Health benefits of sea kayaking

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Abstract
Vertebrogennic troubles of most of the population might be possibly solved by outdoor activities. Indeed, not all of them are appropriate. We name for example running, which by overweight as a limit strain ligament and joint apparatus. In this time, favourite form of outdoor activities on water is sea kayaking. It appeals to 375 million years old motional program of locomotion, realised through the shoulder girdle, which can by concatenation of muscle functions primarily stabilize the area of lumbar spine and in these days, partly eliminate fluently discussed insufficiency of the deep stabilization system. Sea kayaking as the archetypal outdoor activity helps to remove difficulties in the lumbar lordosis area, which we can characterize as „locus resistentiae minoris" vertebrogenic difficulties. This condition is caused by verticalizing as a very young evolution event.

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Key words:
locomotion, sea kayaking, paddling, outdoor, muscle chains, health benefits, inner unit, inner muscular unit, core

Souhrn
Vertebrogenní potíže velké části populace je možné řešit outdoorovými aktivitami. Ne všechny jsou však vhodné. Zmiňujeme například běh, který při nadváze limitně namáhá ligamentózní a kloubní aparát. Aktuálně oblíbenou formou outdoorových aktivit na vodě je jízda na mořském kajaku, která je realizovaná přes pletenec ramenní a vychází z 375 mil. let starého pohybového programu. Pádlování dokáže zřetězením svalových funkcí stabilizovat především oblast bederní páteře a částečně eliminovat dnes často diskutovanou insuficienci hlubokého stabilizačního systému. Sea kajaking jako archetypální outdoorová aktivita pomáhá odstraňovat potíže v oblasti bederní lordózy, kterou můžeme charakterizovat jako „locus resistentiae minoris" vertebrogenních potíží. Tento stav je zapříčiněn vertikalizací jako velmi mladou evoluční událostí.

Klíčová slova:
lokomoce, seakajaking, pádlování, outdoor, svalové řetězce, zdravotní benefity, inner unit, vnitřní svalová jednotka, core

Introduction

Paddling is an effective motional activity, strain shoulder girdle and the upper, which are in the upright figure of man burdened sporadically. With this theme relates the muscular function in the lumbar spine area of vertical figure. Kayak grip concatenates muscle functions in the front and back side of torso, from the hand to the fibula. Stabilisation of torso is solved by the external muscles, which improves the physical condition by lumbar spine difficulties. Removing of the long-term difficulties must solve the specific neuro-rehabilitation methods. Attractive and user-friendly acceptable form of canoeing is sea kayaking.

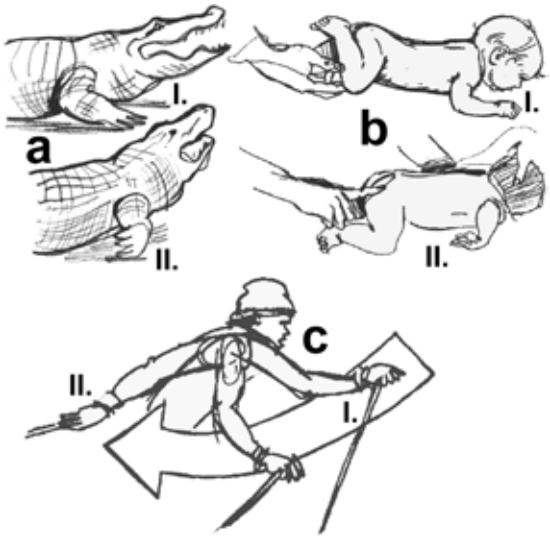
Development context

The human motion starts from locomotion of our ancestors. From fish, we inherit this structure, properties and actions in our body (Shubin, 2008). The transition of vertebrates on land was realized 375 million years ago (Dawkins, 2008; Shubin, Daeschler, & Jenkins, Jr., 2013). Right-left waving of fish and transformation of their pair fins to extremities gave rise to a new quality of movement on a hard surface (such as a salamander crawling). Result is genetically passed motion program, which remained for human shoulder girdle, and is realised as military crawling, rope climbing, cross-country skiing, climbing a ladder or standing up from

