the suspension system of the whole ribcage.

The top two ribs are suspended from the head and neck by the **sternocleidomastoid** and **scalenus** muscles, **anterior, medius and posterior.** The third rib is then suspended from the second, the fourth from the third etc., all the way down to the bottom one.

The body of each rib is pulled by the intercostal muscles above and below it, and the rib will naturally resist being split apart. This means that, across its breadth, each is in tension caused by the pull of the muscles. The whole ribcage, then, is made up of elastic materials - muscles - and rigid materials - ribs. The muscles can actively contract and pull on the ribs, but despite being pulled the ribs do not contract and can maintain their breadth. The whole ribcage is then elevated as a unit in breathing in.

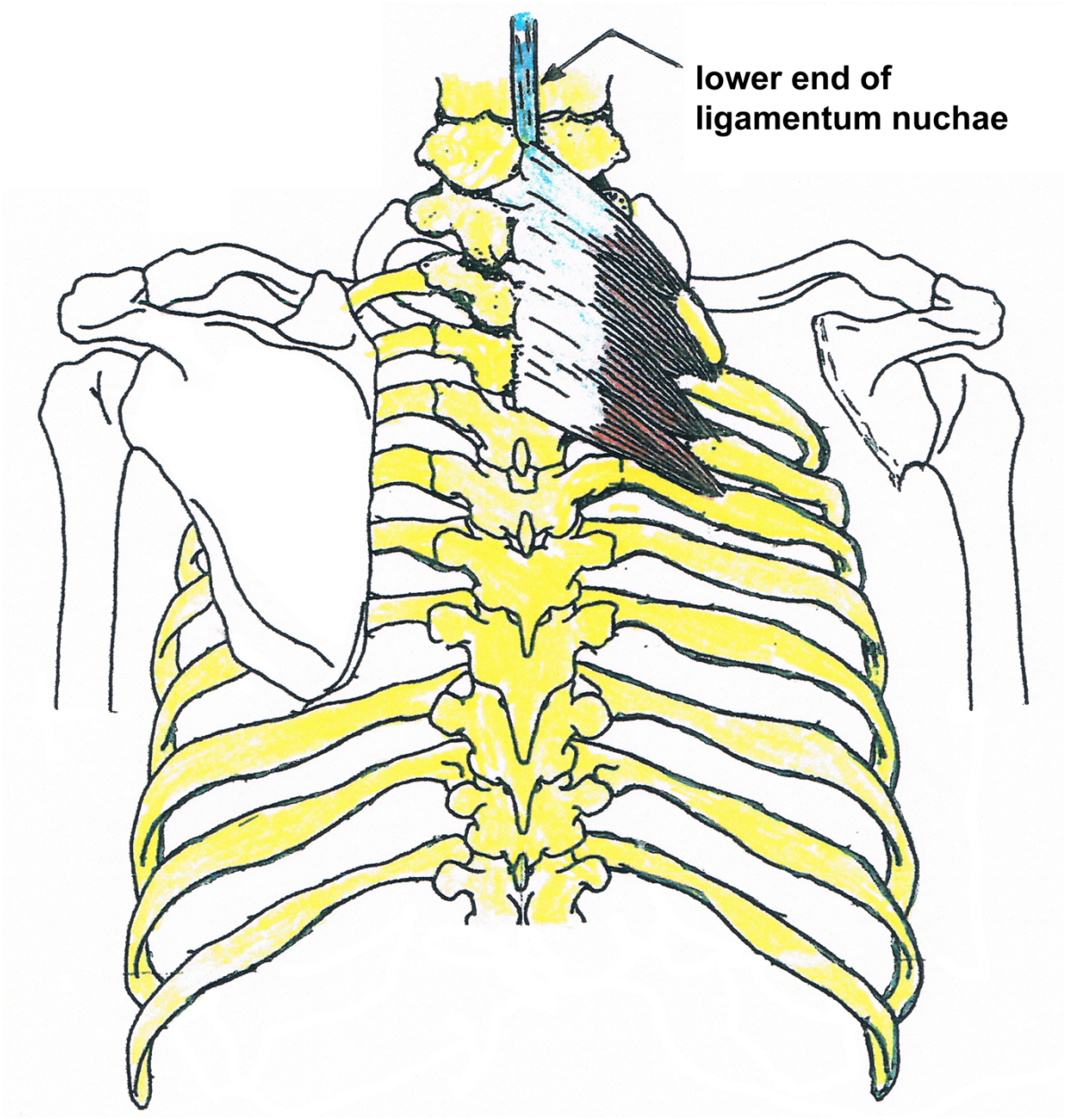
MECHANISMS OF BREATHING CONTD.
LEVATORES COSTARUM



REAR VIEW

These muscles run laterally from the transverse processes of the vertebrae to the first rib below. Some may run to the second rib below. They elevate the ribs in inspiration.

