여성호르몬과 림프 및 근막순환

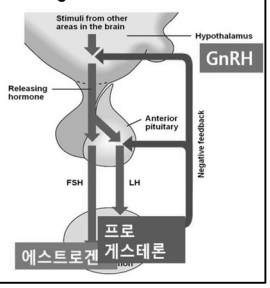
임 상 원

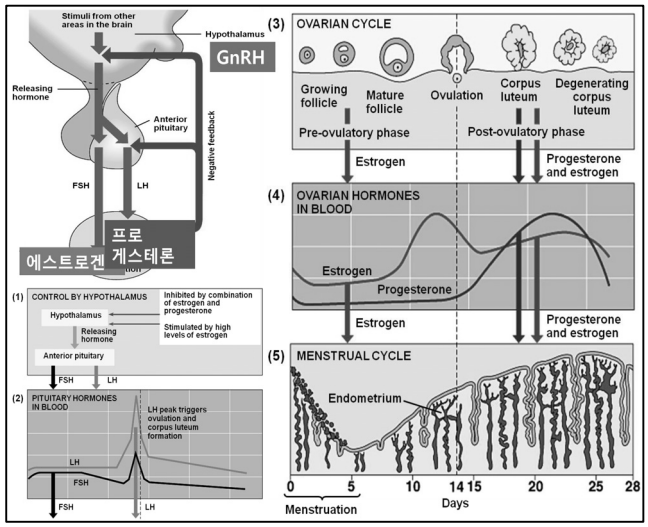
생활습관병예방운동센터

심포지엄 : 건강기능식품, 어떻게할 것인가?

여성 호르몬의 이해

- 뇌하수체에서 분비되는 성선자극호르몬인 난포자극호르몬(follicle stimulating hormone, FSH)과 황체형성호르몬(lutenising hormone, LH)은 시상하부에서 분비되는 성선자극호르몬방출호르몬(gonadotropin-releasing hormone, GnRH)에 의한 조절 및 성호르몬의 되먹임 기전에 의해 그 분비가 조절된다.
- 생리 주기 중 난포기에서 황체기로 넘어가는 시기에 배란이 일어난다.





Fascial tissue에 영향을 미치는 호르몬들

From fascia in sport and movement(HANDSPRING PUBLISHING)

1. **Insulin**
   - anabolic effect and enhances myofibroblast proliferation in vitro.
2. **Thyroid hormone**
   - promote fibroblast expansion and counteract apoptosis in connective tissue.
3. **Oestrogen**
   - Challenge leads to reduction in collagen synthesis, and fibroblast proliferation in vitro.
4. **Corticosteroid hormones(cortisol)**
   - Does-dependent interaction
5. **Relaxin**
   - Stimulate the breakdown of collagen

4

European Journal of Histochemistry 2016; volume 60:2710

Hormone receptor expression in human fascial tissue

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Abstract

Many epidemiologic, clinical, and experimental findings point to sex differences in myofascial pain in view of the fact that adult women tend to have more myofascial problems with respect to men. It is possible that one of the stimuli to sensitization of fascial nociceptors could come from hormonal factors such as estrogen and relaxin, that are involved in extracellular matrix and collagen remodeling and thus contribute to functions of myofascial tissue. Immunohistochemical and molecular investigations (real-time PCR analysis) of relaxin receptor 1 (RXFP1) and estrogen receptor-alpha (ERα) localization were carried out on samples of human fascia collected from 8 volunteers patients during orthopedic surgery (all females, between 42 and 70 yrs, divided into pre- and post-menopausal groups), and in fibroblasts isolated from deep fascia, to examine both protein and RNA expression levels. We can assume that the two sex hormone receptors analyzed are expressed in all the human fascial districts examined and in fascial fibroblasts culture cells, to a lesser degree in the post-menopausal with respect to the pre-menopausal women. Hormone receptor expression was concentrated in the fibroblasts, and RXFP1 was also evident in blood vessels and nerves. Our results are the first demonstrating that the fibroblasts located within different districts of the muscular fasciae express sex hormone receptors and can help to explain the link between hormonal factors and myofascial pain. It is known, in fact, that estrogen and relaxin play a key role in extracellular matrix remodeling by inhibiting fibrosis and inflammatory activities, both important factors affecting fascial stiffness and sensitization of fascial nociceptors.

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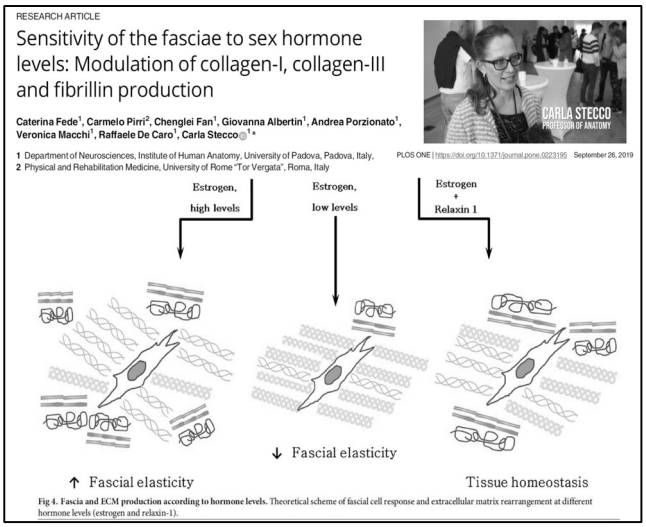
Key words: Fascia; fascial fibroblasts; estrogen; relaxin; immunostaining.


