

Leon Botes

E-M-FLEX

Joining the dots...



E-M-FLEX
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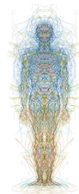


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Pain in Australia

According to the 2020-21 report released by the Australian Institute for Health and Welfare [1],

- One in 5 Australians aged 45 and over are living with persistent, ongoing pain.
- In 2018, chronic pain cost an estimated \$139 billion in Australia, mostly through reduced quality of life and productivity losses.
- In 2016, almost 1 in 5 (19%, or 1.6 million) Australians aged 45 and over reported having chronic pain.
- Chronic pain was 1.8 times as high for women aged 85 and over (28%) as women aged 45–54 (16%). Among men, chronic pain was 1.3 times as high in those aged 85 and over (18%) as in those aged 45–54 (13%). Overall, women had higher rates of chronic pain (21%) than men (17%). According to a different data source, the ABS Survey of Disability, Ageing and Carers, chronic pain rates in adults aged 45 and over remained stable between 2003 and 2015 for both males (20%) and females (25-26%) (ABS 2005, 2012, 2014, 2016).
- Several factors increase the likelihood of developing chronic pain, including being female, increasing age, genetic predisposition and environmental influences, such as socioeconomic disadvantage. Many behavioural risk factors have also been linked to chronic pain, including physical inactivity, smoking, and being overweight or obese.
- Several long-term health conditions are associated with chronic pain. Musculoskeletal conditions (for example, arthritis and back pain), cardiovascular diseases, diabetes, asthma, stroke, and bowel disease may be associated with increased risk of experiencing chronic pain [1].

The following key findings regarding the experience of stressors and bodily pain in Australia for the reference period 2020-21, was reported as:

- 43.7% of adults experienced one or more stressors such as illness or bereavement
- Women were more likely to experience one or more stressors compared to men (45.0% compared to 42.2%)
- Seven in ten (71.1%) adults experienced bodily pain in the four weeks prior to the survey [1].

For the period 2020-2021, 43.7% of people aged 18 years and over experienced one or more stressors, while one in five (20.0%) experienced two or more stressors, in the preceding 1 months:

- Women were more likely to experience one or more stressors compared to men (45.0% compared to 42.2%)
- Similarly, women were more likely to experience two or more stressors compared to men (22.0% compared to 18.0%)
- Younger people were more likely to experience stressors with 48.3% of people aged 18-24 experiencing one or more stressors compared to 34.8% of people aged 65 years and over [1].

During 2020-21, seven in ten (71.1%) people aged 18 years and over experienced bodily pain in the preceding four weeks:

- Almost half (46.7%) experienced very mild or mild bodily pain
- 18.1% experienced moderate bodily pain
- 6.4% experienced severe or very severe bodily pain
- Of those who experienced bodily pain, 62.6% reported interference with their work in the last four weeks [1].

People aged 75 years and over were more likely to experience bodily pain in the last four weeks compared to people aged 18-24 years:

- Overall, 84.0% experienced bodily pain compared to 55.8%
- 10.6% experienced severe or very severe pain compared to 2.4%
- 29.0% experienced moderate pain compared to 10.1%
- Both age groups experienced similar rates of very mild or mild pain (43.9% and 43.1%) [1].

Women were more likely than men to experience bodily pain and have bodily pain interfere with work in the last four weeks:

- 73.9% of women aged 18 years and over experienced bodily pain compared to 68.2% of men
- 63.2% of women aged 18-24 years experienced bodily pain compared to 47.8% of men
- 66.1% of women aged 18 years and over experienced interference with work compared to 58.4% of men [1].

Definition of pain

Since 1979 the International Association for the Study of Pain (IASP) have been using the following definition: *'An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.'*[2]

In 2020, the IASP officially provided an updated definition of 'pain' [3]: Pain is 'an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage', and is expanded upon by the addition of six key notes and the etymology of the word pain for further valuable context.

1. Pain is always a personal experience that is influenced to varying degrees by biological, psychological, and social factors.
2. Pain and nociception* are different phenomena. Pain cannot be inferred solely from activity in sensory neurons.
3. Through their life experiences, individuals learn the concept of pain.
4. A person's report of an experience as pain should be respected.
5. Although pain usually serves an adaptive role, it may have adverse effects on function and social and psychological well-being.
6. Verbal description is only one of several behaviours to express pain; inability to communicate does not negate the possibility that a human or a nonhuman animal experiences pain [3].

* 'Nociception refers to the central nervous system (CNS) and peripheral nervous system (PNS) processing of noxious stimuli, such as tissue injury and temperature extremes, which activate nociceptors and their pathways. Pain is the subjective experience one feels as a result of the activation of these pathways' [4,5].

Pain at cellular level

When thermal, mechanical, or chemical stimuli reach high levels of intensity which could cause injury or harm, they are detected by nociceptors, which are a subpopulation of peripheral nerve fibres found in the skin, joints, viscera, bone, and muscle [4,5].

When tissues are damaged it releases and produces numerous *factors* which in turn activate nerve endings. These factors include but are not limited too; globulin, protein kinases, arachidonic acid, histamine, nerve growth factor (NGF), substance P (SP), calcitonin gene-related peptide (CGRP) [4,5].

These factors cause the stimulation of transducer channels, with transient receptor potential (TRP) channels being the primary example. TRP channels function similarly to voltage-gated potassium channels or nucleotide-gated channels and therefore help to initiate receptor potentials, consequently inducing an action potential in the nerve fibres [4,5].

The organs and systems involved in pain

Although nociceptors are present in the viscera, skin, joints, bone, and muscle of the human body, it is not found in the CNS. This is the rationale for why awake craniotomy is possible, and not painful for the patient [4–7].

The specific sensory modalities leading to nociception differ depending on the type of tissue: [4–7].

- In **skin**, noxious stimuli are commonly thermal, mechanical (a cut), and chemical (exogenous allergens)
- In the **joints**, noxious stimuli are commonly caused by mechanical stress (excessive joint use) and chemical inflammation
- In the **visceral organs**, mechanical distension, traction as well as chemical irritants are usually responsible for nociceptive signals
- In the **muscles**, strenuous mechanical exertion (blunt force, over-stretching) and chemical modalities are most common

Nociceptive signalling to the brain is what leads the perception of pain. The complex biopsychosocial phenomenon of pain occurs in the cortical and subcortical regions, such as the thalamus, amygdala, hypothalamus, periaqueductal grey, basal ganglia and areas of the cerebral cortex. In most situations, nociception typically precedes the perception of pain, but there are clinical circumstances in which these interfaces do not overlap [4–7].

Nociception can occur without subsequent awareness of pain, and pain can be present without a measurable underlying noxious stimulus. For instance, the former may be observable following severe trauma when victims are remarkably pain-free despite massive injury; the latter may be observable with individuals suffering from functional pain syndromes who report substantial pain without signs of physical damage [4–7].