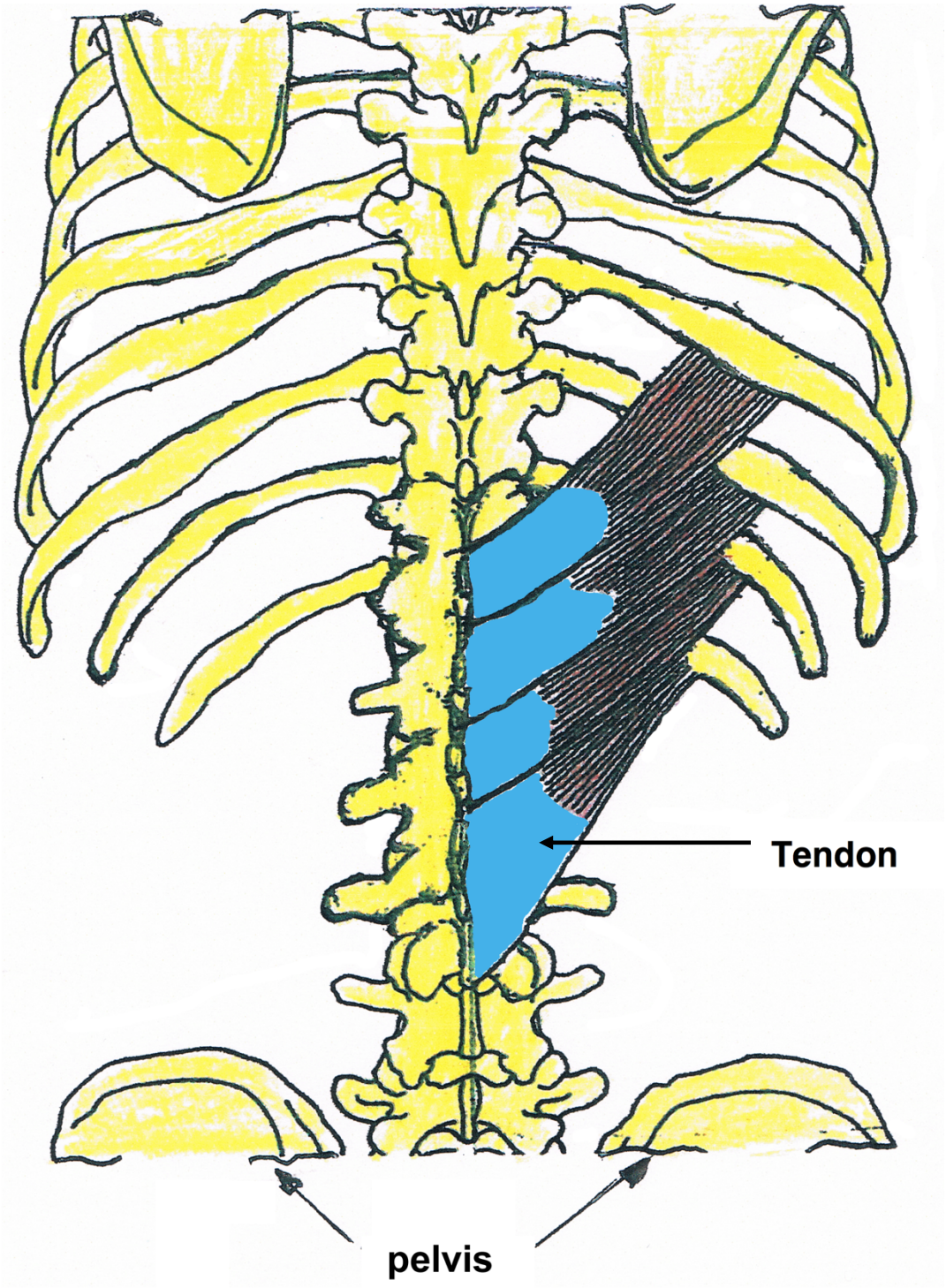
MECHANISMS OF BREATHING CONTD.
SERRATUS POSTERIOR SUPERIOR



REAR VIEW

These muscles run laterally and down from the lower part of the ligamentum nuchae, the spinous processes of the seventh cervical, and the first two or three thoracic vertebrae to the upper parts of the 2nd, 3rd, 4th, and 5th ribs. Together with the intercostal muscles, they elevate the ribs in inspiration.

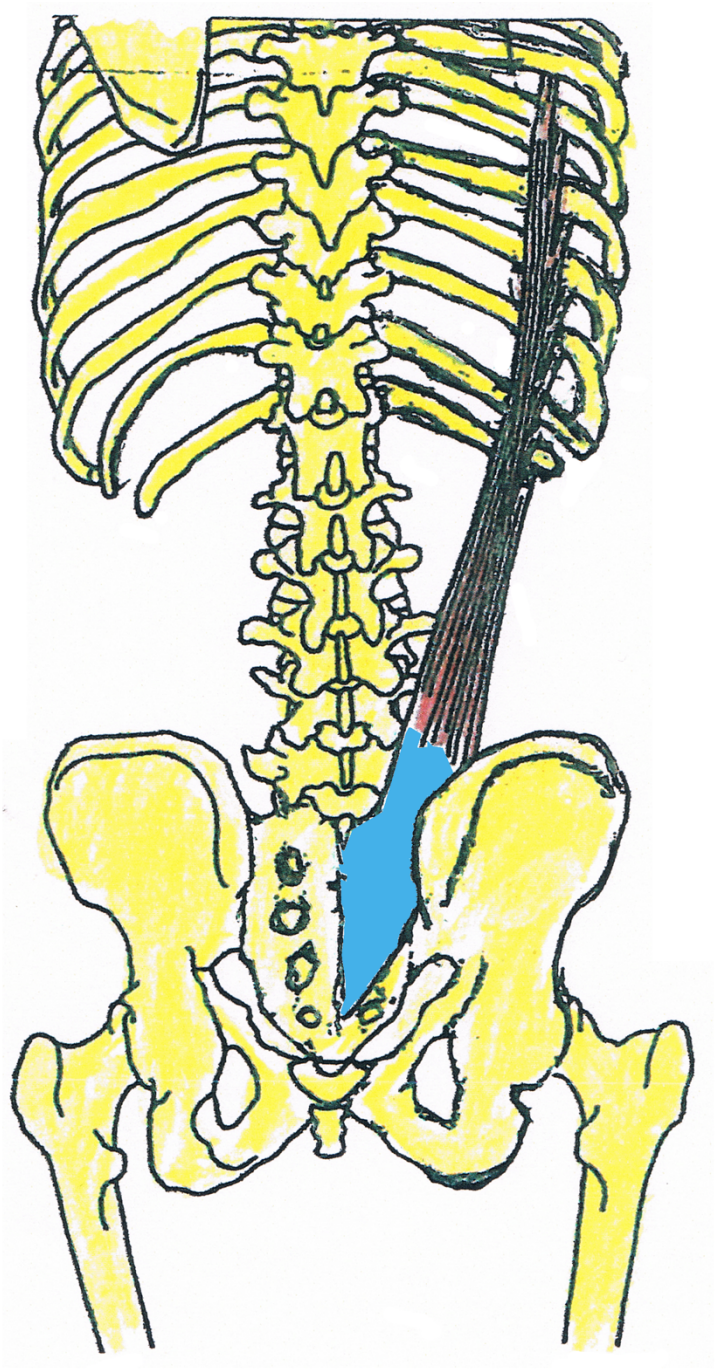
MECHANISMS OF BREATHING CONTD.
SERRATUS POSTERIOR INFERIOR



REAR VIEW

These muscles run laterally and up from the spinous processes of the lower two thoracic and the upper two or three lumbar vertebrae to the lower parts of the bottom four ribs. Together with the intercostal muscles they pull the ribs down in expiration.