RESEARCH ARTICLE

Sensitivity of the fasciae to sex hormone levels: Modulation of collagen-I, collagen-III and fibrillin production

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PLOS ONE | https://doi.org/10.1371/journal.pone.0223195 September 26, 2019

CARLA STECCO PROFESSOR OF ANATOMY

Estrogen, high levels

Estrogen, low levels

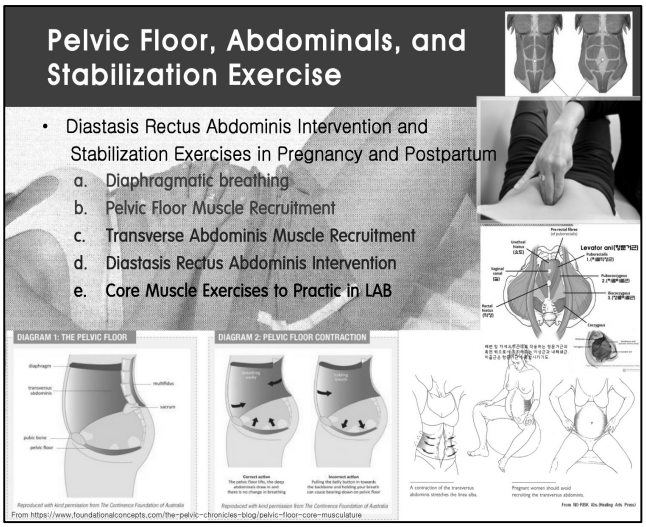
Estrogen + Relaxin 1

↓ Fascial elasticity

↑ Fascial elasticity

Tissue homeostasis

Fig 4. Fascia and ECM production according to hormone levels. Theoretical scheme of fascial cell response and extracellular matrix rearrangement at different hormone levels (estrogen and relaxin-1).

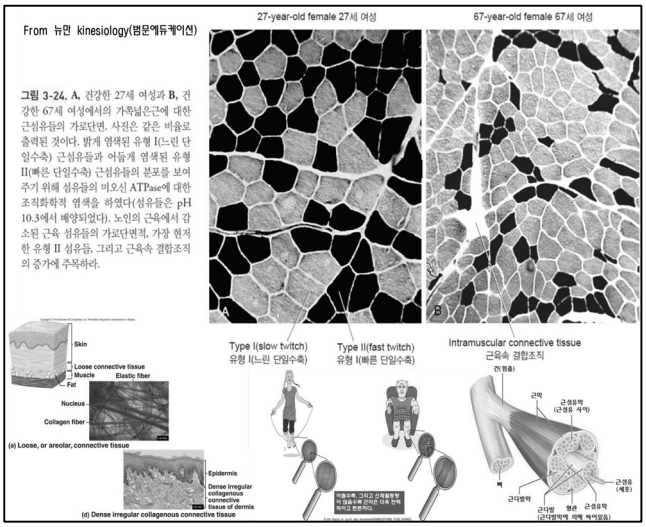

Pelvic Floor, Abdominals, and Stabilization Exercise

- Diastasis Rectus Abdominis Intervention and Stabilization Exercises in Pregnancy and Postpartum
  - a. Diaphragmatic breathing
  - b. Pelvic Floor Muscle Recruitment
  - c. Transverse Abdominis Muscle Recruitment
  - d. Diastasis Rectus Abdominis Intervention
  - e. Core Muscle Exercises to Practic in LAB

DIAGRAM 1: THE PELVIC FLOOR

DIAGRAM 2: PELVIC FLOOR CONTRACTION

From https://www.foundationalconcepts.com/the-pelvic-chronicles-blog/pelvic-floor-core-musculature


From 뉴만 kinesiology(범문에듀케이션)

27-year-old female 27세 여성

67-year-old female 67세 여성

그림 3-24. A, 건강한 27세 여성과 B, 건강한 67세 여성에서의 가쪽넓은근에 대한 근섬유들의 가로단면. 사진은 같은 비율로 출력된 것이다. 밝게 염색된 유형 I(느린 단일수축) 근섬유들과 어둡게 염색된 유형 II(빠른 단일수축) 근섬유들의 분포를 보여주기 위해 섬유들의 미오신 ATPase에 대한 조직화학적 염색을 하였다(섬유들은 pH 10.3에서 배양되었다). 노인의 근육에서 감소된 근육 섬유들의 가로단면적, 가장 현저한 유형 II 섬유들, 그리고 근육속 결합조직의 증가에 주목하라.