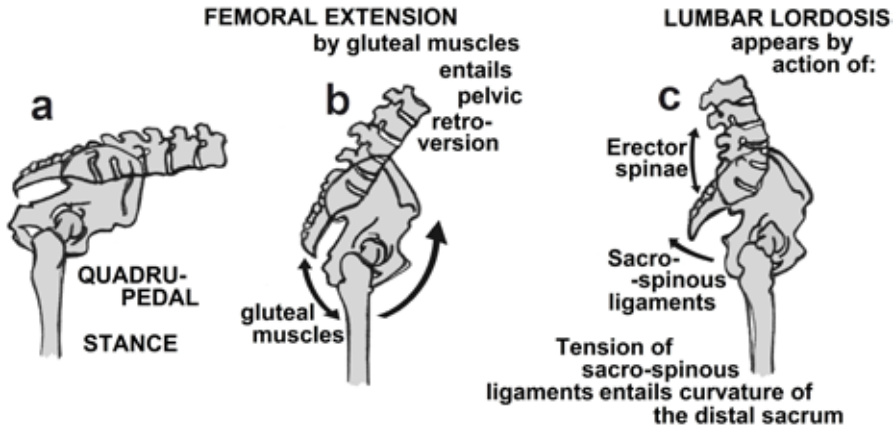
a sitting position with the support of the upper limb. This program is artificially inducible defined by stimulating trigger points, with method Vojta reflex locomotion (Vojta & Peters, 2010). His principle occurs in the citizen and sport motion, where shoulder girdle has its driving (propulsive) function. Picture one shows shape similarity of extreme positions in locomotor movement of lizard´s front legs (position "a"), front/upper limbs of baby in Vojta´s reflex locomotion (position "b"), and propulsive action of upper limb while cross-country skiing in classic style (position "c"). Step toward motion is marked as „I", and as a reflection of „II.". In childhood is locomotion program for for arms dominantly covered by humanisation program of grip and handling with objects, which is allowed by straight figure and relief of upper extremities from locomotion.

Much younger evolutionary event started after separation of genus Pan and Homo after the last common ancestor of chimpanzees and humans. According to various sources, this event happened 6-8 million years ago (Brunet, Guy, Pilbeam, et al., 2002; Dawkins, 2008; Lovejoyet, et al., 2009), when members of the development tree, which departed from apes, they began righting (Sahelanthropus tchadensis, Orrorin, australopithecines). The verticalization of figure is evolutionary young, which influenced primarily cervical and lumbar spine. The evolutionary situation of lumbar spine is probably younger, cervical and lumbar lordosis and thoracic kyphosis was probably to the genus Homo just under 2 million years as an adaptation to economic walking and endurance race. Situation in area of lumbar spine is modelling, based on child development Picture 2. It is known, that the structures, which have undergone the evolutionary youngest changes, have the highest degree of coincidence health problems. On the basis of this young evolutional change we could say, that from that time, when we, as a child, first stood up on our two limbs, started the health problems in lumbar spine area, which suffer 50% of 40 years population.

Picture 1 Step towards (I.) and reflection (II.) front limb function of lizard (a), front/upper limbs of baby by Vojta´s reflex locomotion (b) and by alternating two-stroke cross-country skiing, classic technique (c; archives of authors)