MECHANISMS OF BREATHING CONTD.
ILIOCOSTALIS LUMBORUM



REAR VIEW

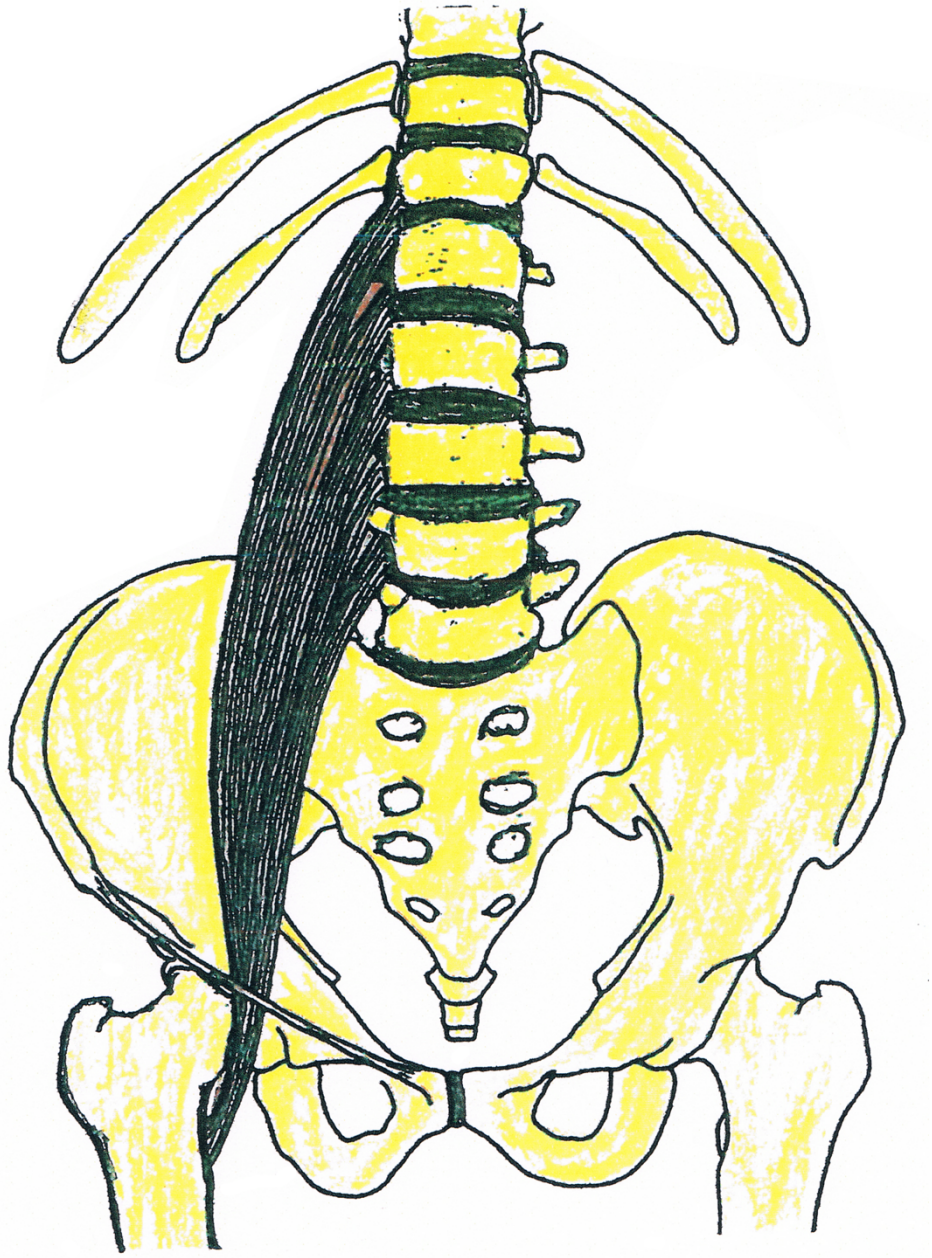
These muscles run laterally and up from the pelvis to the lower parts of the bottom six ribs. Together with the intercostal muscles, they pull the ribs down in expiration.

MECHANISMS OF WALKING

In our daily lives, one of the activities we all have to perform is walking, whether it be a few steps across the kitchen, or a recreational walk of some miles. Usually we don't think too much about what we are doing when walking, and tend to take it for granted. Due to general misuse of the body, especially the distorting of the spine, which causes a shortening in stature, the vast majority of people do not walk in a coordinated, dynamic way. All around can be seen knock-knees, splayed feet, flat feet, pigeon-toes, exaggerated lifting of the heels, misaligned ankle joints etc. all caused by specific misuse of the muscles in the spine, pelvis and legs.

Let's look at the function of some of the muscles in this area.