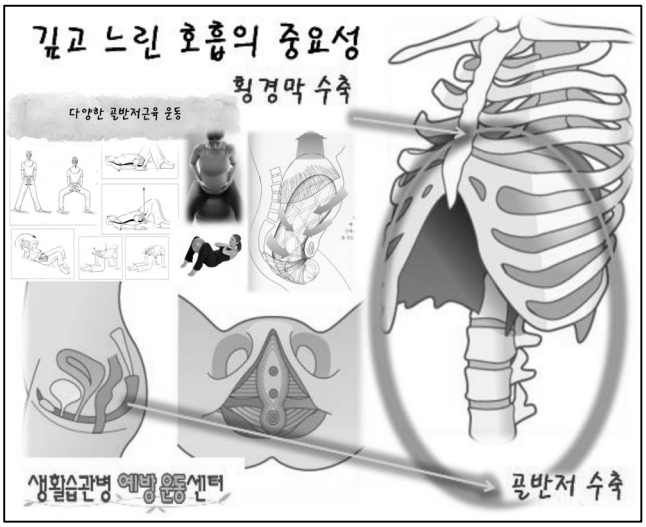
Skin
Loose connective tissue
Muscle
Elastic fiber
Fat
Nucleus
Collagen fiber
(a) Loose, or areolar, connective tissue

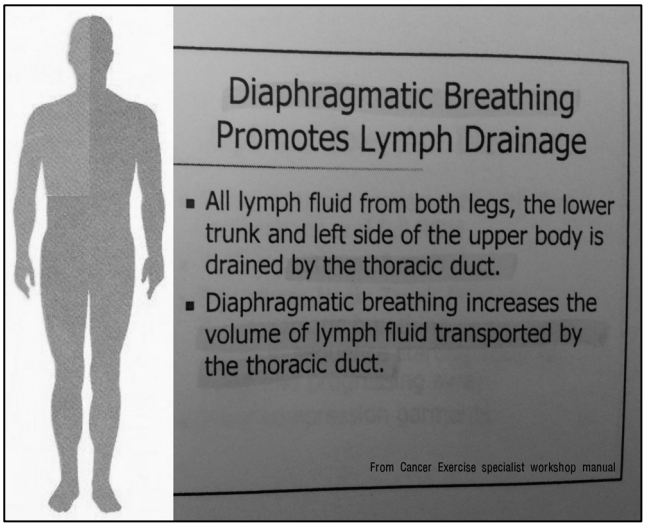
Epidermis
Dense irregular collagenous connective tissue of dermis
(d) Dense irregular collagenous connective tissue

Type I(slow twitch) 유형 I(느린 단일수축)

Type II(fast twitch) 유형 II(빠른 단일수축)

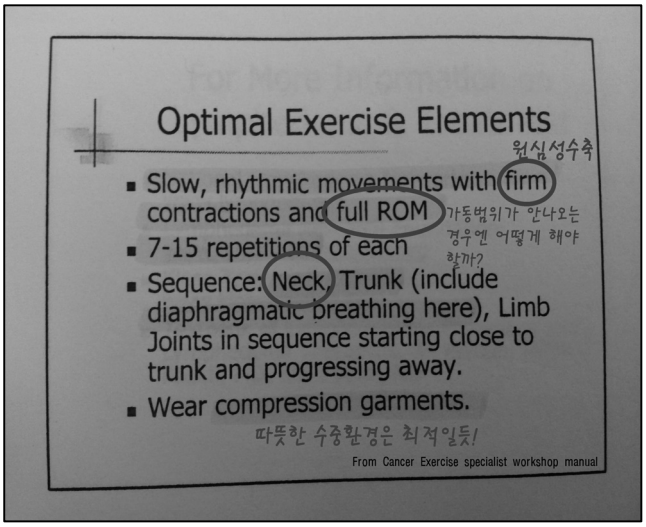
Intramuscular connective tissue 근육속 결합조직




Diaphragmatic Breathing Promotes Lymph Drainage

- All lymph fluid from both legs, the lower trunk and left side of the upper body is drained by the thoracic duct.
- Diaphragmatic breathing increases the volume of lymph fluid transported by the thoracic duct.

From Cancer Exercise specialist workshop manual


Optimal Exercise Elements

원심성수축

- Slow, rhythmic movements with firm contractions and full ROM
- 7-15 repetitions of each
- Sequence: Neck, Trunk (include diaphragmatic breathing here), Limb Joints in sequence starting close to trunk and progressing away.
- Wear compression garments.

가동범위가 안나오는 경우엔 어떻게 해야 할까?

따뜻한 수중환경은 최적일듯!

From Cancer Exercise specialist workshop manual

림프순환 운동법

1. 느리고 리드미컬한 힘있는 근수축과 함께 하는 스트레칭운동(원심성 수축운동)에 의한 피부의 늘어나는 자극이 림프관의 운동성을 원활하게 한다.
2. 80%를 차지하는 천층의 림프관은 피부의 늘어나는 자극에 의해, 그리고 20%를 차지하는 심부의 림프관은 횡격막 호흡 및 근수축에 의존한다(심장과 같은 펌프작용이 없음).
3. 횡격막 호흡 및 목의 스트레칭부터 실시하여 림프의 흐름을 원활히 한 후 몸의 중심부 쪽(견갑대, 골반부위)의 운동부터 시작해서 말단의 손과 발의 운동으로 순서를 따르는 것이 무척 중요하다.