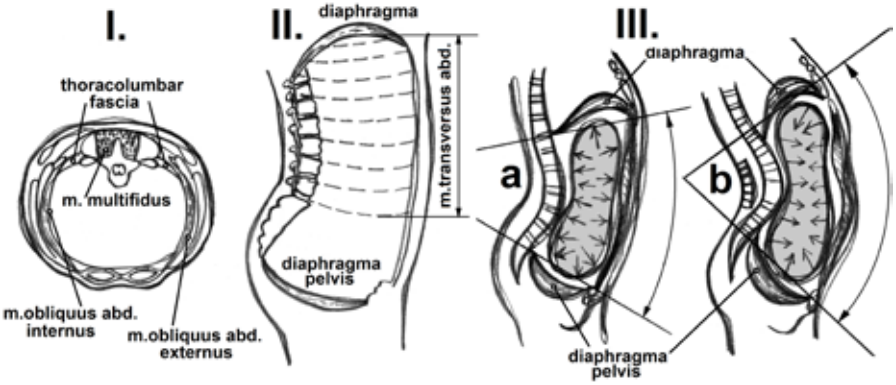


Picture 2 Transition from quadrupedic to bipedic position of pelvis, although only the example of human locomotion postural ontogenesis for lack of fossil evidences; concrete changes in lumbar spine area in one year time of human life after birth (position a, b, c; modified according to Tardieu et al., 2013).



Two-limbs standing and walking places considerable demands on the stabilization of the torso. Upright figure added to diaphragm beside respiration function the stabilisation function (by four-leg vertebrates this function need not to be made). The stabilisation of torso in lumbar spine area have major impact diaphragm, pelvic floor muscles, m. transversus abdominis and other abdominal muscles - m. obliquus externus abdominis, m. obliquus internus abdominis and the lower part of the m. rectus abdominis. Situation is shown on the picture 3. The difficulty is, that the optimal stabilisation function in lumbar spine area has just a few number of people. Frequent lack of abdominal muscle function then takes over the paravertebral muscles, especially m. multifidus (position C).

Picture 3 I – inner unit (modified by Check, 1999); II. – thoracolumbar fascie and inner unit of side sight (modified by Check, 1999); III. – physiological (a) and non- physiological (b) stabilisation situation of lumbar spine (archives of authors): diaphragm and pelvic floor is opening, weakened lower part of the abdominal muscles bulging belly forward, reducing the dorsal pressure on internal organs and lumbar spine stabilization must take paravertebral muscles (m. multifidus); (Kolář, 2011; Kračmar, Chrástková, Bačáková et al., 2016). This situation must be solved therapeutically.



Problem

In context of upright figure and bipedal locomotion is noteworthy to state the most widespread recreational activity, which is jogging. In these times is running a huge boom. Running is coordinately easy, financially, time-saving and locally sport (e.g. compared to cycling). While running, lower limbs are propulsive working, while abdominal and back muscles to maintain postural upright torso. Arms work phasically in a diagonal pattern of locomotion according to lower limbs, respectively lower limbs work in a diagonal pattern by the upper limbs (Kračmar, Chrástková, Bačáková et al., 2016). Running is also very effective tool for increasing

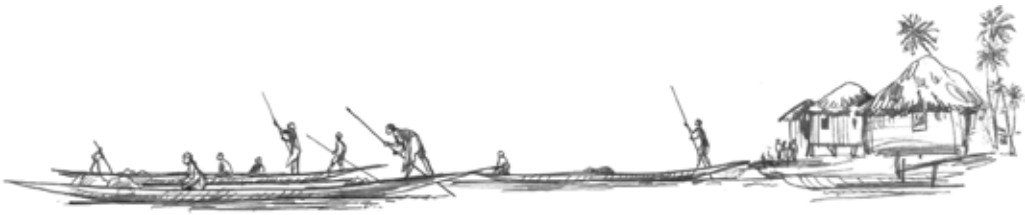
of physical condition, and reducing percentage of fat. Otherwise, according to Kračmar (2007), running is a serie of interlinked "jumps", because in the contrary of walking, running is entirely missing the double support phase, which also defines also Véle (2006). And exactly this fact may be for many inexperienced overweight runners a big problem excessive burden on joints of lower limbs. That may lead to various smaller but also fatal injuries, and also to antipathy to sport.