Significance of pain perception and causes

The characteristics of an individual's pain can offer indications regarding the causes or manner in which their pain has developed. Several classes of pain symptoms and possible diagnosis have been summarised in an article by Chen et al [4], they are:

Acute pain:

At the site of local tissue injury, the activation of nociceptive transducers contributes to this form of pain [4,7,8].

Chronic pain:

Persistent pain is frequently related to conditions (diabetes mellitus, arthritis, and tumour growth) which potentiates chronic tissue inflammation or alteration of the properties of peripheral nerves (neuropathic). Given the unrelenting nature of chronic pain, expectations are that external factors such as stress, emotions and the environment may produce a cumulative effect, along with the damaged tissue to enhance the intensity and persistence of the pain [4,7,8].

Somatic pain:

This form of pain may be acute or chronic. It is activated by the nociceptors in the cutaneous or deep tissues. In the case of cutaneous somatic pain, the case of a skin cut, it is described as sharp or burning and is localised. In the case of somatic pain arising from the deep tissues, such as in the joints, tendons, and bones, it is described as more throbbing or aching and is less localised [4,7,8].

Visceral pain:

This pain arises mainly from the viscera and deep somatic structures (pain from the gastrointestinal tract). Visceral pain that is not distinctly localized is carried via the C fibres from the deep structures to the spinal cord [4,7,8].

Neuropathic:

This persistent pain is often a consequence of damage to nerve fibres, leading to increased spontaneous firing or alterations in their conduction or neurotransmitter properties [4,7,8].

Allodynia:

Pain resulting from a harmless stimulus is referred to as allodynia. Though the mechanism is not fully understood, it is thought to potentially arise from 1) sensitization on the skin, leading to a decreased threshold of silent nociceptors or 2) damage to peripheral neurons inducing structural changes, leading touch-sensitive fibres to reroute and form synapses in areas of the spinal cord that normally receive pain input [4,7,8].

Hyperalgesia:

Occurs when noxious stimuli generate an exaggerated pain response. Similar mechanisms as proposed in the case of allodynia, with patients demonstrating amplification of pain or hyperalgesia, as well as an increase in duration that the pain persists [4,7,8]

Referred pain:

When there is pain perception at a location other than the site of the painful stimulus, it is known as referred pain. The classical example of referred pain involves pain in the neck, shoulders, and back following a myocardial infarction. There is no current consensus regarding the true mechanisms behind referred pain. It is hypothesised that referred pain may be visceral or somatic, with the former describing pain from an organ and the latter describing pain from the deep tissues such as muscles or joints. Somatic pain occurs when spinal structures such as discs or joints receive a noxious stimulus, and the pain is subsequently perceived to be localised in the deep tissues - most commonly in the lower extremity [4,7,8].

Lecture notes from the Meditation Association of Australia podcast

The following notes have been taken from an online panel discussion 'Pain Management Awareness for Meditation Teachers' presented and facilitated by the Meditation Association of Australia [6,8,9].

- Pain becomes Chronic if it persists for longer than six months
- Acute pain is an adaptive response to stimuli
- Chronic pain is multifaceted, could be due to surgery, injury or on its own
- Chronic and acute pain are described as subjective
- Pain is related to:
 - The human body and how it responds to its environment
 - Our psychological make up
- Our perception of our body creates the potential to feel or experience pain
- Pain is affected by our social situation
- The spinal cord and brain - amplifies pain or perceived pain
- At the core is our perspective of how we perceive our own pain
- Metaphors: Looking at a photo stored on your phone versus having it stored in the cloud, is not the same. It might be the same image but it stored and accessed in different places. This could be how pain is stored and accessed. We need to learn how to look at pain differently.
- Sometimes we forget that we have bodies and only when we experience pain or a painful event, we are reminded of our body.
- Befriend your body and befriend your pain – learn how to live with your pain. Stop pushing away from the pain and from your body.
- Patients having knee surgery versus MBSR course, showed that MBSR patients did much better 12 months after the study, without surgical intervention.
- Take breaks before you need them – stop pushing yourself to keep going, till finally a much larger dose of meditation, or a longer recovery time, is needed
- Use breath awareness to question what is wrong in your body?
- Pain healing starts with listening. Self-compassion. Self-listening.
- We have a high level of self-critical thinking/voice working in the background. When having pain, the self-critical voice amplifies our suffering. Bring kindness and compassion to the self – use loving kindness meditation.
- Show self-compassion to deal with pain. Put a hand on your heart and allow yourself to receive self-love.
- Compassion focus therapy – Compassion is an emotion of great courage and wisdom. Bring this to people who are dealing with pain.
- Compassionate self-correction. Be kind to yourself, when correcting how you are thinking or experiencing pain.
- Sadness or grief can surface during or after the meditation. This is a type of pain. Consider referral for counselling/therapy.
- Think of activities which hurt while meditating – use this exercise to familiarise yourself with the pain and to get use to moving or sitting in a certain position.
- Have a relationship with your body, with your life with your pain.

Fascia

The following definition and explanation of fascia is offered by the Johns Hopkins Medical Department: 'Fascia is a thin casing of connective tissue that surrounds and holds every organ, blood vessel, bone, nerve fibre and muscle in place. Fascia does more than provide internal structure; fascia has nerves that make it as sensitive as skin. When stressed, it tightens up. Although fascia looks like one sheet of tissue, it is actually made up of multiple layers with liquid in-between called, hyaluronan. It's designed to stretch as you move. But there are certain things that cause fascia to thicken and become sticky. When it dries up and tightens around muscles, it can limit mobility and cause painful knots to develop [10].

Fascia is mentioned in the academic literature as early as 1814, by Mackesy [11]. Not much has changed regarding the definition and description of fascia since then. Fascia is often still described as connective tissues, which separates and supports the muscles and movements [12].

An alternative definition was offered in 2019 by Bordoni et al as; 'Fascia is any tissue that contains features capable of responding to mechanical stimuli. The fascial continuum is the result of the evolution of the perfect synergy among different tissues, liquids and solids, capable of supporting, dividing, penetrating, feeding and connecting all the regions of the body, from the epidermis to the bone, involving all its functions and organic structures. This continuum constantly transmits and receives mechanometabolic information that can influence the shape and function of the entire body. These afferent/efferent impulses come from the fascia and the tissues that are not considered as part of the fascia in a biunivocal mode. In this definition, these tissues include: "epidermis, dermis, fat, blood, lymph, blood, and lymphatic vessels, tissue covering the nervous filaments (endoneurium, perineurium, epineurium), voluntary striated muscle fibres and the tissue covering and permeating it (epimysium, perimysium, endomysium), ligaments, tendons, aponeurosis, cartilage, bones, meninges, and tongue' [13]

From a microscopic and macroscopic point of view, it has been shown that myofascial tissue (muscle and connective tissue) transmits tension produced to other muscles, linking the body systems and the muscles on a much deeper and more complex level than previously understood [13].

