

## Article 4

# Advanced Therapeutic Technology in Hand Therapy: A Side-Effect-Free Approach to Soft Tissue Rehabilitation Through Body Engineering

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### **Abstract:**

Rehabilitation body engineering and hand therapy utilizing soft tissue manipulation represent a novel and effective approach for addressing a wide range of diseases, including those that are resistant to traditional treatments. This therapeutic method involves applying targeted pressure to specific soft tissue areas to enhance organ function and overall health. The technique shows promise in treating conditions that conventional methods often fail to address, providing a significant advantage in comprehensive patient care. The integration of artificial intelligence (AI) into hand rehabilitation robots further expands the potential of these therapies. AI technology enhances the functionality of rehabilitation robots by improving their precision, effectiveness, and adaptability. Through AI-driven algorithms, these robots can deliver personalized rehabilitation exercises, adjust treatment parameters in real-time, and optimize therapy outcomes based on individual patient needs. This technological advancement not only enhances the accuracy and responsiveness of rehabilitation practices but also reduces the burden on medical resources by streamlining treatment processes. Moreover, AI contributes to a more engaging and comfortable rehabilitation experience for patients. By facilitating human-robot collaboration, AI enables more interactive and supportive rehabilitation sessions, thus increasing patient motivation and adherence to treatment regimens. The promising synergy between AI and hand rehabilitation robotics points to a future where rehabilitation therapies are not only more effective but also more accessible and tailored to individual requirements. Overall, this approach represents a significant leap forward in the field of rehabilitation, offering new solutions for managing complex health conditions and improving patient outcomes.

**Keywords:** Therapeutic Technology, Body Engineering, Body Engineering and Soft tissue area.

## 1 Introduction

Health is a foundational element of human life, directly impacting a person's capacity to work, produce, and enjoy life. The relationship between physical health and mental well-being is well-established, with a healthy body often being the prerequisite for a healthy mind (Barrett et al., 2019). This interconnection is supported by evidence showing that poor physical health can lead to deteriorations in mental health, and vice versa. The concept that "a healthy mind resides in a healthy body" emphasizes the symbiotic relationship between the two, making it imperative to maintain both for overall well-being.

In modern society, the incidence of diseases linked to technological advancements, such as sedentary lifestyles, increased stress, and pollution, has risen sharply (Passi-Solar et al., 2020). Additionally, work-related injuries, traffic accidents, and the side effects of pharmaceuticals and surgical interventions have had significant impacts on public health (Kelley, 2002). The consequences of these factors underscore the need for approaches that not only treat disease but also prevent it, while minimizing adverse effects.

Recognizing that every disease potentially has a cure, our research has focused on manual therapy as an effective treatment modality. Manual therapy has been shown to be effective in managing musculoskeletal pain and other disorders by targeting the body's internal structures and soft tissues (Carlson, 2004). Through extensive research, we have identified the soft tissue area as a critical region for therapeutic intervention. This area plays a central role in regulating the body's energy flow, which is essential for overall health (Martini et al., 2012).

Our findings suggest that treatments should begin and end with the soft tissue area, integrating complementary and preventive therapies that avoid the need for chemical drugs or invasive surgical procedures (Sisken & Walker, 1995). By focusing on the body's natural healing processes, manual therapy can address the root causes of various conditions, promoting holistic health.

We have developed the Rehabilitation Body Engineering series (Alboqai, 2017), with a particular focus on the soft tissue area, to serve as a comprehensive guide for clinicians and researchers. This work builds on previous studies, providing detailed insights into the soft tissue area's role in health and disease (El Geidie, 2023). The series aims to establish a solid scientific foundation for manual therapy techniques that address physical and organic dysfunctions effectively.

Manual therapy's holistic approach considers the body as an integrated whole rather than focusing on isolated symptoms or organs (Boron, 2017). This perspective is particularly valuable for conditions that traditional medicine may struggle to treat effectively, such as chronic pain and functional disorders. By treating the body holistically, manual therapy can offer a viable alternative to conventional methods, especially for patients

who have not responded well to pharmaceutical or surgical treatments (Fleming et al., 2020).