From the view of animal species evolution is evident, that the human locomotor system is organized according to crossover diagonal locomotor pattern. As shown below, there exist a diagonal muscular chains going from the upper limb to the opposite lower limb, which have their ancient origin from the period of quadrupedy (evolutionarily young event of upright figure can not change this archetype of muscle). These chains are activated if the power for forward movement generates the shoulder girdle. Taking into consideration above mentioned general extension of stabilization dysfunction of the lumbar spine and one of solution of this problem is involvement of shoulder girdle. Diagonally chained muscular functions in the front and back side of body can help the stabilization of lumbar spine (it is not possible to consider them as alternative to therapeutic intervention). The only locomotion made only by shoulder girdle is paddling, where the upper limbs are not reacting to propulsion power (similar situation is known as Olympic climbing, but this type of sport is for the majority of people because of the power requirements impracticable). While paddling, the virtual place for the support on the blade is made (de facto on hand), and to this place is magnetized the whole locomotor system with a boat. Actually favourite form of outdoor activities is sea kajaking, which is relatively undemanding also for individuals with lower level of technical paddling.

Sea kayak

In canoe sportsworld see the proper alternative or compensation tool for running and also a proper start for overweight people sport. Paddling is archetypal human locomotion on water and through the ride on eskimo (inuit) kayak, on indian canoe or in form of paddling in shallow waters, as shown in Picture 4.

Picture 4 Paddling in shallow waters by Sumatra, as the archetypal manner of movement on the water surface. From modern canoe forms, we can find the alternative in paddleboarding (archives of authors).

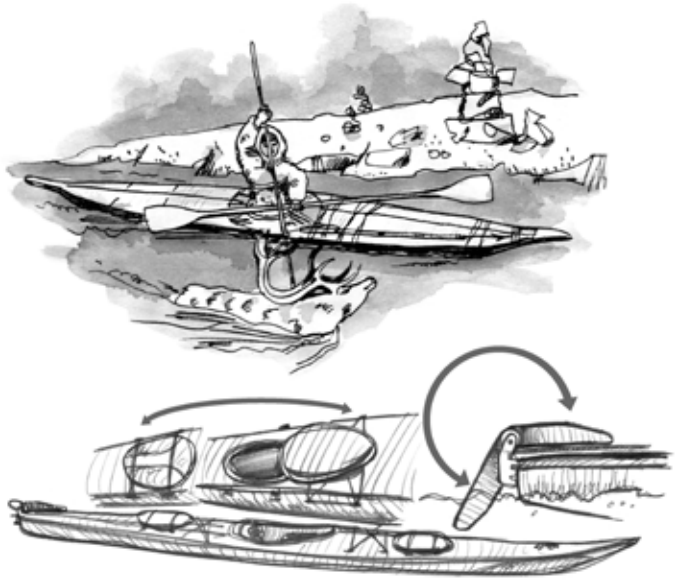


Sea kayak was for thousand years used for transport and fishing and big sea mammals. Aleuts were the only one north-american inhabitants, who hunted the whales from kayaks. Kayak was in the area of Greenland and Aleutian Islands important for local tribes surviving, and it became the part of mythology and culture. Europe first met with inuit kayaks through polar researcher Nansen, who brought a few kayaks from his expeditions. In the last years in Czech Republic, thanks to the climatic changes and permanent water scarcity in rivers, the sea kajaking became popular form of water tourism on the water surfaces. Modern sea kayaking is not different from its ancestors at all. It is a vessel designed for speed ride in waves and also for the economic paddling on calm water due to rapid and conductive transverse „V" profile of ships at the tip to stern and steady „U" shape under the seat rider of promoting stability, see Picture 5 (Bílý, Kračmar, & Novotný, 2001).

Kayaks are usually between 4 and a half to 6 metres long, shorter kayaks are used for recreation rides or training in the surf, long kayaks for expeditions (Buckley, 2005). Kayaks intended for the general public are provided with the stern rudder, which is controlled by foot pedals. Some kayaks are equipped by skeg (retractable fin, located about a meter from the stern of kayak), which allows straight sailing even in strong winds or rough seas.