MECHANISMS OF WALKING CONTD.
PSOAS MAJOR

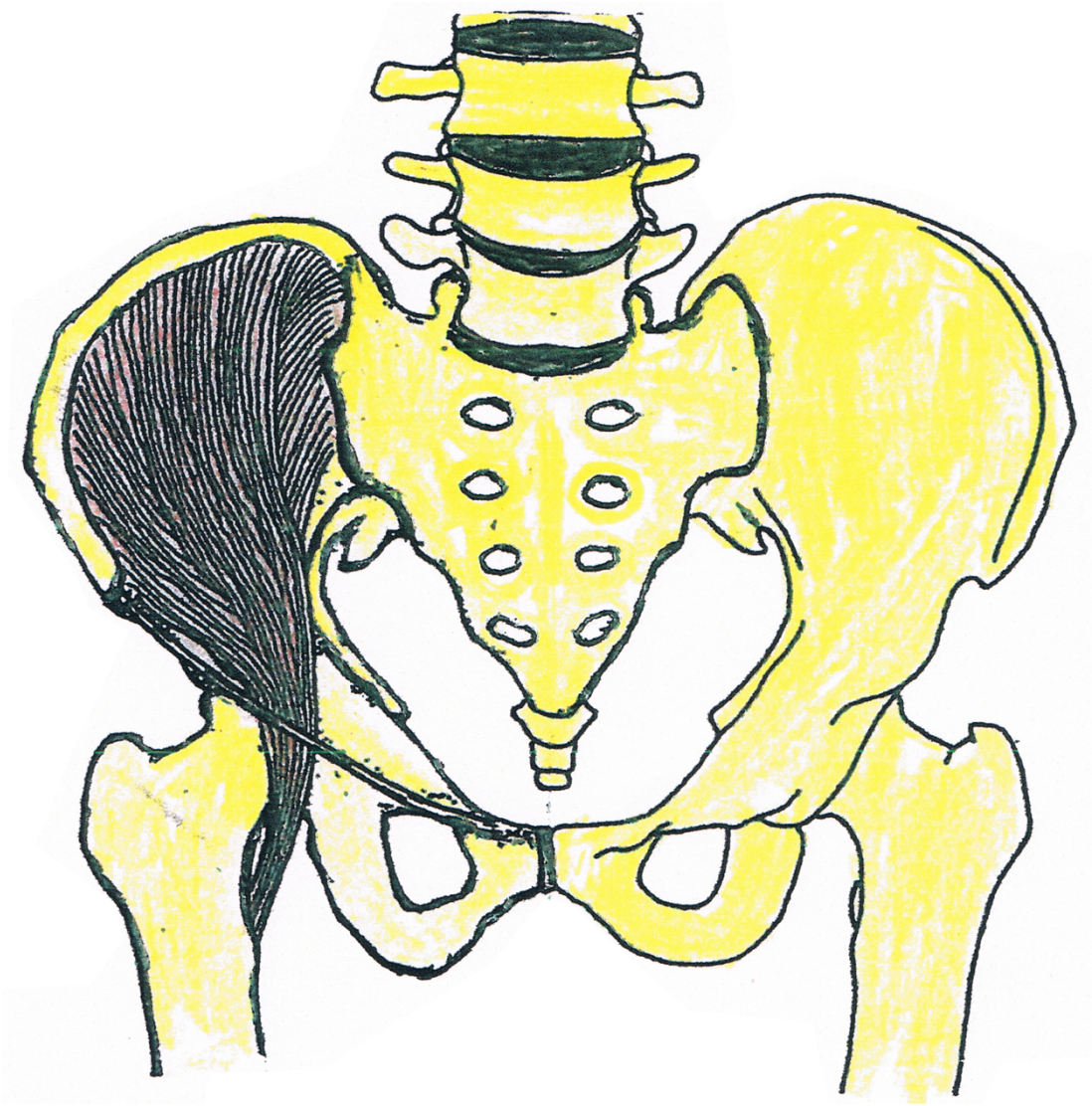


FRONT VIEW

This muscle originates at the twelfth thoracic vertebra, the transverse processes of the five lumbar vertebrae, the intervertebral disks of the lumbar spine, and inserts into the lesser trochanter of the femur. It is a flexor of the upper leg. In other words, in walking, it propels the upper leg forward and up at the beginning and through each stride. It is also considered by many sources to be a flexor of the lumbar spine, but this is not its function. It is the main muscle used in walking, and is the only leg muscle to run up above the pelvis into the lumbar spine, giving it greater mechanical advantage than the others. If the lumbar spine is too flexible, it will not supply adequate stability when pulled by the psoas major, and inefficient walking will result.

With the iliacus, it forms part of the iliopsoas muscle.

MECHANISMS OF WALKING CONTD.
ILIACUS

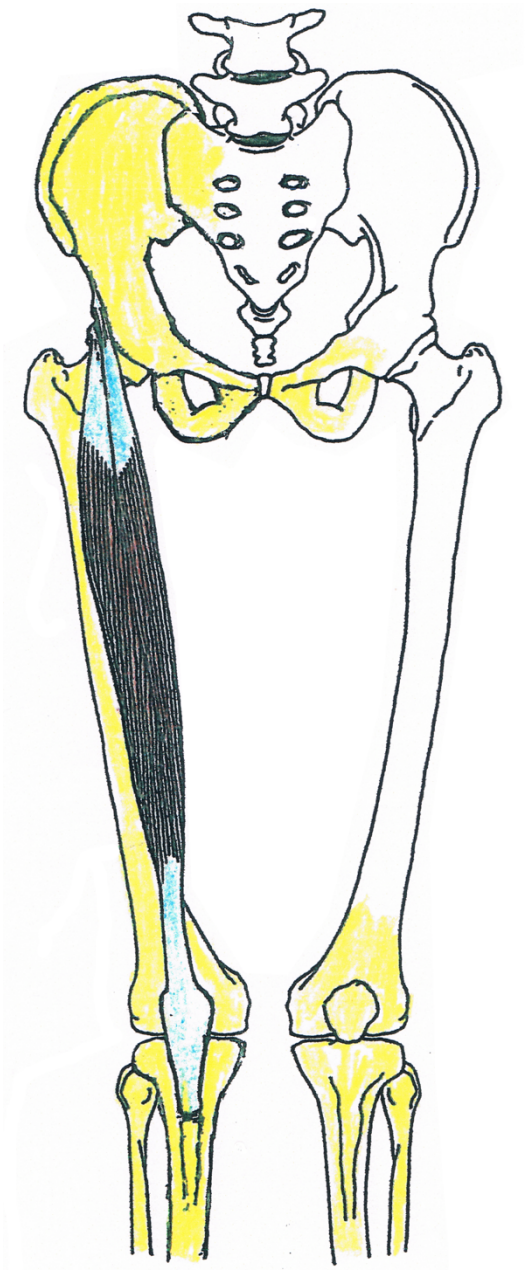


FRONT VIEW

This muscle originates at the ilium of the pelvis and part of the sacrum, and inserts into the lesser trochanter of the femur at the same place as the psoas major. It is a flexor of the upper leg. In other words, in walking it propels the upper leg forward and up at the beginning and through each stride.

With the psoas major muscle it forms part of the iliopsoas muscle.

MECHANISMS OF WALKING CONTD.
RECTUS FEMORIS



This muscle has two heads, the anterior one originating at the anterior inferior iliac spine, and the posterior one at the ilium just above the acetabulum. It inserts at the tuberosity of the tibia of the lower leg. The patella forms part of the lower tendon.

In the first phase of taking a step, it flexes the upper leg at the hip joint, and in the second, where the foot has come up off the ground, it extends the lower leg at the knee joint, thus straightening the leg to allow the foot to come down onto the ground.