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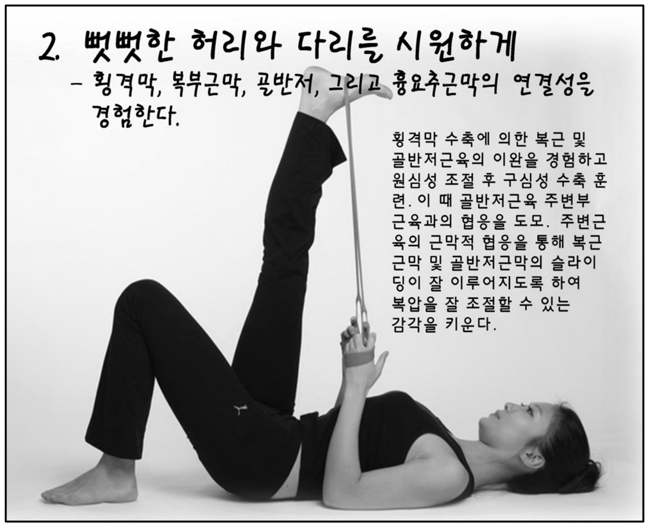

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frontiers in NEUROSCIENCE

REVIEW ARTICLE
published: 24 November 2014
doi: 10.3389/fnins.2014.00380

Menstrual cycle influence on cognitive function and emotion processing—from a reproductive perspective

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Table 5 | Menstrual cycle studies including fMRI with emotional stimuli.

Author	Subjects	Cycle phases	Task	Behavioral results	Contrast	ROI analyses	Whole Brain analyses
Gingnell et al., 2013a	14 NC	6–12/22–27	Neg. and pos. images and the anticipation thereof	No effect of phase	Neg. > pos.	n.a.	None
Protopopescu et al., 2005	12 NC	8–12/–23–27	Go NoGo emotional words	n.a.	Neg. Go > neu Go	n.a.	↑↓ OFC in the luteal phase
					Pos. Go > neu Go	n.a.	↑ ACC in the luteal phase
					Neg. NoGo > neu NoGo	n.a.	↑ OFC in the luteal phase
Gingnell et al., 2012	15 NC	6–12/22–27	Facial emotion recognition	No effect of phase	Angry & afraid faces > shapes	↑ amygdala in luteal phase	n.a.
Gingnell et al., 2013b	17 NC	1–10/15–21	Facial emotion recognition	no effect of phase	Angry & afraid faces > shapes	↓ amygdala in luteal phase	n.a
Andreano and Cahill, 2010	17 NC	1–7/18–24	Neg. and neutral images	n.a.	Neg. > neutral	↑ amygdala and hippocampus in luteal phase	↑ IFG, fusiform gyrus, cerebellum, CN in the luteal phase
Goldstein et al., 2005	12 NC	2–3/16–18	Neg. and neutral images	n.a.	Neg. > neutral	↑ BA 40, BA 423 in late follicular ↓ ACC, hypothalamus, brain stem, OFC, amygdala, BA 47, BA 10, BA 18, BA 19, BA 37, BA 30, BA 23, BA 39, cerebellum in late follicular	n.a.
Bayer et al., 2014	22 NC	0–4/17–23	Encoding of neg., pos. and neutral images	↓ recollection of negative stimuli in luteal phase	Emotional (hit>miss) > neutral (hit>miss)	↓ hippocampus in luteal phase	n.a.
					Negative (hit>miss) > neutral (hit>miss)	↑ amygdala in luteal phase	n.a.
					Positive (hit>miss) > neutral (hit>miss)	↓ ACC in the luteal phase	n.a
Rupp et al., 2009	10 NC	10–12/19–23	Evaluation of attractiveness in houses and faces	No effect of phase	Faces > houses	n.a.	↓ OFC in luteal phase
CROSS-SECTIONAL							
Derntl et al., 2008a	22 NC	1–14/15–28	Facial emotion recognition	↓ recognition accuracy in luteal phase	Emotional faces > cross hair	↓ amygdala in the luteal phase	↓ hippocampus in the luteal phase
					Disgusted faces > cross hair	n.a.	↓ fusiform gyrus in the luteal phase
					Sad faces > cross hair	n.a.	↓ MTG in the luteal phase
					Neutral faces > cross hair		↓ hippocampus in the luteal phase
Zeidan et al., 2011	34 NC	Low E2/High E2	Fear conditioning and extinction	No effect of group	CS+ > CS-	None	n.a.
				No effect of group	Late CS+E > early CS+E	↑ mPFC in high E2	n.a.
				↑ extinction memory in high E2	first CS+E > first CS+NE	↑ mPFC and amygdala in high E2	n.a.

NC, normal cycling; E2, estradiol; neg., negative; pos., positive; neu, neutral; ACC, anterior cingulate cortex; dmPFC, dorsomedial prefrontal cortex; dlPFC, dorsolateral prefrontal.