What is missing from this theoretical mechanical model of fascia, is the integration of the tension caused by the nervous tissue, the vascular tissue, the movement of the viscera and bodily fluids (liquid fascia), such as blood, lymph, interstitial and intracellular fluids. Body fluids not only allow life and functional continuity but, in particular, it determine the passage of mechanical tensions faster than the muscles and allow the mechanotransductive mechanisms to express itself [12].

Fascia is wrapped throughout the body on 'lines of pull'. It is understood that our toes to our brow in connected in one uninterrupted sheet of fascia. So are our fingers linked to our chest and neck. The heart fascia is connected at the collarbone, which connects to the arm and fingers. Fascia coils around bones, muscle fibres, muscle bundles, organs, arteries, veins and nerves, applying tension and compression to the body parts it surrounds [14].

If the body experiences disruption or damage to tissue functions, pain is often experienced. Pain can be caused by a lack of proper circulation or a blockage of some components of our anatomy. Pain can also impede the flow of blood throughout the body. This can result in numbness, heaviness, stiffness and swelling of the joints and muscles. Stress and tension also slows down our circulation and becomes an inflammation in certain areas of the body [14].

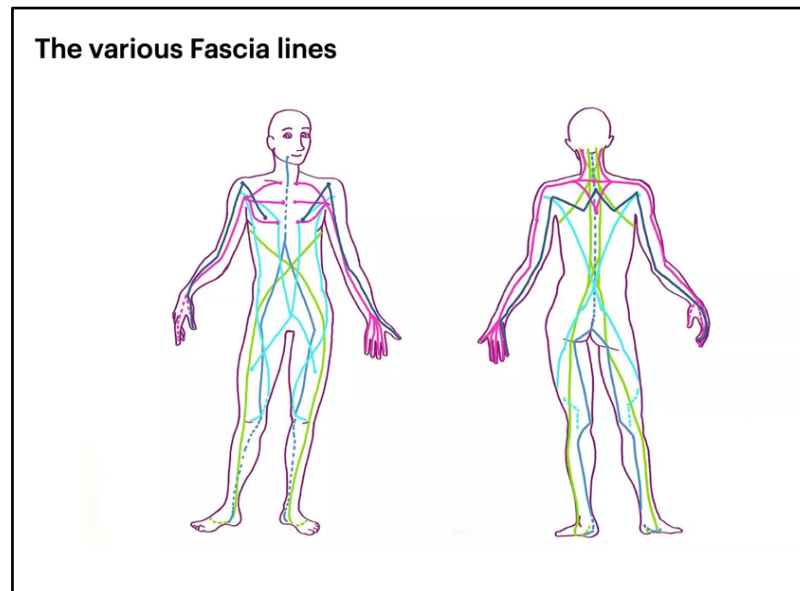


Figure 1. Various Fascia Lines of the human body

As illustrated in the above figure, Bohlin and Meyers representation of all the fascial lines in the human body [15,16]. They describe seven fascia lines within the body of which five are connected to the feet.

These are:

1. Superficial back line / Superficial dorsal line
2. Superficial front line
3. Lateral line
4. Spiral line
5. Deep front line

Non feet attached fascia lines:

6. Fascia Arm Lines
7. Functional lines

To date the role of fascia has been underestimated in the treatment of pain. Furthermore, very limited studies/exploration has occurred to explore how fascial manipulation in the feet affects pain management. Due to the interconnectedness of fascia in and on all the body systems/organs, it is a logical conclusion to intimate a positive outcome will be found between foot reflexology and chronic pain management.

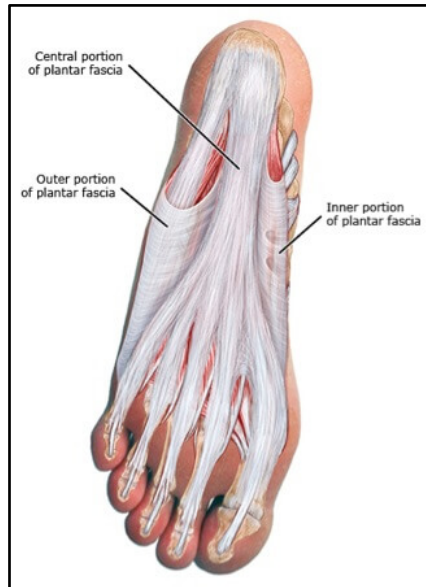


Figure 2. Fascia of the dorsal aspect of the foot

<https://oahuspineand rehab.com/plantar-fasciitis/> [Accessed 28 June 2023]

As illustrated in Figure 3, by Wilke et al, is an example of a myofascial chain. It is understood that there a link consists between the plantar aponeurosis, Achilles tendon, gastrocnemius muscle, hamstring muscles, sacrotuberous ligament, and the lumbar fascia/erector spinae muscle. The in-series arrangement of the components, suggests direct continuity between head and the toes [17].

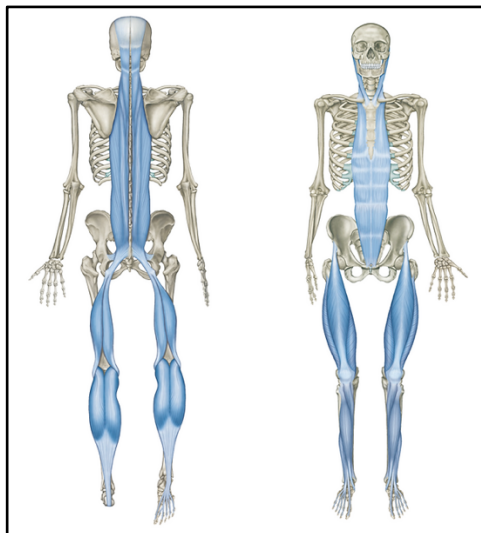


Figure 3. Representation of a myofascial chain

Meridian Lines

A Meridian massage is an ancient form of Traditional Chinese Medicine (TCM). This massage stimulates the acupressure points using various techniques to help clear any blockage and balance the flow of qi and blood in the meridians.

Meridians are described as being like rivers, carrying the flow of energy (Qi) just like a river carries the flow of water to divergent destinations in a specific direction. These meridian pathways work by distributing energy, nutrients, and blood across the body in just about the same way as the circulatory system.