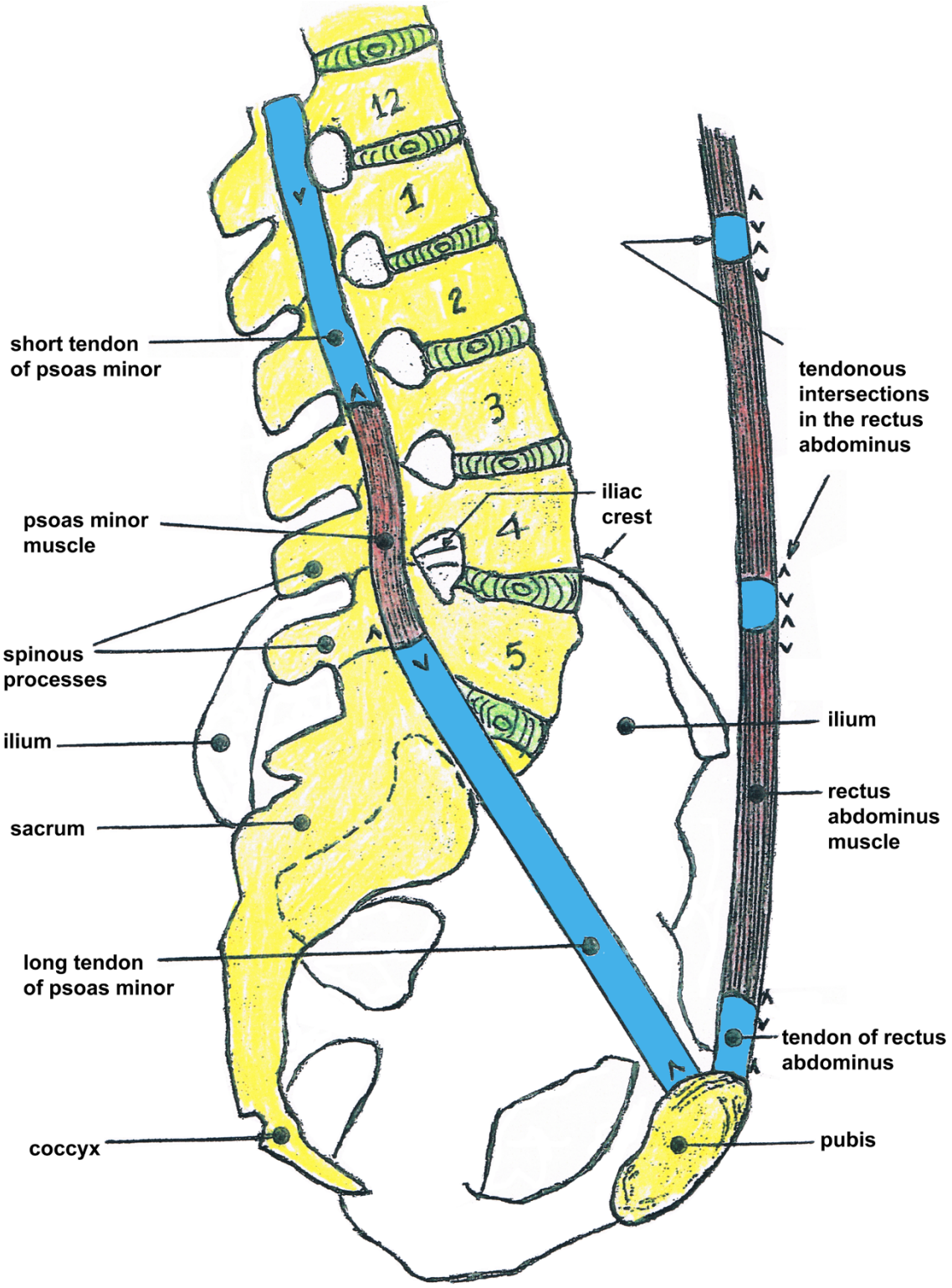
Rectus femoris is one of quadriceps femoris.

MECHANISMS OF WALKING CONTD.
SARTORIUS

FRONT VIEW

This muscle originates at the anterior superior iliac spine of the pelvis, and inserts into the medial face of the tibia of the lower leg. It flexes and laterally rotates the upper leg. Together with the quadriceps femoris it also extends the lower leg in the second phase of walking when the foot leaves the ground.

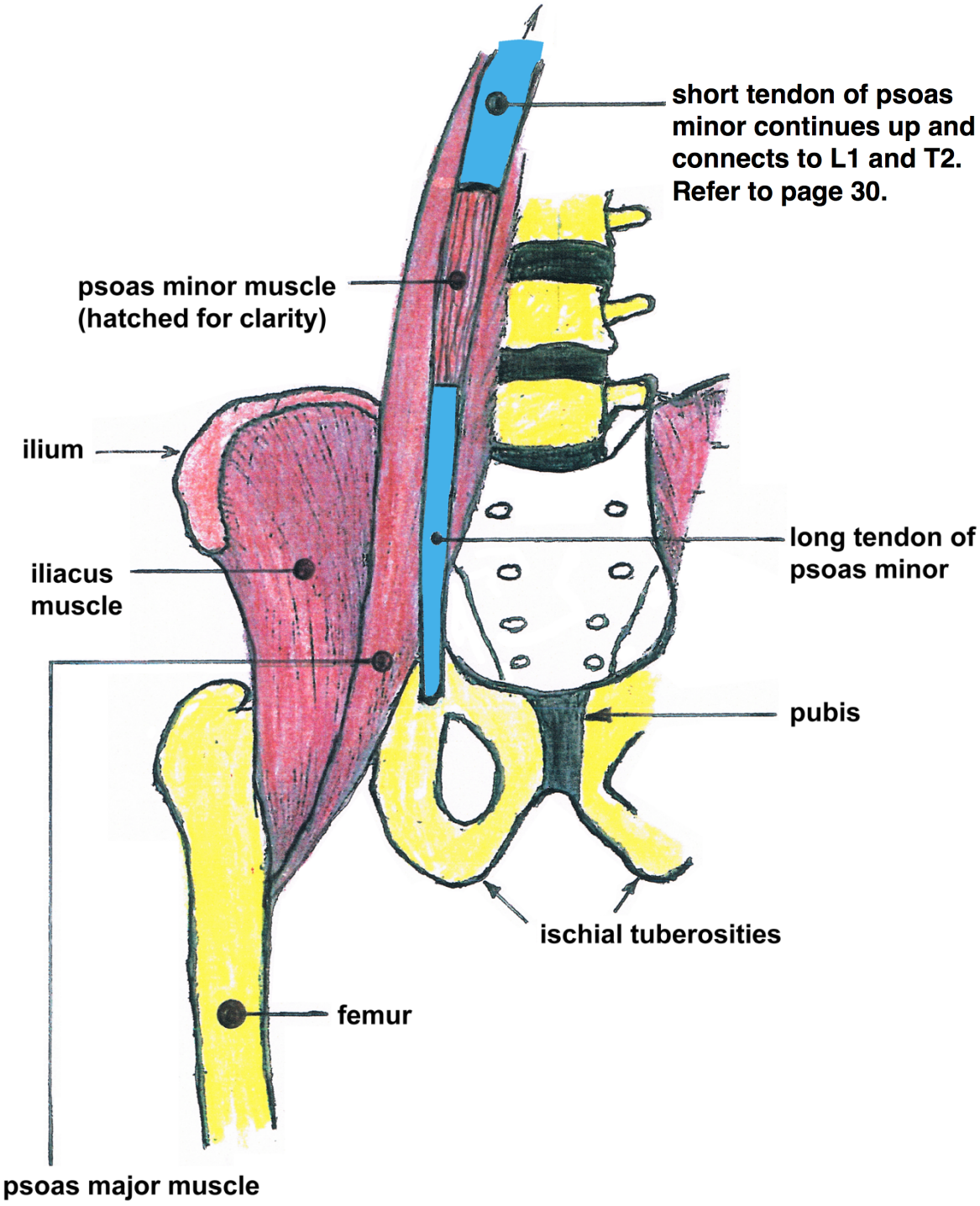
MECHANISMS OF WALKING CONTD.
PSOAS MINOR



SIDE VIEW

To be read in conjunction with pages 30 and 31

MECHANISMS OF WALKING CONTD.
PSOAS MINOR



FRONT VIEW

To be read in conjunction with pages 29 and 31

As shown on page 29, the psoas minor muscle originates at the twelfth thoracic and first lumbar vertebrae, and inserts at the fascia iliaca over the ilio pectineal line close to the pubis of the pelvis.