The ongoing success of manual therapy in treating complex conditions underscores its potential as a mainstream therapeutic option. This approach is grounded in rigorous scientific principles and evidence-based practice, making it a credible and effective solution for various health challenges (Folorunso et al., 2023). The publication of our work on the soft tissue area seeks to further this field, providing a valuable resource for healthcare professionals and contributing to the broader understanding of manual therapy's role in modern medicine.

## 2. Methodological Framework

The concept of rehabilitative body engineering and manual therapy sciences evolved from a comprehensive understanding of the importance of a healthy lifestyle—encompassing diet, hydration, and exercise—and from in-depth exploration into the functions and interconnections of internal organs and the viscera (Al-Salem, 2024). This field is grounded in several fundamental principles.

A central tenet of this science is the notion that every part of the human body possesses a form of somatic memory that responds to external stimuli. This memory is closely linked to what we have termed the "soft tissue area," which functions as a secondary brain center (Vélez-Guerrero et al., 2021). This area is part of the enteric nervous system, extending from the esophagus to the anus, and comprises a complex network of nerve cells, proteins, and neurotransmitters. These elements facilitate direct communication with the brain and enable the enteric nervous system to operate semi-independently. It primarily regulates involuntary body functions such as digestion, heart rate, respiration, and urination (Grundy, 2023).

Oxygenation is another critical factor in this framework. Chronic oxygen deprivation can lead to cellular damage and atrophy, particularly in organs with high oxygen demand, such as the liver, spleen, pancreas, kidneys, heart, and lungs (Berne & Levy, 2008). As the brain prioritizes its own oxygen needs, other regions of the body may suffer from reduced oxygen supply, leading to cellular dysfunction, tissue atrophy, and the onset of various diseases (Alberts et al., 2002).

### The Impact of the Soft Tissue Area on Brain Function

Mental health is not solely determined by the brain; the soft tissue area also plays a significant role (Allen & Cameron, 2004). Numerous studies have identified a strong correlation between gastrointestinal health and mental health, particularly in conditions such as depression, anxiety, and other mood disorders (Lei et al., 2014). The integration of this understanding into manual therapy marks a significant advancement in the field, as it emphasizes treating the body holistically rather than focusing on isolated organs. This approach allows for more accurate

diagnosis and effective treatment of conditions that are often resistant to conventional therapies, such as chemical medications and surgical interventions (Xu et al., 2021).

### **The Soft Tissue Area: Definition and Significance**

The soft tissue area refers to the abdominal cavity, located beneath the thoracic cavity and above the pelvic cavity, housing the stomach and other vital organs (Kierszenbaum, 2002). This region is devoid of bony structures, making it uniquely significant in both physical and mental health. Recent studies have highlighted its importance as a key indicator of overall health and as a focal point in the treatment of various acute and chronic conditions. These include migraines, neck and chest pain, lower back pain, respiratory issues (e.g., asthma, chronic bronchitis), chronic fatigue, and digestive disorders (e.g., gastritis, liver dysfunction, indigestion, bowel disorders) (Hansel et al., 2015).

Soft tissues play a crucial role in connecting, supporting, and surrounding the body's organs. These tissues, which include fat, muscle, nerves, blood vessels, ligaments, tendons, and other fibrous tissues, are ubiquitous throughout the body and are essential for maintaining structural integrity and function (Wang, 2015).

### **Components of the Soft Tissue Area**

1. **Stomach** The stomach is a hollow muscular organ integral to the digestive system. Located between the esophagus and the duodenum, it functions primarily to digest food through mechanical and chemical means (Grundy, 1985). Gastric enzymes and hydrochloric acid break down food into chyme, which is then propelled into the duodenum by the pyloric sphincter. The stomach's position is in the upper left quadrant of the abdominal cavity, adjacent to the diaphragm, pancreas, and other structures.
2. **Pancreas** The pancreas, situated behind the stomach, is a spongy organ with both endocrine and exocrine functions (Carlson, 2004). It produces digestive enzymes, such as trypsin, chymotrypsin, amylase, and lipase, which are essential for breaking down proteins, carbohydrates, and fats. The pancreas also secretes hormones like insulin and glucagon, which regulate blood sugar levels. Its exocrine secretions enter the duodenum via the pancreatic duct, merging with bile from the liver to aid digestion.
3. **Liver** The liver is the body's largest solid organ and plays a crucial role in detoxification, metabolism, and digestion (Alberts et al., 2002). It produces bile, processes nutrients from the blood, and detoxifies harmful substances. The liver is located in the upper right abdominal cavity and performs over 500 functions including bile production, glucose regulation, and protein synthesis.