There are 12 major meridians in a body and these meridian lines are all connected to major organs:[18,19]

1. Lung Meridian: The lung meridian controls how energy is consumed and impacts the respiratory system.
2. Large Intestine Meridian: The large intestine meridian regulates the processing and extraction of water from waste.
3. Stomach Meridian: The stomach meridian regulates the extraction of nutrients from food, nutrient distribution to the intestines and spleen, and the overall digestion of food.
4. Spleen Meridian: Transportation and Distribution. The spleen transforms food and drink, extracting Qi and essences which are then distributed to the other officials. It houses our "thought" - it influences our capacity for thinking, concentrating, memorising and even worry.
5. Heart Meridian: The heart meridian regulates the circulation of blood to all organs.
6. Small Intestine Meridian: The small intestine meridian is responsible for digestion, water absorption, nutrient absorption, and bowel functions.
7. Bladder Meridian: The bladder meridian regulates the removal of the toxins from the body.
8. Kidney Meridian: The kidney meridian regulates the reproductive system, testosterone levels, produces bone marrow and blood.
9. Pericardium Meridian: The pericardium meridian regulates the energy (Qi) which surrounds the heart, protects the heart, ensuring proper function and emotional balance.
10. Triple Warmer Meridian: The triple warmer meridian regulates the metabolism of the body and promotes general wellness.
11. Gall Bladder Meridian: The gall bladder meridian regulates the removal and storage of toxins that are produced by the liver.
12. Liver Meridian: The liver meridian regulates the female reproductive system, circulation of energy, and maintains the flexibility of the ligaments and the tendons.

Eventually, these internal meridians will come to the surface of the skin, where it becomes external.

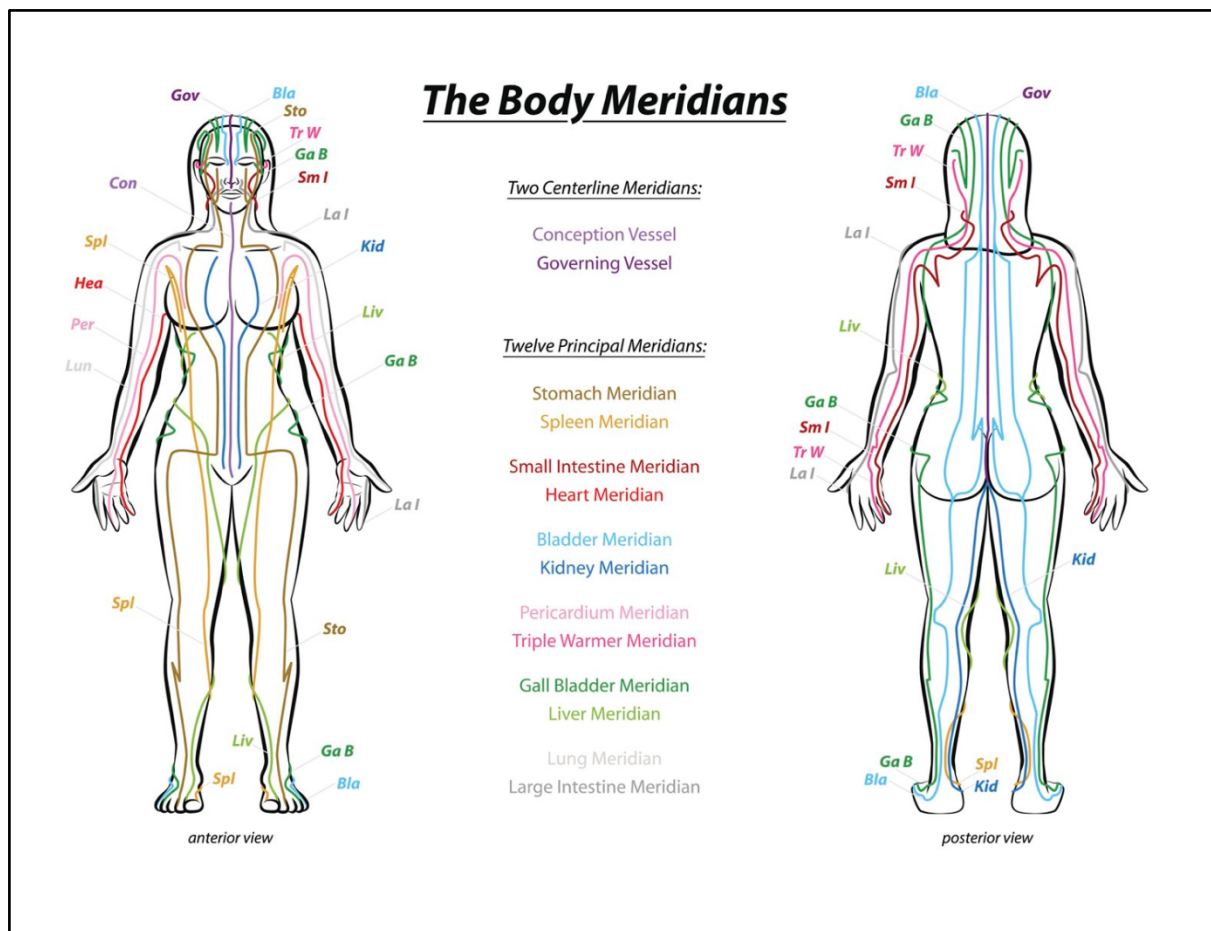


Figure 4. A basic interpretation of the 12 Meridians

<https://www.risingmoontaichi.net/the-meridians> [Accessed 29 June 2023]

Three main functions of the meridians are explained as being [20]:

1. Carrying Energy, Blood, and Information

Energy and blood flow continuously through the meridians, yet they also transmit information to and among your organs. What kind of information? Instantaneously they send signals to raise or lower your body temperature, signs that your body needs to release water, signals to regulate emotion, among countless others. Are you aware that your body is constantly communicating with itself through innumerable messages flowing through your meridians? These life-giving energy pathways help coordinate the work of the organs and keep your body balanced by regulating its functions.

2. Free Flow of Qi

According to TCM, as long as Qi flows freely through your meridians and your organs work in harmony, your body can remain healthy. This means that when your body's meridian system functions well, you are well. Yet due to a number of causes—like excess stress—your body's meridians can become clogged or even blocked. This

affects the function of the corresponding organ and ultimately the whole body-mind-spirit.

3. Receiving and Relaying Healing Stimulation

Meridians are incredibly sensitive. They can carry the effects of stimulation in the form of healing energy throughout your entire being. It is this special quality that allows the various TCM treatment modalities to work. By using food, herbs, Qigong, acupuncture, or acupressure, the flow of energy in the meridians can be stimulated, restoring balance and health.

In an attempt to describe meridians in a western scientific manner, researchers from China have proposed a hypothesis suggesting a link between fascial and meridian lines within the body. Along with the fascia theory they are also exploring:

- neuro-theory
- humoral circulation theory
- biological field hypothesis
- immune theory
- mast cell theory
- meridian-qi
- elusive phenomenon theory to explain meridians in the body [18,21–23].

Embodiment

'Embodiment', explained as a definition, refers to the state when people experience the world through their bodies and senses. They feel grounded in their physical bodies or *embodied*. The term refers to the mind and body connection [24].