OPINION

AUGUST 2002 | VOLUME 3 www.nature.com/reviews/neuro

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How do you feel? Interoception: the sense of the physiological condition of the body

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doi:10.1038/nrn894

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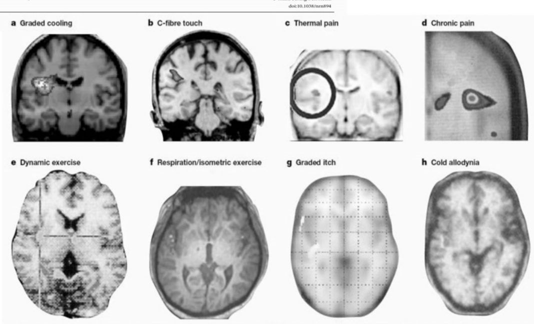


Figure 4 | **Activation of the interoceptive cortex in the dorsal posterior insula by various modalities. a** | Graded cooling (reproduced, with permission, from REF. 5 © 2000 Macmillan Magazines Ltd). **b** | Sensual (limbic) touch evoked by slow brushing in a polyneuropathy patient with only C-mechanoreceptor activation (reproduced, with permission, from REF. 101 © 2002 Macmillan Magazines Ltd). **c** | Thermal pain (reproduced, with permission, from REF. 91 © 2002 Elsevier Science). **d** | Chronic pain (reproduced, with permission, from REF. 92 © 2001 International Association for the Study of Pain). **e** | Dynamic exercise on a bicycle (reproduced, with permission, from REF. 96 © 1999 The American Physiological Society). **f** | Forced respiration and isometric exercise with a hand grip (reproduced, with permission, from REF. 95 © 1999 John Wiley & Sons). **g** | Graded itch elicited by cutaneous histamine injection (reproduced, with permission, from REF. 94 © 2001 International Association for the Study of Pain). **h** | Cold allodynia (reproduced, with permission, from REF. 93 © 2000 International Association for the Study of Pain).

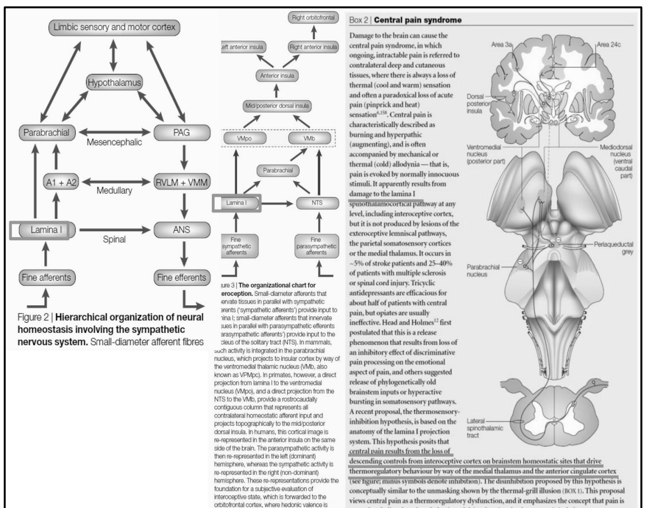


Figure 2 | **Hierarchical organization of neural homeostasis involving the sympathetic nervous system.** Small-diameter afferent fibres

ure 3 | **The organizational chart for eroception.** Small-diameter afferents that ervate tissues in parallel with sympathetic erents ('sympathetic afferents') provide input to nina I; small-diameter afferents that innervate sues in parallel with parasympathetic efferents arasympathetic afferents') provide input to the cleus of the solitary tract (NTS). In mammals, such activity is integrated in the parabrachial nucleus, which projects to insular cortex by way of the ventromedial thalamic nucleus (VMb, also known as VPMpc). In primates, however, a direct projection from lamina I to the ventromedial nucleus (VMpo), and a direct projection from the NTS to the VMb, provide a rostrocaudally contiguous column that represents all contralateral homeostatic afferent input and projects topographically to the mid/posterior dorsal insula. In humans, this cortical image is re-represented in the anterior insula on the same side of the brain. The parasympathetic activity is then re-represented in the left (dominant) hemisphere, whereas the sympathetic activity is re-represented in the right (non-dominant) hemisphere. These re-representations provide the foundation for a subjective evaluation of interoceptive state, which is forwarded to the orbitofrontal cortex, where hedonic valence is represented in mammals.