4. **Spleen** The spleen is part of the lymphatic system and is located in the left upper abdomen (Al-Salem, 2024). It is involved in filtering blood, storing red blood cells, and producing white blood cells that are crucial for immune responses. The spleen's structure includes white pulp, which is involved in immune function, and red pulp, which filters blood and removes old red blood cells.
5. **Gallbladder** The gallbladder, a pear-shaped organ beneath the liver, stores and concentrates bile produced by the liver. It releases bile into the small intestine to aid in fat digestion (El Geidie, 2023). Gallstones can form if the chemical composition of bile becomes imbalanced, potentially causing pain and digestive issues.
6. **Kidneys** The kidneys are bean-shaped organs located below the rib cage, responsible for filtering blood to produce urine, balancing electrolytes, and maintaining overall fluid homeostasis (Grundy, 2023). Each kidney contains approximately a million nephrons, which filter blood and manage waste removal. The kidneys also produce hormones essential for regulating blood pressure and red blood cell production.
7. **Small Intestine** The small intestine is a coiled tube extending from the stomach to the large intestine. It is approximately 6.7 to 7.6 meters long and comprises three sections: the duodenum, jejunum, and ileum (Alberts et al., 2002). Its primary functions are digestion and nutrient absorption, facilitated by villi and microvilli that increase surface area.
8. **Large Intestine** The large intestine, which includes the cecum, colon, rectum, and anus, is responsible for absorbing water and electrolytes from the remaining indigestible food matter and forming solid waste (Berne & Levy, 2008). The colon harbors a complex microbial ecosystem, which is crucial for fermenting undigested carbohydrates and producing vitamins such as vitamin K.

### **Principles of Body Engineering in Rehabilitation**

Body engineering views the human body as an integrated system rather than as separate organs. This perspective recognizes the interconnectedness of organs and their impact on each other. Here's an overview of key relationships among organs and their implications for treatment:

1. **Kidneys and Bladder**
  - **Kidneys:** Bean-shaped organs located below the rib cage. They filter blood to remove toxins and excess water, forming urine. Healthy kidneys also produce hormones essential for bone and blood health (Boron, 2017).

- Bladder: A hollow organ that stores urine. It receives urine from the kidneys via the ureters and expels it through the urethra. A healthy bladder can hold 300-500 ml of urine (Berne & Levy, 2008).
  - Connection: The kidneys (solid organ) and bladder (hollow organ) are interrelated in regulating water balance, energy storage, and bone marrow production. Kidney issues can lead to fluid accumulation in the lungs and weak bones. Body engineering therapies, such as lymphatic drainage, address these imbalances (Kelley, 2002).
2. Spleen and Stomach
- Spleen: A solid organ involved in blood filtration and immune response (Fleming et al., 2020).
  - Stomach: A hollow organ responsible for food digestion and storage (Martini et al., 2012).
  - Connection: Diseases affecting the spleen also impact the stomach, and vice versa. Treatment may involve addressing muscle weakness and fluid retention through body engineering methods. Psychological factors like anxiety also influence spleen health (Vélez-Guerrero et al., 2021).
3. Liver and Gallbladder
- Liver: The largest gland in the body, located on the right side of the abdomen. It produces bile and performs various metabolic functions (Alberts et al., 2002).
  - Gallbladder: Stores bile produced by the liver and releases it into the small intestine (Borron, 2017).
  - Connection: The liver and gallbladder influence each other's health. Imbalances can lead to issues with tendons and peripheral organs. Addressing liver health can help manage related conditions and improve overall strength (Wang, 2015).
4. Small Intestine and Heart
- Small Intestine: A hollow organ involved in nutrient absorption (Xu et al., 2021).
  - Heart: A solid organ that pumps blood throughout the body (Kierszenbaum, 2002).
  - Connection: Heart conditions can be linked to small intestine health, and vice versa. Stress and joy can impact heart function, influencing mental health. Treatments may involve enhancing small intestine health to support heart function and vice versa (Carlson, 2004).
5. Lungs and Large Intestine