The overall goal of virtual reality (VR) research and development, is to improve the entertainment value of the experience or ability to affect change in the user's real-world behaviour. A significant portion of the research and development into improving presence is centred on sensory stimulation, avatar mobility, and avatar representativeness. The authors argue that our reality is shaped by the interactions of our mind, body, and environment. Furthermore, the body is not only important in perception and action, but it is used as a medium in re-presentations of information, memories, and experiences[25].

The above-mentioned concepts have been taken from human cognitive theories. Embodied cognition theorists argue that the body serves as a central framework for our interactions with the world around us. We perceive the physical world in relation to our body and therefore what we know about the world is 'constructed from patterns of energy detected by the body'. In addition the body is a very effective communication device and is a critical tool for expressing and experiencing mental states [25].

Embodiment of an organism simultaneously limits and prescribes the types of cognitive processes that are available to it. The particular way in which an organism is embodied (whether it has feet, fins, eyes, a tail, etc.) will influence how it performs goal-directed actions in the world, and the particular sensorimotor experiences connected with these actions will serve as the basis for category and concept formation [26].

Embodiment meditation, also referred to as 'interiority' or 'inward looking practice', refers to the practice of learning the language spoken by our body. This practice allows the body to inform and contain what is happening in our present state within our sense of self. Embodiment deepens capacity for presence, receptivity, and compassionate exchange between the body and the environment. The practice of embodiment is about becoming more deeply present for a direct experience with the here and now. All of the feelings that influence our thinking and physical actions are stored in our bodies. As such, our bodies contain an innate intelligence that is often hidden from our conscious mind [27,28].

This kind of practice can be achieved through Vipassana meditation, which focuses on the importance of body scanning. The main premiss of Vipassana is to observe what is happening to the body, without dwelling on the experience. It teaches the meditator to remain neutral or equanimous, to the senses of the body. We are not to seek out or cling to pleasurable experiences, neither evade the unpleasant. It is the constant looking inwards, for what is, at a particular time and place. This journey inward is an exploration of the body in the production and maintenance of the self, by identifying and accepting rather than questioning, body pain and discomfort.

Reid Robison, a meditation master on Insight Timer, explains embodiment in the following words [29]:

- ‘Embodiment is our first-person experience within and through the body in this world. It is a subjective sense of wholeness, a sense of being at home and at one with who we are.
- Inhabiting the body is not just a matter of being aware or scanning the body, embodiment is actually living within the body, and living and being present and aware of the body, as the body.
- The body is the instrument by which we experience perception, thought, emotion and sensation. Our body is our gateway to the here and now, because the body is always in the present moment. Our body reflects how we are constructed. It contains our history, our DNA, everything we have done and everything we are capable of doing.
- The mind and the body are mutually interactive and mutually influential. When we engage the body, we also engage the psychological and emotional activities within ourself.
- When you engage the mind for an intervention which is psychological or emotionally orientated, we automatically engage the body. The body therefore, gives form to the mind's story. It gives structure to our emotions and experiences. If there is a mismatch, between an attitude in the mind versus the body, it is not only uncomfortable and distressing it is also unsustainable. For example; while sitting in a chair bending forward in a 'hunched' over position, telling ourselves we are 'empowered and able to accomplish everything we want in our life', does not fit or feel right, as there is a lack of congruency between mind and body.
- It is therefore necessary to become aware of being grounded within our body. Our body is made of space and it inhabits the space around us. It is therefore important to learn to feel the body and how it interacts with the space it is in. By doing this we start telling new stories and embody new sensations. We can change unpleasant or uncomfortable sensations viewing the way we perceive them’.
- The purpose of embodiment can therefore be summarised in the words of the author and motivational speaker Wayne Dyer (1940-2015): ‘When we change the way, we look at things, the things we look at change. When you change the way, you see the world; when your intentions are positive and powerful; when you search only for the good, then your life transforms into an amazing adventure’ [30] .

Meditation

The following definition for the word 'meditation' is taken from the Merriam Webster Dictionary [31]:

- Intransitive verb:

1: to engage in contemplation or reflection

He meditated long and hard before announcing his decision.

2: to engage in mental exercise (such as concentration on one's breathing or repetition of a mantra) for the purpose of reaching a heightened level of spiritual awareness

- Transitive verb:

1: to focus one's thoughts on: reflect on or ponder over

He was meditating his past achievements.

2: to plan or project in the mind: intend, purpose

He was meditating revenge.

The history of meditation can be traced back to 5000 BCE. Meditation has been described and reported in many global cultures. Meditation is therefore not a new concept. There are many different meditation techniques and these techniques often vary between cultures or groups. Individuals may prefer one type of meditation style above another. This does not matter and does not diminish the value gained from meditation [32].

Meditation refers to the practice of focusing the mind and attention. The method of focus, will vary depending on the chosen meditation type. Types of meditation include focusing on the breath, body scanning, use of a mantra or just sitting, as in Zen meditation [32].

Meditation can be done either when sitting, kneeling, standing, walking or lying down. There is no hard rule regarding how to sit during meditation. The emphasis is on being comfortable and sitting in a position where the spine is upright or straight, allowing the lungs to expand to their full capacity. Sitting on the floor or a chair versus kneeling will depend on the individual's health and physical ability [32].

The process of meditation, can be taught by learning how to focus on the sensation created on the upper lip, when the breath is inhaled and exhaled, through the nostrils. This is the first step to be mastered during Vipassana meditation. Once the meditator is familiar with the sensation caused by the breath on the upper lip, the next step is to become aware of similar sensations or feelings throughout the body, using a 'body scan' approach. The meditator should acknowledge these feelings or sensations for what they are, without getting attached to them or seeking them out. These feelings and sensations should be observed but not fixated upon, irrespective of them being pleasant or unpleasant [32].

When thoughts surface during a meditation session, the practitioner should acknowledge the thoughts, but then refocus the mind on the breath before returning to body scanning. This process should be repeated for the duration of the session. Focusing and refocusing is part of the process and becomes easier the more the technique is practiced. Eventually scanning of the entire body can be done in a couple of seconds [32].

Several studies report the benefits of meditation to include [33–37]:

- Decrease in depression
- Regulating anxiety
- Increases emotional intelligence and personal resilience
- Increases our ability to be empathic
- Improves self-awareness and self-regulation and
- Fosters positive emotions and human connections.

We now know that the brain is an organ with high plasticity, meaning it has the ability to change and grow. This is true for people of all ages. The brain develops through forming neural connections. Neurons, which are the information processing cells in the brain, connect to form neural pathways, which are responsible for our thoughts, sensations, feelings and actions. The more we perform a certain action the stronger these connections become. This also applies to meditation. The more regularly the practitioner sit, the greater the benefit [8,34].