Box 2 | **Central pain syndrome**

Damage to the brain can cause the central pain syndrome, in which ongoing, intractable pain is referred to contralateral deep and cutaneous tissues, where there is always a loss of thermal (cool and warm) sensation and often a paradoxical loss of acute pain (pinprick and heat) sensation[6,158]. Central pain is characteristically described as burning and hyperpathic (augmenting), and is often accompanied by mechanical or thermal (cold) allodynia — that is, pain is evoked by normally innocuous stimuli. It apparently results from damage to the lamina I spinothalamocortical pathway at any level, including interoceptive cortex, but it is not produced by lesions of the exteroceptive lemniscal pathways, the parietal somatosensory cortices or the medial thalamus. It occurs in ~5% of stroke patients and 25–40% of patients with multiple sclerosis or spinal cord injury. Tricyclic antidepressants are efficacious for about half of patients with central pain, but opiates are usually ineffective. Head and Holmes[12] first postulated that this is a release phenomenon that results from loss of an inhibitory effect of discriminative pain processing on the emotional aspect of pain, and others suggested release of phylogenetically old brainstem inputs or hyperactive bursting in somatosensory pathways. A recent proposal, the thermosensory-inhibition hypothesis, is based on the anatomy of the lamina I projection system. This hypothesis posits that central pain results from the loss of descending controls from interoceptive cortex on brainstem homeostatic sites that drive thermoregulatory behaviour by way of the medial thalamus and the anterior cingulate cortex (see figure; minus symbols denote inhibition). The disinhibition proposed by this hypothesis is conceptually similar to the unmasking shown by the thermal-grill illusion (BOX 1). This proposal views central pain as a thermoregulatory dysfunction, and it emphasizes the concept that pain is not only a feeling, but also a behavioural drive that signals a homeostatic imbalance.

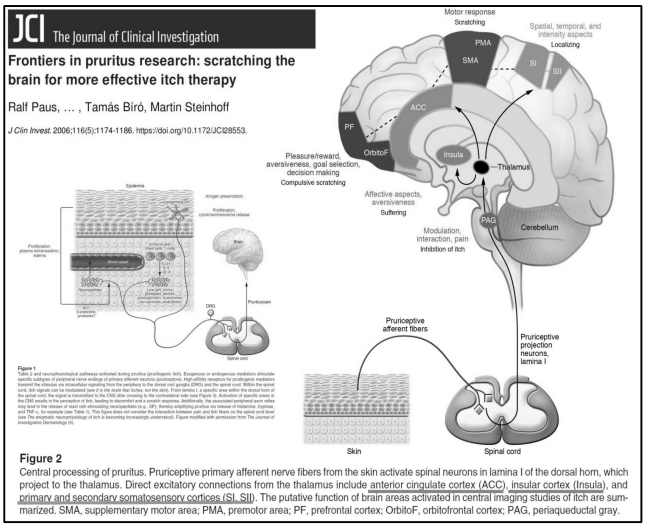
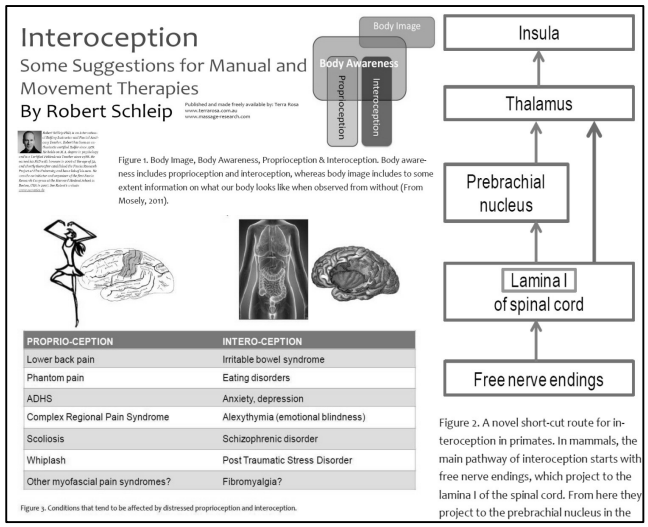


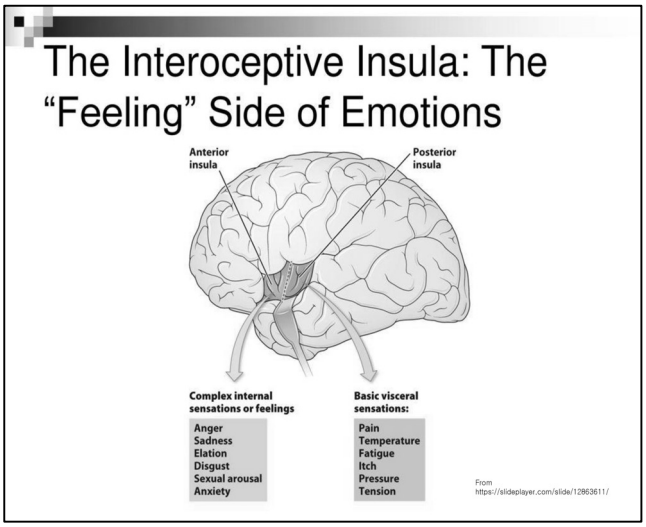
Figure 2
Central processing of pruritus. Pruriceptive primary afferent nerve fibers from the skin activate spinal neurons in lamina I of the dorsal horn, which project to the thalamus. Direct excitatory connections from the thalamus include anterior cingulate cortex (ACC), insular cortex (Insula), and primary and secondary somatosensory cortices (SI, SII). The putative function of brain areas activated in central imaging studies of itch are summarized. SMA, supplementary motor area; PMA, premotor area; PF, prefrontal cortex; OrbitoF, orbitofrontal cortex; PAG, periaqueductal gray.