- Lungs: Solid organs responsible for breathing and fluid regulation (Grund et al., 1985).
- Large Intestine: A hollow organ involved in waste processing and water absorption (Berne & Levy, 2008).
- Connection: Lung health affects colon function and vice versa. Fluid retention and respiratory issues can be managed through body engineering methods, addressing both organs (Fleming et al., 2020).

### **Energy Therapy**

Energy therapy, a key aspect of body engineering, is based on the principle that the body's energy flow impacts health. Proper balance of this energy is crucial for well-being. Energy therapy involves various hand techniques to enhance bioenergy flow, addressing both physical and mental health issues (Adams & Lee, 2023). This holistic approach aims to restore balance and improve overall health.

### **Understanding Energy Therapy**

**Energy Pathways (Meridians):** Energy pathways, or meridians, are analogous to the circulatory system but transport vital energy called Qi (pronounced 'chee') rather than blood. These pathways are functional, not anatomical, and are not visible upon dissection (Adams & Lee, 2023). They are conceptual channels that distribute energy throughout the body, similar to how arteries and veins distribute blood. Any imbalance in these pathways, whether internal or external, can disrupt energy flow and contribute to illness.

### **Basic Principles of Energy Healing**

- **Bioenergy:** An invisible force present in all living organisms (Adams & Lee, 2023).
- **Energy Balance:** Health is maintained when bioenergy is balanced.
- **Energy Blockage:** Stress, negative emotions, and physical injuries can obstruct bioenergy flow.
- **Energy Medicine:** Techniques aimed at improving bioenergy flow to enhance health and well-being (Adams & Lee, 2023).

### **Benefits of Energy Therapy**

Energy therapy is believed to address various health conditions by improving bioenergy flow:

- **Chronic Pain:** Alleviates pain from conditions like arthritis and gout (Fleming et al., 2020).
- **Anxiety and Depression:** Helps in managing symptoms of anxiety and depression (Lei et al., 2014).
- **Sleep Disorders:** Enhances sleep quality.

- Digestive Problems: Relieves issues such as diarrhea and constipation (Xu et al., 2021).
- Autoimmune Diseases: Strengthens the immune system (Adams & Lee, 2023).

### **Energy Pathways and Their Locations**

Energy pathways extend across the body's surface and interior. They can be found on the face, head, chest, back, abdomen, and extremities. Body engineering views energy science differently from traditional approaches, emphasizing the importance of the soft tissue area in energy pathways. Effective treatment involves focusing on this area to ensure comprehensive healing (Adams & Lee, 2023).

### **Key Energy Pathways**

- Pulmonary Pathway: Extends from the chest to the middle and little fingers.
- Cardiac Pathway: Extends from the heart to the thumb.
- Gastric Pathway: Extends from the stomach to the little finger.
- Hepatic Pathway: Extends from the liver to the index finger.
- Splenic Pathway: Extends from the spleen to the index finger.
- Renal Pathway: Extends from the kidneys to the middle and little fingers.
- Bladder Pathway: Extends from the bladder to the thumb.
- Bile Pathway: Extends from the gallbladder to the index finger.
- Pancreatic Pathway: Extends from the pancreas to the index finger.

All energy paths interact with or are close to the soft tissue area. Effective treatment requires addressing this area to activate and balance energy flow (Adams & Lee, 2023).