The function of this muscle is controversial and there are conflicting opinions from various sources. In studies of cadavers it has been found to be missing - either one or both - in a significant number of people.

I will outline my idea of how it functions - especially in relation to the rectus abdominis muscle and the pelvis.

When starting to walk, and the first stride is initiated, the psoas major muscle will pull the upper leg forward and up, and the weight of the leg will pull the lumbar spine forward, thus increasing its natural forward curve - lordosis. At the same time the iliacus muscle will also take the weight of the leg and this will cause the pelvis to rotate clockwise looking from the right hand side, causing the front end of the pelvis to drop. Referring to the suspension system of the torso on pages 31 and 32 of my book, GOING MENTAL, it can be seen that the dropping of the front of the pelvis will be instantly prevented by the rectus abdominis muscle, which suspends the front end of the pelvis at the pubis from the ribcage. Simultaneously, the psoas minor muscle will also prevent the dropping of the front end of the pelvis.

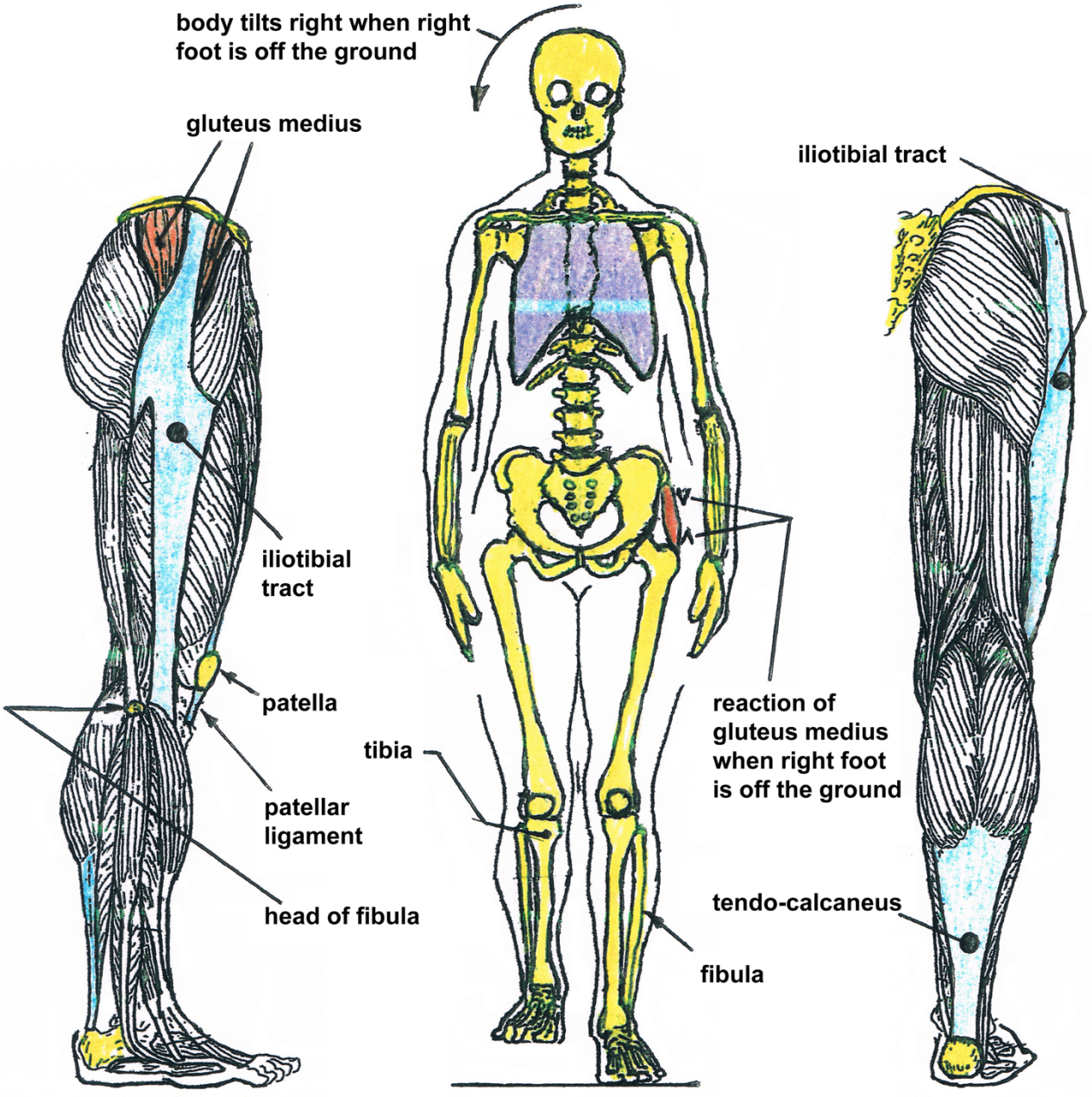
For a number of reasons, the composition and close teamwork of these muscles are very significant. The rectus abdominis is made up of a number of muscular segments running between tendonous intersections. Each muscular section contracts and pulls on the tendons at each end of it. Muscles can actively contract, tendons cannot. There are three or four tendonous intersections along the length of the muscle. In walking, this combination gives the muscle the ability to react instantly. If the tendonous intersections were not there, the muscle would have to be much thicker, because it would have to span the long distance from the ribcage to the pubis: it would also not be able to react as quickly as the muscle-tendon arrangement. This arrangement is similar to that of the intercostal muscles (elastic) and the ribs (rigid).

Going back to the psoas minor, it can be seen that it is also built for speedy reaction, because the belly of the muscular part is only about one quarter of the length of the tendons at each end of it. We have, therefore, a short muscular part that instantly contracts and pulls on the tendons, which do not contract. This causes an instant restraining of the pelvis at the pubis and prevents it from rotating clockwise looking from the right hand side.