Clinical studies have found that over time, meditation leads to an increase in grey matter density in the hippocampus, as well as increases in the size of the anterior insula and cortical regions of the brain. Increases in grey matter in the left hippocampus aids learning, cognition and memory, resulting in better retention of facts and more mindful behaviour. Increases in the anterior insula and in cortical thickening benefit's cognitive function, attention and self-awareness [8,34,38].

Meditation has also been report as being able to deactivate our sympathetic nervous system (fight or flight response), allowing our parasympathetic nervous system to become activated. This allows us to rest and relax. Studies have found that over time this practice can also help to reduce pain, depression, stress and anxiety [38].

Studies have also reported that meditation decreases activity in the default mode network, which is the brain network responsible for mind-wandering and self-referential thoughts, also referred to as the 'monkey mind'. The default mode network is 'on' or active when we're not thinking about anything in particular, when our minds are just wandering from thought to thought. Mind-wandering is typically associated with being less happy, ruminating and worrying about the past and future. It will therefore be beneficial if we can learn how to dial down our monkey brains. Several studies have shown that meditation, appears to do just this. And even when the mind does start to wander, because of the new neural connections that have been formed, meditators are better at refocusing their attention [38].

Meditators have also been found to have higher than normal levels of gamma waves, in their brain. Gamma waves are responsible for having 'light-bulb' moments [39].

Meditation is therefore a process which effects and benefits the biological, psychological and social aspects of a person.

Unwanted effects of Meditation

Much have been published regarding the long-term use and evidence-based efficacy of meditation and mindfulness-based interventions. One study has looked at the lack of data about the possible unwanted effects (UEs) of meditation and mindfulness. The following tables have been taken from that study to illustrate the reported UEs of 234 women and 108 men (n= 342) [40].

Their findings indicates that meditation, especially for those in western societies, may sometimes be distressing and even harmful. The following UEs are reported: Anxiety symptoms, Pain, Depersonalization and derealisation, Hypomania or depressive symptoms, Emotional lability, Visual focalization problems, Loss of consciousness or dizziness.

Table 1. Sociodemographic data for the sample

Sociodemographic data for the sample.

		M	SD
Age		39.7	(12)
		TOTAL	%
Gender	Men	108	31.6
	Women	234	68.4
Nationality	Spain	145	42.9
	Argentina/Uruguay	28	8.3
	Mexico	34	10.1
	Colombia	15	4.4
	Rest of Europe	11	3.3
	Brazil	22	6.5
	Peru	3	.9
	Chile	6	1.8
	Venezuela	6	1.8
	United Kingdom	20	5.8
	USA & Canada	25	7.3
	Other countries	23	6.7
Marital status	Single	122	35.7
	Married	166	48.5
	Widowed	7	2
	Divorced	46	13.5
Education level	Primary	4	1.2
	Secondary	10	2.9
	Higher secondary	28	8.2
	University	186	54.4
	Master and/or PhD	114	33.3

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Table 2. Percentage of self-reported Unwanted Effects

Percentage of self-reported UEs and characteristics (n = 87).

		n	%
Unwanted effects (UEs)	Yes	87	25.4
	No	255	74.6
Situation	Individual practice	36	41.3
	Retreat	12	13.7
	Group (non-retreat)	9	10.3
	No information	30	34.4
Type of practice	Body scan	7	8
	Focused attention	15	17.2
	Open monitoring	8	9.1
	Mantra	7	8
	Awareness of emotions	1	1.1
	Yoga (pranayama)	2	2.2
	No information	47	54
Duration of the meditation session (min)	>40	9	10.3
	21–40	9	10.3
	16–20	1	1.1
	5–15	4	4.6
	No information	64	73.5
Symptoms	Anxiety symptoms (including panic attacks)	12	13.8
	Pain (stomach, headache, muscular, nausea)	5	5.7
	Depersonalization and derealisation	8	9.2
	Hypomania or depressive symptoms	2	2.3
	Emotional lability	2	2.3
	Visual focalization problems	2	2.3
	Loss of consciousness or dizziness	6	6.9
	Other symptoms	4	4.5
Continuous or transitory	No information	46	52.8
	Continuous	9	10.3
	Transitory	34	39
Discontinued meditation	No information	44	50.5
	Yes	11	1.1
	No	33	37.9
Assistance from a medical centre or specific therapist	No information	43	49.4
	Yes	5	5.7
	No	39	44.8
	No information	43	49.4

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Meditation for pain management

A review article published in 2011, reported on 18 studies where Mindfulness Based Stress Reduction (MBSR) therapy was successfully used for stress reduction among people living with chronic disease such as cancer, hypertension, diabetes, HIV/AIDS, chronic pain and skin disorders [41].

In 2016, Zeidan (Department of Neurobiology and Anatomy) and Vago (Department of Psychiatry), described the mechanism behind the mindfulness approach to pain management. Although this paper was published before the expansion of the definition of pain, in 2020, these authors show a deep understanding of pain and the mechanism by which it can be controlled. They describe pain as a multidimensional experience involving sensory, cognitive, and affective factors. They point to a need for a biopsychosocial approach to pain management. They identify that the clustering of interactions between these factors contributes challenging and financially burden, involved in treating chronic pain.

They point out the significant cost financial, social and psychological attached to the current treatment of opioid addiction caused by the over prescription of pain management medication. They propose that these staggering statistics related to opioid use and addiction, highlights the importance of developing, testing, and validating fast-acting nonpharmacological approaches to treat pain.

Mindfulness meditation is a technique that has been found to significantly reduce pain in research and clinical settings. They conclude that their review findings from recent studies demonstrate that mindfulness meditation is a significant and worthy addition to the scope of treatments available to those living with pain, through multiple, unique mechanisms. This kind of intervention will not only decrease the cost burden associated with chronic pain management but also offer an important alternative choice for the millions of people living with chronic pain seeking narcotic-free, self-managed pain therapy [42].

In a 2018 review paper of 14 suitable studies, examining the effectiveness of the Breathwork Mindfulness programme, the authors concluded that there is clear potential benefit for mindfulness helping those with long-term conditions and chronic pain [43].

Shines et al (2020), published a meta-analysis and review in the journal *Pain: The efficacy of mindfulness-based interventions (MBI) in acute pain: a systematic review and meta-analysis*. This journal is the official journal for the International Association for the Study of Pain. After including 19 quantitative and 22 qualitative articles in their review, the authors concluded that according to the GRADE* assessment '*except for pain tolerance, the data were of low or very low quality. There is moderate evidence that MBIs are efficacious in increasing pain tolerance and weak evidence for pain threshold. However, there is an absence of good quality evidence for the efficacy of MBIs for reducing the pain severity or pain-related distress in either clinical or experimental settings*' [44].

*GRADE (Grading of Recommendations, Assessment, Development, and Evaluations) is a transparent framework for developing and presenting summaries of evidence and provides a systematic approach for making clinical practice recommendations [45].