### **Hand Therapy**

Hand therapy involves applying pressure to specific points on the body to relieve tension, improve energy flow, and promote overall health. This method, rooted in ancient Chinese, Japanese, and Eastern medicine, is unique in its approach:

- Navel Point: Improves digestion and relieves pain.
- Liver Point: Located on the right side of the abdomen, enhances liver health and alleviates intestinal disorders.
- Spleen Point: Located on the left side of the abdomen, supports spleen health and reduces intestinal issues.
- Stomach Point: Positioned in the upper abdomen, improves stomach health and relieves nausea and vomiting.



- **Bowel Point:** Located in the lower abdomen, helps with bowel health, constipation, and bloating.

Hand therapy focuses on opening and activating energy pathways through the soft tissue area, providing comprehensive treatment and addressing both physical and mental balance (Adams & Lee, 2023). Sessions typically last between 30 minutes to an hour, tailored to the patient's condition. This method aims to eliminate blockages and restore energy balance, offering relief from pain and improving overall well-being (Adams & Lee, 2023).

## **Foundations of Manual Therapy**

### **Principles of Hand Therapy**

Hand therapy is grounded in Bioenergy theory, which posits that the body is regulated by energy pathways or channels. Blockages in these pathways can lead to pain and various health issues (Adams & Lee, 2023).

### **Mechanism of Action**

- **Manual Movements:** Hands are used to move joints and muscles, enhancing mobility and strength (Carlson, 2004).
- **Tracing Pain Sources:** Therapists identify and address blockages by tracing the pain source and its path. This often results in immediate warmth and relief due to improved energy flow (Carlson, 2004).

### **Benefits for Movement Pain**

Manual therapy is effective for treating movement-related pain, such as neuropathy, allergies, or numbness. It improves blood circulation and reduces pain and swelling (Fleming et al., 2020).

### **Applicability Across Ages**

Manual therapy is suitable for individuals of all ages, including children. It aims to achieve both physical and mental balance by improving energy flow throughout the body (Fleming et al., 2020).

### **Comprehensive Treatment Focus**

The goal of manual therapy is to provide thorough, lasting treatment by removing energy blockages, thereby enhancing overall health (Adams & Lee, 2023).

## **The First Brain and the Second Brain (The Soft Tissue Area)**

### **The First Brain**

- **Central Nervous System:** Coordinates sensations, movement, cognition, and emotions (Alberts et al., 2002).
- **Components:**

- Cerebrum: Largest part of the brain, responsible for higher functions such as thinking, memory, and emotion (Kierszenbaum, 2002).
- Cerebellum: Controls movement and balance, essential for motor coordination (Carlson, 2004).
- Brainstem: Manages basic life functions like breathing, heart rate, and blood pressure (Berne & Levy, 2008).

The brain consists of approximately 100 billion neurons and consumes about 20% of the body's energy. It continues to develop and adapt throughout life, a process known as neuroplasticity (Alberts et al., 2002).

### **Memory and the First Brain:**

#### **Types of Memory**

- Short-term: Stores information briefly for immediate use (Carlson, 2004).
- Long-term: Stores information for extended periods, enabling recall over days, months, or even years (Kierszenbaum, 2002).

Memory relies on complex neuronal networks and can be affected by factors such as age, injury, neurological diseases, medications, and psychological stress. Techniques such as repetition and mental exercises can improve memory function and support cognitive health (Carlson, 2004).

### **The Second Brain**

The enteric nervous system (ENS), located in the digestive tract, is known as the "second brain" due to its extensive network of neurons (Vélez-Guerrero et al., 2021).

#### **Features**

- Contains about 100 million neurons, more than the spinal cord, making it a complex and independent entity within the body (Martini et al., 2012).
- Communicates with the central nervous system via the vagus nerve, linking gut health to overall mental and physical well-being (Alberts et al., 2002).
- Regulates appetite and is influenced by factors such as diet and environment, which play a crucial role in digestive and mental health (Xu et al., 2021).

#### **Functions of the Enteric Nervous System**

- Intestinal Motility: Controls the movement of food through the digestive system, ensuring efficient digestion and nutrient absorption (Berne & Levy, 2008).