These muscles - psoas minor and rectus abdominis - as well as all the others that make up the suspension system of the torso - can only function with maximum efficiency ***if the spine is performing at its optimal length.***

The rectus abdominis is generally regarded as a flexor of the lumbar spine, but to use it in this way in certain forms of dancing and in gymnastic exercises such as sit-ups, toe-touches with legs fixed and straight, is to misuse it. In these movements the repeated bending back and forth of the lumbar spine can cause severe damage to it. There is a common belief that the spine should be supple and bendy. This belief is a fallacy. The spine is the main column of support of the whole torso, the “rigid” (if necessary it can bend a little) upright from which muscles move other parts of the body. Contrary to various sources it does not require support from muscles, because the latter cannot push, they can only pull. For example, the psoas major muscles are often illustrated as “supporting the spine.” It is the other way round. They move the legs from the stable base of the lumbar spine. The habitual excessive bending of the spine is a gross misuse of it. The hip knee and ankle joints should be used in bending - as done naturally by very young children - ***which would allow the spine to maintain its optimal length and strength.*** Certain sources describe the psoas minor muscles as having little function, and as being frequently absent, up to 50% of people. Others say it might be a flexor of the spine, but it is not, because - during walking - it restrains the pelvis from rotating clockwise, looking from the right-hand side, by pulling on it from the stable base of the twelfth thoracic and first lumbar vertebrae. This cannot occur, however, if there is excessive lordosis in the lumbar spine, which is true of the majority of modern men and women. In this chronic condition of the lumbar curve being exaggerated, and the pelvis harmfully rotated clockwise looking from the right hand side, the psoas minor would become too long and flaccid, and could not act quickly enough to restrain the pelvis. It would become defunct. Obesity would be another factor in the disappearance of the psoas minor.

MECHANISMS OF WALKING CONTD.
LATERAL RESTRAINT OF THE BODY IN MID-STRIDE



In walking, the body tilts from side to side, although in good coordinated walking the tilt is so small it is hardly noticeable. If the right leg is moving, the left leg has not only to carry the weight of the whole body, but also has to resist the overturning effect of the body tilting to the right. This overturning force increases as it moves down the left side of the body from the head to the sole of the left foot. It is probably resisted in the following way:-

From the ilium of the pelvis to the greater trochanter of the femur, by the gluteus medius muscle.

From the ilium of the pelvis to the head of the tibia of the lower leg by the iliotibial tract.

From the head of the tibia to the talus of the foot by the fibula.

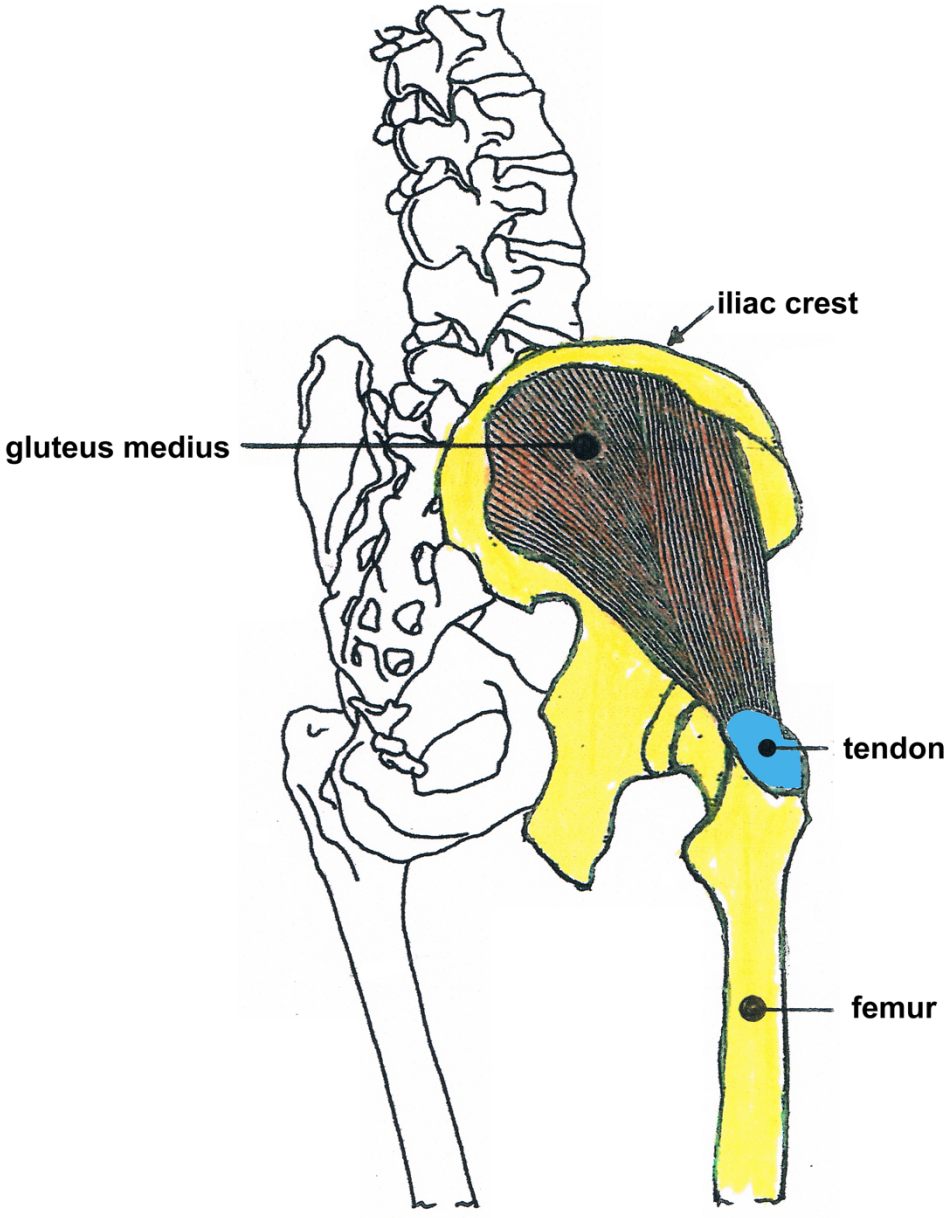
This arrangement of restraining the body from tilting, while momentarily being on one leg alternately, works by using a muscle - gluteus medius - which consists of an elastic material. When stretched, it can contract instantly to the torso tilting to one side: and then, as the overturning force increases as it moves down the side of the upper leg, a tendon - the iliotibial tract - is used, which is not an elastic material, that will contract minutely and immediately help to stabilize the upper leg. As the overturning force increases down the lower leg to the foot, a bone - the fibula - which is even more rigid than a tendon, is used to stabilize the lower leg.