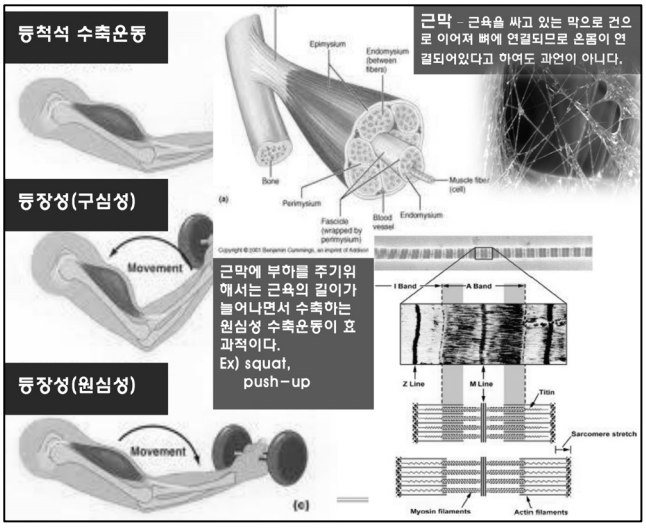


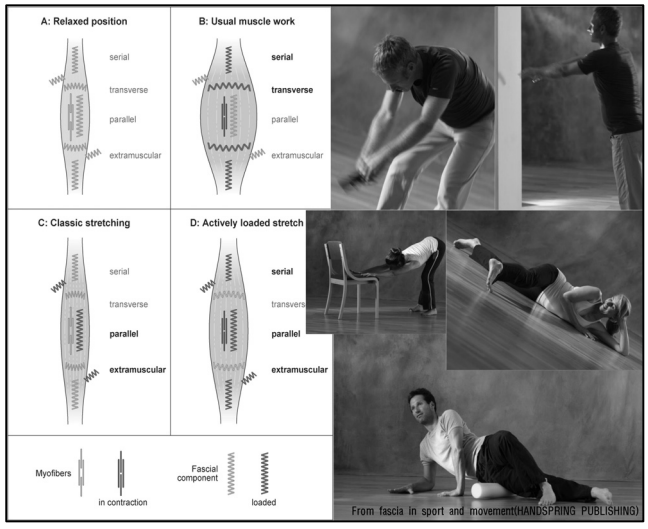
PROPRIO-CEPTION	INTERO-CEPTION
Lower back pain	Irritable bowel syndrome
Phantom pain	Eating disorders
ADHS	Anxiety, depression
Complex Regional Pain Syndrome	Alexythymia (emotional blindness)
Scoliosis	Schizophrenic disorder
Whiplash	Post Traumatic Stress Disorder
Other myofascial pain syndromes?	Fibromyalgia?

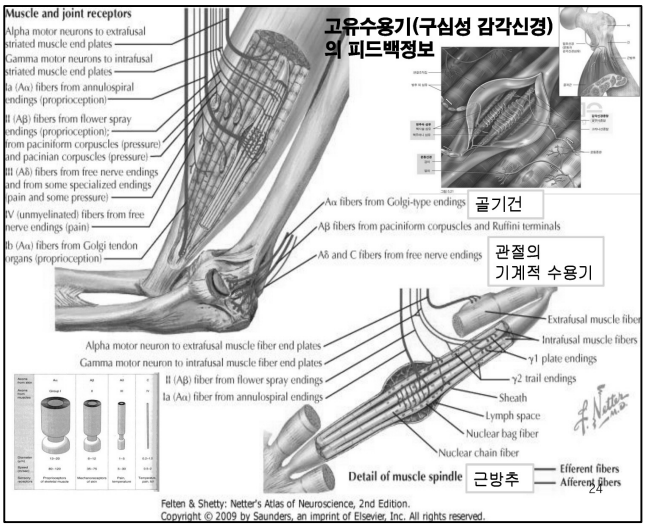
Figure 3. Conditions that tend to be affected by distressed proprioception and interoception.

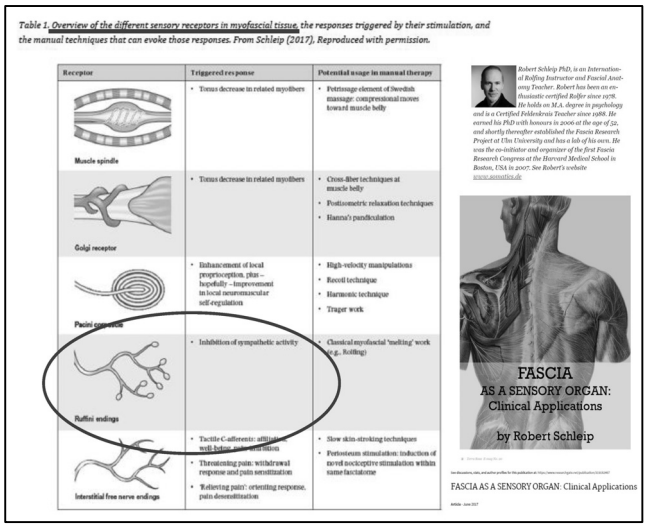
Figure 2. A novel short-cut route for interoception in primates. In mammals, the main pathway of interoception starts with free nerve endings, which project to the lamina I of the spinal cord. From here they project to the prebrachial nucleus in the