- **Nutrient Absorption:** Assists in the absorption of nutrients, a critical process for sustaining bodily functions and overall health (Xu et al., 2021).
- **Immune Defense:** Contributes to the body's immune response by interacting with gut-associated lymphoid tissue (Vélez-Guerrero et al., 2021).
- **Mood and Behavior:** Affects mood and behavior through its connection to the brain, highlighting the gut-brain axis's role in mental health (Fleming et al., 2020).

### **Digestion Process**

- **Mouth:** Food is chewed and mixed with saliva, which begins the process of starch digestion through the enzyme amylase (Martini et al., 2012).
- **Stomach:** Gastric juice, containing hydrochloric acid and pepsin, further breaks down proteins into peptides (Berne & Levy, 2008).
- **Small Intestine:** Nutrients are absorbed through the villi, tiny projections that increase the surface area for absorption (Xu et al., 2021).
- **Large Intestine:** Absorbs water and salts, forming solid waste that is eventually excreted from the body (Berne & Levy, 2008).

### **Chemical Reactions in Digestion**

- **Starches:** Broken down into simple sugars, such as glucose, by saliva and pancreatic enzymes, providing energy for the body (Alberts et al., 2002).
- **Proteins:** Broken down into amino acids by stomach acids and pancreatic enzymes, which are then used for building and repairing tissues (Berne & Levy, 2008).
- **Fats:** Digested in the small intestine with the aid of bile acids, breaking down into fatty acids and glycerol, which are essential for energy storage and cell structure (Xu et al., 2021).

### **Health Benefits of the Digestive System**

- **Nutrient Absorption:** Provides essential nutrients necessary for growth, energy, and cellular repair, maintaining overall health and well-being (Martini et al., 2012).
- **Infection Protection:** Enzymes and other digestive processes help to kill harmful bacteria and pathogens, protecting the body from infections (Fleming et al., 2020).
- **Detoxification:** The digestive system plays a key role in removing toxins from the body, supporting the liver and kidneys in detoxification processes (Carlson, 2004).

## Enteric Nervous System (ENS)

The Enteric Nervous System (ENS) is a complex network of neurons located in the digestive tract, containing approximately 100 million neurons, comparable to the number in the spinal cord (Martini et al., 2012; Passi-Solar, 2020).

### Functions of the ENS

- **Motility:** The ENS regulates bowel movements, facilitating the propulsion of food through the digestive tract, ensuring smooth digestion and nutrient absorption (Berne & Levy, 2008).
- **Absorption:** It controls the secretion of digestive enzymes and hormones necessary for nutrient absorption, playing a critical role in maintaining nutritional balance (Xu et al., 2021).
- **Defense:** The ENS mediates the digestive system's response to infections, acting as a first line of defense against harmful pathogens (Fleming et al., 2020).

The ENS can be viewed as a chemical laboratory where numerous biochemical reactions occur to regulate digestive functions (Alberts et al., 2002).

### Chemical Reactions in the ENS

- **Enzyme Secretion:** The ENS releases enzymes that assist in food breakdown, crucial for the effective digestion and absorption of nutrients (Berne & Levy, 2008; Passi-Solar, 2020).
- **Hormone Secretion:** It produces hormones that regulate digestive processes, ensuring that the body's energy needs are met (Martini et al., 2012).
- **Neurotransmitter Signaling:** The ENS communicates with the brain and other organs through neurotransmitter signaling, influencing both physical and mental health (Xu et al., 2021).

### Health Benefits of the ENS

- **Healthy Digestion:** The ENS ensures proper digestion of food, providing essential nutrients needed for energy, growth, and repair (Alberts et al., 2002; Passi-Solar, 2020).
- **Nutrient Absorption:** It enhances the effective absorption of nutrients, supporting overall growth and development by ensuring that the body receives adequate nutrition (Xu et al., 2021).
- **Digestive System Protection:** The ENS plays a crucial role in protecting the digestive system from infections, contributing to the body's overall immune defense (Fleming et al., 2020).