Note that the fibula is not a compression member because it does not stand on the talus of the foot, but is kept in place by its connection to the tibia through the interosseous ligament. This membrane transfers the overturning force, caused by being momentarily on one leg, from the fibula to the main load-bearing bone - the tibia. The fibula, like the iliotibial tract is a tension member. It also provides a stable “column” from which certain muscles can move the foot in various ways.

Having written, ”probably resisted” above, the following points, however, can be considered. If the gluteus medius can, by itself, resist the tilting of the torso to the right, then the iliotibial tract supplies the stability required from which the gluteus medius can pull against the tilt.

If this combination adequately resists the tilting force down to the knee, then the fibula will not be subject to this tensile pull of the tilting force, and will not be in tension. This means that it will still act as a stable “column” from which certain muscles can move the foot. Its stability in both possible scenarios is provided by its direct connection through the interosseous ligament to the main load-bearing bone, the tibia.

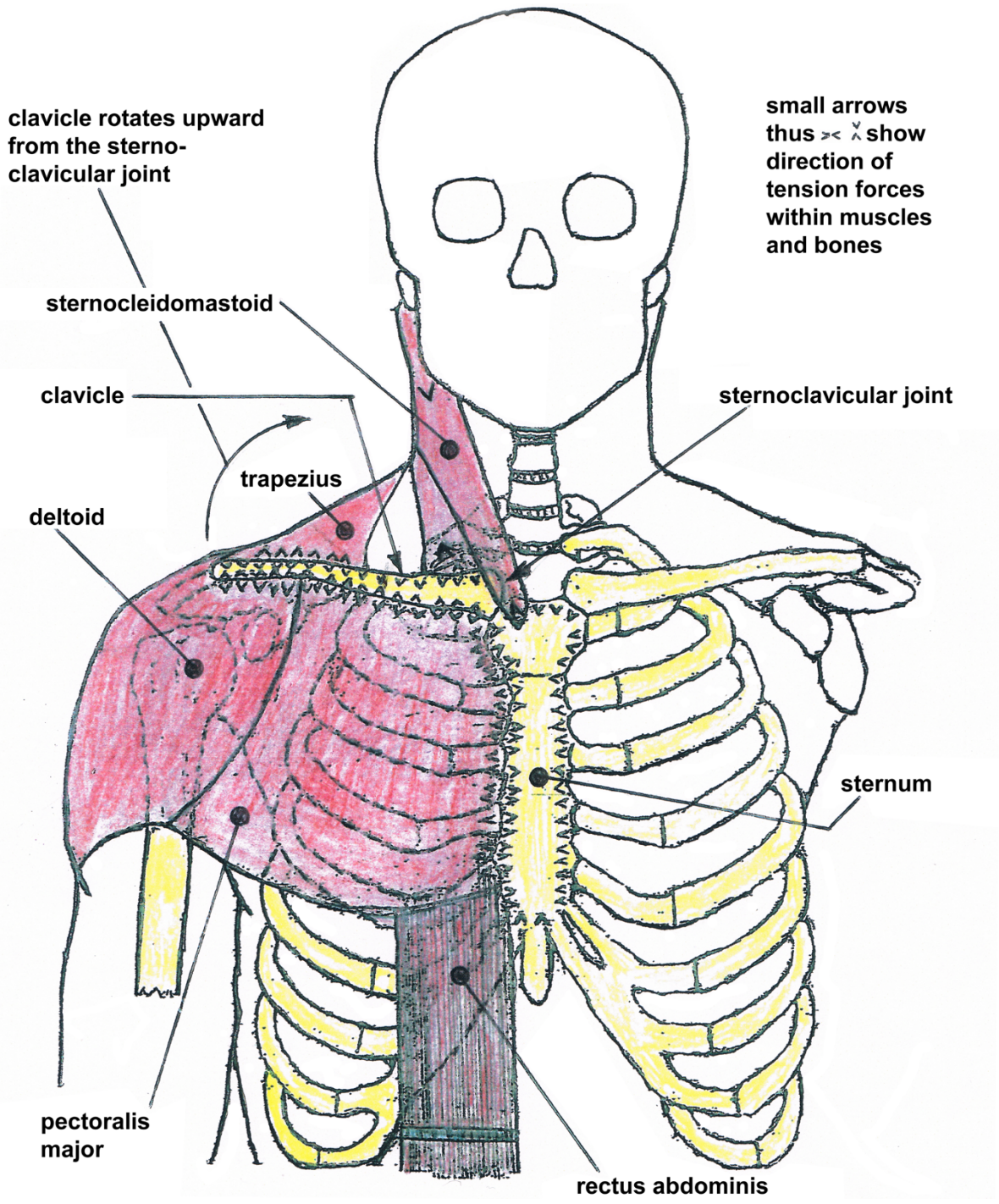
MECHANISMS OF WALKING CONTD.
GLUTEUS MEDIUS



RIGHT SIDE VIEW

During walking, when the right leg, for example, is in mid-stride with the foot off the ground, the pelvis will momentarily tilt to the right, and the gluteus medius on the left-hand side of the pelvis will instantly contract to prevent the immediate dropping of the right hand side of the pelvis, thus keeping the pelvis level. Naturally, the same, but opposite process, occurs when the left leg is in mid-stride.

THE STEADFAST STERNUM AND THE MOBILE CLAVICLE



The clavicle is a spar, or stiffener, similar to the spine of the scapula, that is pulled on by the trapezius muscle to elevate the shoulder. When the trapezius contracts, it rotates the clavicle at the front, and the scapula at the back of the shoulder. The cervical spine in the neck is the stable column from which the trapezius pulls up the clavicle and the scapula. The clavicle is very mobile and rotates upwards from the sternoclavicular joint.

The chest muscles - pectoralis major and minor are connected to the clavicle on the underside. The clavicle, therefore, is tending to be split apart because of the pull of the trapezius and the sternocleidomastoid from above, and the pectoralis muscles and the deltoid from below. This is similar to the ribs tending to be split apart by the intercostal muscles.

THIS IS A WORK IN PROGRESS…

This book is a work in progress. Anyone who has knowledge and experience of these subjects is welcome to ask questions or send me helpful comments and constructive criticism.

I have been the Head of Training for Alexander Technique teacher-training courses for 28 years. First in Berlin, Germany (1990-2000) and currently at the Centre for Constructive Awareness and Related Education in Devon, England, since 2002.

I qualified as a teacher of the Alexander Technique in 1983 and have worked full time on training courses and privately with pupils since then.

Anyone who has been stirred by this book to know more about the Alexander Technique or the mechanisms of the organism, feel free to get in touch to discuss getting lessons or training as a teacher.

I have also written six books on the Alexander Technique, holistic anatomy, philosophy and related subjects. Many are available for free from my website.

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