Reflexology

According to Cai et al, 2023, Complementary and Alternative Medicine (CAM) are divided into four types of treatment [46]:

1. traditional Asian medical systems (TAMS), including traditional Chinese medicine, acupuncture, and acupressure
2. alternative medicinal systems (AMS), including homeopathy and herbal therapy
3. manual body-based therapies (MBBTs), including massage therapy, chiropractic therapy osteopathy, and reflexology
4. mind-body therapies (MBTs), including hypnotherapy and psychotherapy

Current research indicates that Reflexology is one of the most commonly sought out CAM. People seeking out Reflexology treatment do so as they report positive outcomes on a physical, emotional, and spiritual level. Some of the reasons for choosing Reflexology above other CAM or traditional western medicine includes [46]:

- It does not use any drugs or chemicals and is the best choice for many health problems;
- It can reduce pain
- It helps maintain physical flexibility and athleticism
- It relaxes the limbs, especially the hands and feet, and the whole body
- It stimulates the body to release pain-relieving chemicals
- It can be used as a means of preventing disease
- It promotes recovery from physical injury, especially for the hands and feet
- It triggers the release of endorphins and enkephalins, which help relieve pain and improve mental energy and well-being

The definition offered by Byers in 2001 [47], describes it as a 'science which deals with the principles that there are reflex areas in the feet and hands that corresponds to all the glands, organs and parts of the body. Reflexology is a unique method of using the thumb and fingers on these reflex areas. Reflexology includes but is not limited to:

- the relief of stress and tension
- improving blood supply and promote unblocking of nerve impulses
- helping achieve homeostasis

Two key contributors who brought Reflexology to the understanding of people living in the Western world are Dr Fitzgerald (1917) and Eunice Ingham (1925). Fitzgerald, introduced zone therapy as widely described in the literature and Ingham, introduced thumb walking each part of the foot according to its allocated body organ or gland [47].

The scope and practice of Reflexology is beyond this review, only to be noted that other methods of this art exist and are practiced in different parts of the world. Needless to say, new techniques and philosophies will come to light as this art and science evolve.

Whatley et al (2022) published a paper exploring the mechanism of action offered by Reflexology. They suggest the following mechanisms of actions [48]:

1. to downregulate or 'balance' the nervous system due to daily exposure of living in a highly scientific and over stimulated world
2. it introduces and fosters relaxation and sleep
3. it facilitates and builds a therapeutic relationship
4. it brings healing and comfort through the mechanism of therapeutic touch
5. it can have a placebo effect, yet bringing about a positive effect or outcome
6. it creates a positive environment where the client's expectation is one of enjoyment, safety and healing
7. due to the interconnectedness and large amount of fascia in the feet and lower limbs (needed to keep the body upright and allows for bipedal walking), results of stimulation of the fascia in the feet can affect the changes in other tissue and organs of the body
8. as in osteopathy, it has been suggested that pressure on the foot could convert mechanical force into biochemical changes; this change is termed mechanotransduction. This process facilitates changes between the cytoskeletal structure and the extracellular matrix, producing cellular responses across membranes
9. it effects the transfer of force through the body, via the network of collagenous tissues that make up the variety of fascial matrices allowing the dissipation of mechanical forces throughout the body
10. it is suggested that reflexology may involve the correction of proprioception (the body's ability to sense where all of its parts are relative to each other and to objects in the immediate environment), as part of the rebalancing process
11. the manipulation of fascial layers during reflexology may contribute to the alleviation of pain, especially pain associated with inflammation
12. research has demonstrated densification of the thoracolumbar fascia and decreased shear in patients with chronic low back pain and, supports the use of fascial release to effect change at the cellular level, leading to the movement of fluid and wound healing
13. it calls for a whole systems research approach to investigate the value and effects of reflexology versus the gold standard 'double blind, placebo-controlled study design'.

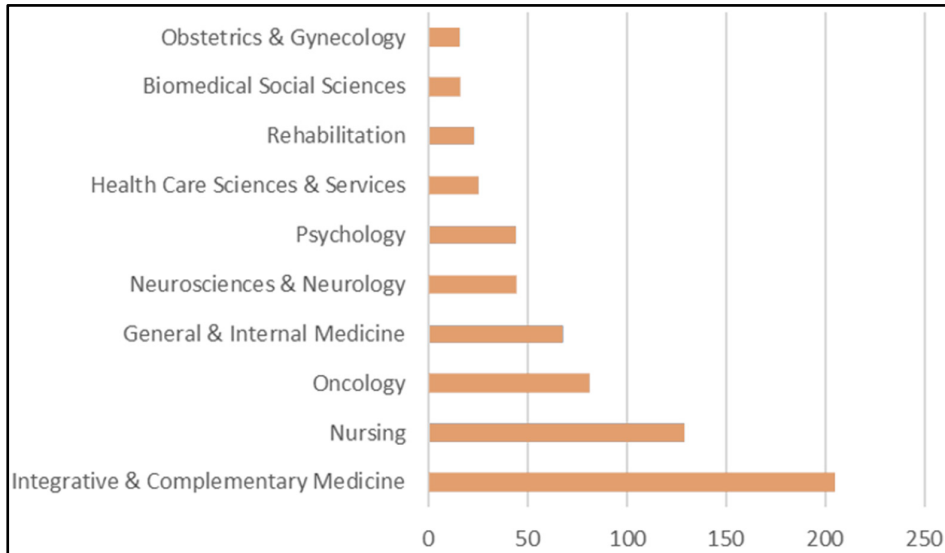


Figure 5. Top 10 research areas for foot reflexology

As illustrated in Figure 4, publications from the 2023 review article indicates most Reflexology publications relate to 10 health categories. 61% of the publications related to foot reflexology, indicating that the applications of foot reflexology are no longer a single direction of research but focus more on the breadth and depth of research in medical, nursing, and psychological applications [46].

The same group of authors showed between 1991 and 2021, there was an exponential increase in the number of Reflexology related publications. As seen in Figure 5, a total of 801 publications, representing authors and institutions from around the world, were published during the review period [46]. This indicates a global trend in the interest and reported effects of Reflexology as a growing art and science.