Mastering paddling leading by an experienced instructor easy. Against classic touristic kayaks (in

Picture 5 Aleuts manner of hunting from kayak and current sea kayaks with covers for luggage and tilt-controlled rudder pedals (author's archive).



Czech Republic is not paddling on kayak spread yet), is higher economic riding sea kayak a huge advantage. Sea kayak in pause of paddling rides still forwars and do not turns (inertia).

Thanks to the opportunity of manipulating kayak using the rudder and its stability has increased radius for the use of vessels on lakes, dams and running water on one side and on the other, it can be used and riders with lower levels of skills and experience with the operation of the vessel (O'Connell, 2010). By using ships made from polyetylen and thanks their resistance increases their success on Czech and foreign rivers.

Key moments for proper paddling on sea kayak

A key requirement is sitting in the boat so that the head and torso are upright, to avoid overloading the motor structures, especially in the area of neck, shoulders and loins. While technically correctly performed directly engages kayaking is due to the rotation of the shoulders and pulled the engagement arm to engage the muscles of the shoulder girdle and arm muscles so that the momentum led to an engagement surface. The blade is transmitted sequentially from the large muscles of the back and shoulder girdle over the muscles of the arm and forearm. Effect of muscle tension continues over the shoulder and scapula along the front and the rear side of the hull and through the thoracolumbar facie extends to the outer side of the knee to the head of fibula (fibula; see details below). By this the economy of ride rapidly rises. Balancing on the boat, for more, supports hardening called inner unit (Picture 3, the position I and II.) or intra-muscular units (Check 1999).

Health benefits of paddling on sea kayak

Since Taylor & McGruder (1996) started research the use of sea kayaks by people with vertebrogenic difficulties, by change of less important diagnosis, they found altogether positive influence of paddling with two-blades paddle. Powell (2005) characterized paddle-made injuries on sea kayak as "sprains, pulled muscles, bruises and scratches.". „In any case, it was not the emergence of vertebrogenic problems.

The cooperation of muscles and back as one functional unit describes Bogduk and Twoney in their book "Clinical Anatomy of the Lumbar Spine" (1991), this problematics processes also Kolář et al. (2011). Functional unit formed by combining the transverse abdominal muscles and internal oblique abdominal muscles with cover thoracolumbar facie that embraces the back muscles. It is a synergy of transverse abdominal muscle, posterior fibers of the internal oblique abdominal muscles, pelvic floor muscles, paravertebral muscle m. multifidus and lumbar portions m. longissimus and with diaphragm. Inner muscle unit is self-neurologically

operated. That explains, why traditionally exercised muscles of abdomen are ineffective in process of hardening spine and also in reduction of chronical back-pain. If there are enough practicing of transverse abdominal muscles and pelvic floor muscles, then stability of spine, pelvis and rib cage is built. By this process, it arises the basis for the proper function of major muscles (Chrástková, 2009; Kolář, 2011). Diaphragm is by upright-seeing figure not only breathing muscle, but also important stabilisation muscle. In picture 3 in position III. is shown physiological (a) and pathological (b) situation of stabilization the hull. If by inhaling moves the lower part of the sternum (processus xiphoideus) upwards, the front side of diaphragm is rising. Thanks to this neurological control of inner function unit, the front part of pelvic floor is declaring. From the picture is evident „the widening scissors." Lower abdomen bulges outward, thereby reducing the pressure of the dorsal direction, exerted on the internal organs of the lumbar spine. Because of that stabilisation of lumbar spine takes paravertebral muscles, which are shortened and accentuate the lumbar lordosis with a significant threat to the intervertebral discs.

Check (1999) refers the fact, that when the external muscles are exercised, without inner drive to work properly, there will be inevitable unintended structural changes and injuries to the musculoskeletal system. Kolář et al. (2011) clearly formulates their primary function autochthonous musculature, ie. muscles closest spine, which is programmatically hidden handedness waves of fish that later gave rise to qadrupedic locomotor pattern of terrestrial vertebrates.