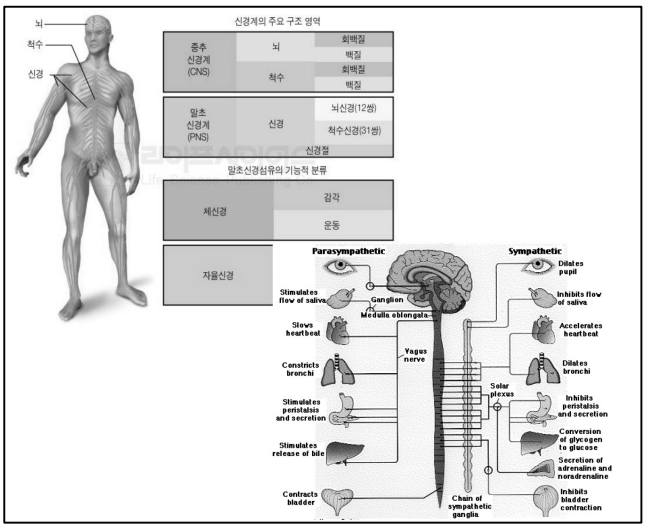












생활습관병 예방증진센터

1) 바른 호흡

- Diaphragmatic Breathing[횡격막 호흡]을 원활히 할 수 있도록 도움줄 수 있는 방법은?
  - ✓ 부교감신경계를 활성화시킬 수 있는 움직임 훈련을 통해
    - a. 심장에 부하가 가해져야[HPA axis 조절]
    - b. Skin stretch[교감신경↓]
    - c. Cranio-sacral outflow 가능한 바르고 기능적인 자세조절능력

2) 바른 자세

- 전 관절가동범위 운동이 가능한 기능적인 몸 만들기를 통한 각 관절의 바른 정렬

3) 리드미컬한 움직임[쭉쭉 힘있게 늘려주는]

- 림프순환 : skin stretch
- 근막 순환: fascia는 tensional load에 반응
- 심폐혈관계 순환을 도모하는 대근육운동과 함께

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생활습관병 예방증진센터

Stress 조절이 무엇보다도 우선시 되어야

- Fight or flight➡ 연료인 혈당 상승
  - ➡ 대사증후군, 우울증, 치매, 근골격계 통증, 암 [생활습관병]

여성의 두려움?

- Mensturation - 생리전증후군, 생리통
- Sexual problem - 성교통, 난임, 불임
- Delivery[prenatal & postnatl problem]
  - - 산후우울증, 복직근이개, 스트레스성 요실금
- Menopause[mentalpause]
  - - 자율신경실조증, 안면홍조, 야간발한, 절박성 요실금
- Fear of falling[osteoporosis]

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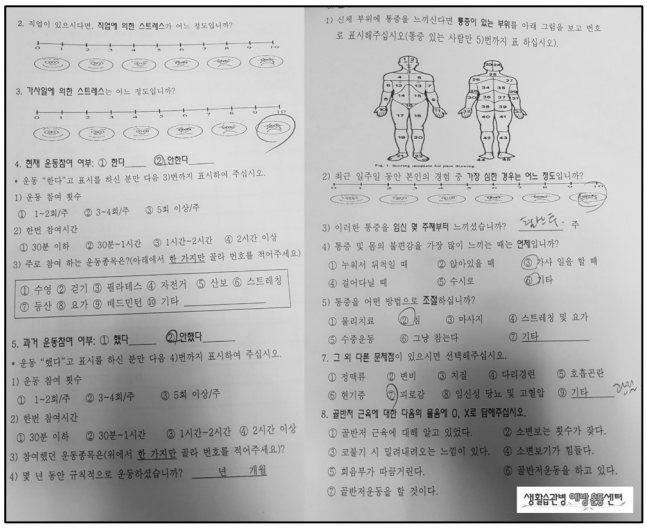

참고문헌

대한스포츠의학연구회 역(2012). 근골격계 질환의 진단 및 재활치료. 한미의학.

임상원(2009). 임상원의 X라인 10분 3회. 정담미디어.

채윤원 외 역(2011). 뉴만 Kinesiology. (주)범문에듀케이션.

APTA(2013). Fundamental Topics in Pregnancy and Postpartum course manual

Blandine Calais-Germain(2008). NO-RISK Abs. Healing Arts Press.

Diane Lee(2011). The Pelvic Girdle. Elsevier LTD.

Diane Lee(2018). The Thorax. Handspring Publishing LTD.

Janet A Hulme MA(2008). Beyond kegels. Phoenix Publishing Co.

Josephine Key(2018). Freedom to Move. Handspring Publishing LTD.

Robert Schleip(2015). Fascia in sport and movement. Handspring Publishing LTD.