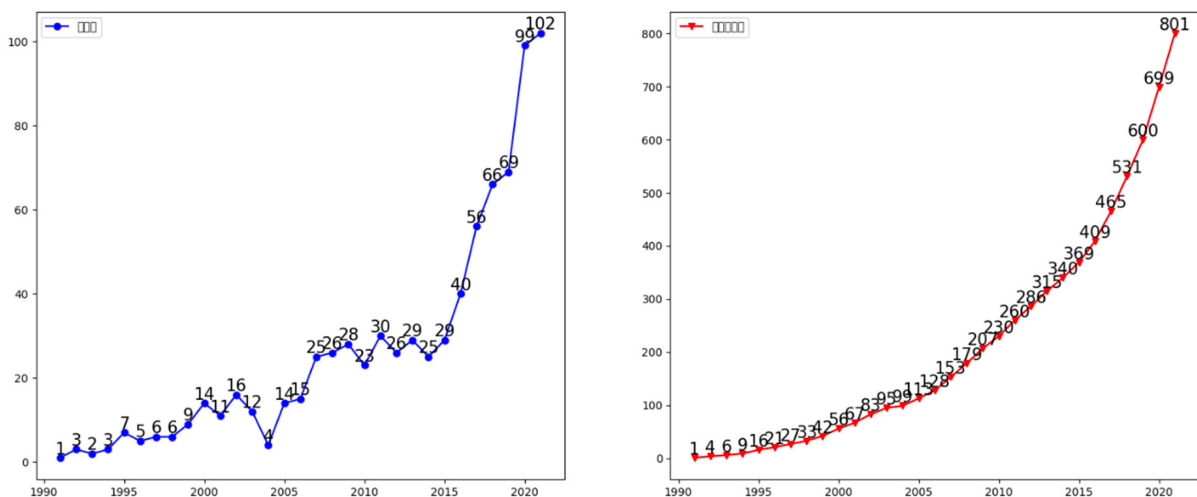


Figure 6. Distribution and cumulative volume of foot reflexology publications between 1991 and 2021

Reflexology for pain management

When addressing the effects Reflexology has/might have on pain relief, it is necessary to have a good working knowledge of the new 2020 definition of pain, as discussed in a previous section.

Now that the new definition of pain focus on the individuals perception and experience of pain, the alleviation of pain can/should be attributed to many factors, which include empathy from a therapist [49], the effect of caring touch [50] or distraction [51].

The following is a direct copy of the excellent explanation offered by Whatley et al in their 2022 article[48]:

'The manipulation of fascial layers during reflexology may also have something to add about the alleviation of pain, especially pain associated with inflammation. Cells known as fibroblasts exist in deep fascial structures, which play an essential part in the regulation of inflammation, and the dysregulation of these fibroblasts has been implicated in chronic inflammation [52]'.

'Fibroblasts produce collagen which is a pre-requisite for remodelling and for tissue repair. Researchers have discovered specialised fibroblasts which have been called fasciocytes [53]'.

'The fasciocytes produce hyaluronan, a glycosaminoglycan which helps to lubricate joints and allow for sliding between layers of fascia. The quantity of hyaluronan varies throughout the body with greater amounts surrounding joints, the ankle retinaculum for example where greater movement is necessary. Hyaluronan regulates inflammation and tissue repair but its role is variable depending upon its molecular weight, thus it may act as pro or anti-inflammatory [54]'.

'Manipulative treatments, and the use of mechanical transduction which instigates a piezoelectric response, may stimulate the activity of fibroblasts causing them to proliferate and potentially reduce the pain associated with inflammatory conditions such as fibromyalgia [55]'.

'In addition, the technique of Positional Release (initially known as Strain-Counterstrain) developed by American osteopath Lawrence Jones in 1955, in conjunction with fascial release has been shown to reverse inflammatory cell behaviour within 60 s of application [56–58]'.

'Reflexologists who use twisting and stretching reflexology techniques on the foot and ankle may well be tapping into the same processes.'

In 2003 a review paper focusing on the use of Reflexology as an intervention for pain management, was published. This review focused on the reports of 18 published articles, all indicating a positive effect of Reflexology on pain amongst adult patients [59].

A narrative review paper published in 2022, focusing on the effect of reflexology on reducing the severity of pain, determined that foot reflexology applied for an average of 30 minutes reduces the severity of pain in the patients of a study by Metin & Ozdemir, 2016 and Ozturk et al., 2018. In the study by Samuel and Ebenezer (2013), it is reported that reflexology increases the pain threshold and tolerance of patients with acute pain. Furthermore, it is reported that reflexology applied to surgical patients had a positive effect on pain in studies conducted by Metin & Ozdemir, 2016, Ozturk et al., 2018 and Sakalli &

Oztekin, 2021. It is therefore concluded that the effect of reflexology applications in the relief of postoperative pain is effective for pain reduction [60].

A review paper by Artiolo et al, 2021, reporting on the results of the randomized controlled trials with a control group where foot Reflexology was used for the treatment of painful conditions as a single intervention, reported on 17 such publications. Most studies have showed that foot reflexology was effective in reducing pain, and the common practice was a bilateral treatment which lasted between 2 to 30 minutes per foot, and follows the sequence of stimulating the solar plexus, corresponding area of pain in the body and accessory areas correlated to the diagnosis, or massaging the feet as a whole. These findings are statements based on studies rated as having moderate to good methodological quality [61].

In conclusion it can be said that there is enough scientific data available to support the use of Reflexology for the treatment of pain. Long-term cohort data does not seem to be available for this topic and treatment modality.

E-M-FLEX Hypothesis

Embodied Meditation and Reflexology – a proposed pain management strategy for those living with chronic pain.

As described in the previous pages, published data supports the use of meditation for chronic pain management. In addition, Reflexology is increasingly being used for pain management. Although no long-term studies have been done to support the use of Reflexology for chronic pain management, E-M-FLEX is hypothesising that there will be value and benefit when combining a guided body scan meditation during a foot reflexology session.

The aim when combining Meditation and Reflexology, is to teach and create a higher level of understanding of embodiment. It is through this process by which a person living with pain, is able to reshape the neural pathways in their brain. This will change how they view and experience pain and possibly eliminate the learned or conceived pain perceptions in their physical, cognitive and effective domains.

There has been a suggestion that fascia should be considered as a ‘body system’, separate from the muscular or skeletal system. Because of the interconnectedness of fascia, it can be hypothesised that manipulating the considerable amounts of fascia in the feet, could have an effect on the fascia in the rest of the body. Although the mechanism of fascia manipulation and chronic pain management has not been investigated or reported on, E-M-FLEX suggests an exploration of a possible role and relationship between these two concepts.

It is further put forward that Chinese Meridian Lines, which is believed to run along and throughout the body, might be ‘old knowledge’ explaining the role fascia plays within the body. This thinking is not new and is currently being studied by several leading scholars from high ranking Chinese universities.

E-M-FLEX Methodology

Drawing together the proven value of meditation and reflexology, linking it to our current understanding of embodiment, fascia and meridian lines, it was decided to offer the three participants in this case study report a novel new treatment combination.

Participants were pre prepared with knowledge of the process:

- Reflexology sessions are done in silence
- The Reflexologist will guide the participant verbally, mentioning each body part/body area as they move through them on the foot
- Each session was treated as a ‘body scan meditation’
- The inhouse six item questionnaire was completed before each session and used as a catchup tool, to lead the discussion and focus attention

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