While paddling, among other things, these following long chains of cross muscular torso are applied, as defined Véle (2006): a) back side of torso: humerus from one side – m. latissimus dorsi – fascia thoracolumbalis – spine – crista iliaca (from second side) – fascia glutea – m. gluteus maximus – fascia lata – m. tensor fasciae latae – fibula, b) front side of torso: humerus from one side – m. pectoralis major – fascis of front side of thoracis – (via the cervix of direct abdominal muscles on the other side) – mm. obliquui abdominis – ligamentum inguinale – fascie femoral – fascia lata – m. tensor fasciae latae – fibula. Both chains are crossing in the front, and also in the back side of thorso and strengthens it. It is evident that effective paddling participates also lower limbs (although they provide not propulsive function), but only stabilize them. Pišvejc (2006) found that the activation of the lower limbs takes not the place according to qadrupedic cruciate locomotor pattern. And without denying foot rests on a boat paddle shot is not effective. Not less important is the string firming shoulder girdle: chest - clavicula - m. deltoid - humerus - m. deltoid - scapula - muscles vane loops - chest. This chain affects the relationship between the clavicle and the shoulder blade and cooperates with m. supraspinatus, m. biceps brachii (abduction), m. trapezius and loops around the blade (Véle, 2006). In these days for below typical "hunched" sitting at office desks and computers these muscles very easily atrophy, which was signed on overall posture. Paddling thus gives a great opportunity to restore the function of these muscles and the functional chains and help correct posture.

Linking of muscle chains from hand to the head of fibula firms generally problematic area of the lumbar spine. This situation occurs while paddling on kayak. But it is important to state, that paddling, wall climbing, Nordic walking and other forms where shoulder girdle is involved into the locomotion, stabilize lumbar spine only actually. It is not replacing the correction of unstabilized "core"- the inner function unit, and insufficient function of the inner layer of the spinal muscles. This topic is concerned with breathing exercises or Kolář concept „Dynamic Neuromuscular Stabilization" (Kolář, 2011).

Muscle m. serratus anterior mainly influences the position and adjusting the scapula, which for paddling, as locomotion is realized solely through the shoulder girdle thing of utmost importance (Wassinger et al., 2010). According to Mrůzková (2011) m. serratus anterior presets scapula for paddel shot (while paddling on a climbing wall, swimming techniques crawl, while cross-country skiing, rope climbing, crawling, climbing a ladder, etc.). And this art of proper setting of scapula for locomotion can help a lot, for proper setting of oriented posture (Kračmar, Chrástková, Bačáková et al., 2016) and the art of upright-seeing figure, which we are thanks to life-siiting style loosing.

Energetic output in recreational paddling sea kayaks is not among the highest (Zamparo, Capelli, & Guerrini, 1999), but while paddling upstream or in the waves on the sea is rapidly increasing. In the year 1972 Lammert (1972) monitored the energetic severity of eskymo hunters ride, and he found similar claims as by other forms of hunting, so claims on the level of aerobic coverage (Shepard, 1978). We can find sea kayaking as form of water tourism, because on this ship we can easily apply the training

programs for increase of function capacity of organism or reduction of weight (interval or repeting trainings, aerobic level trainings etc.).

Conclusion

Paddling on this type of ship was again-founded as historically proven effective form of archetypal drive to large bodies of water, and waves. Sea kayaking brings health benefits same as riding similar ships. And that's mainly because forward movement provides unlike the normal life the shoulder girdle. Thanks to the benefits of driving abilities sea kayak allows paddling also for less-experienced people. Linking muscle chains on the front and back side of torso helps to stabilize the spine. But in case of a non-physiological work called inner functional unit (diaphragm, pelvic floor, lower part of the abdomen) paddling is not universal cure, it must be followed by rehabilitation therapeutic intervention.

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