### Chemistry of Energy Transfer

Organic polymers in soft tissues facilitate energy transfer. Cells obtain energy from organic molecules through respiration, where carbon and hydrogen atoms combine with oxygen to produce CO<sub>2</sub> and H<sub>2</sub>O. Photosynthesis, which predates respiration, generates organic molecules from sunlight, fueling life forms. Over billions of years, photosynthesis increased atmospheric O<sub>2</sub>, essential for aerobic respiration (Martini et al., 2012) (Fig 1).

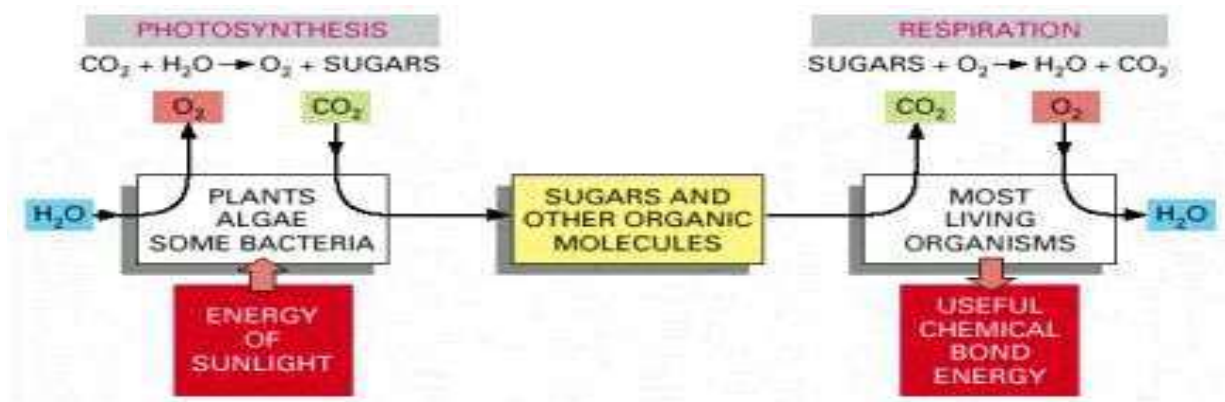


Fig. 1 The Photosynthesis and respiration cycles (Martini et al., 2012)

### Thermally Conductive Polymers and Composites

Polymer chain entanglements and interfaces hinder thermal conductivity. Simulation studies suggest that crystalline polymers, like polyethylene, could achieve high thermal conductivity similar to diamond. Effective thermal transport is enhanced by optimizing chain alignment and crystallinity, this behavior is similar to that of soft tissue area that is a polymer in nature (Alberts et al., 2002) (Fig 2 a).

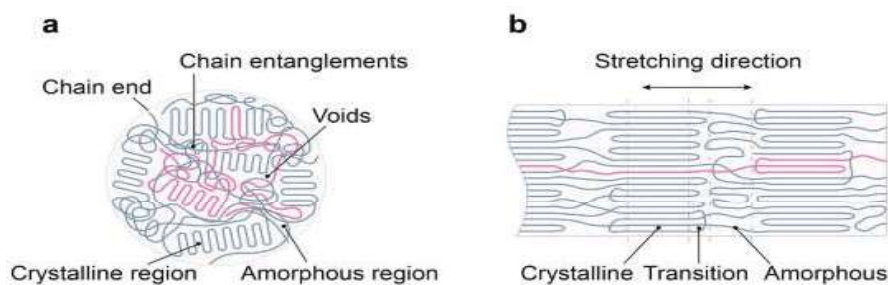


Fig. 2a. Illustration of polymer structures with amorphous and crystalline regions. In the amorphous regions, there are chain entanglements, chain voids and ends limit efficient heat transfer in polymers. (b) Illustration of polymer structures with better chain alignment and higher crystallinity, which are expected to provide efficient thermal transport pathways (Xu et al., 2021).

### Conductive Polymers' Electronic Structure Modification

Modifications in the electronic structures of polypyrrole, polythiophene, and polyaniline enhance their properties for applications such as sensors and electrochemical electrodes. Doping and synthesis methods significantly affect these properties, also, this behavior is similar to that of soft tissue area that is a polymer in nature (Xu et al., 2021) (Fig 2b).

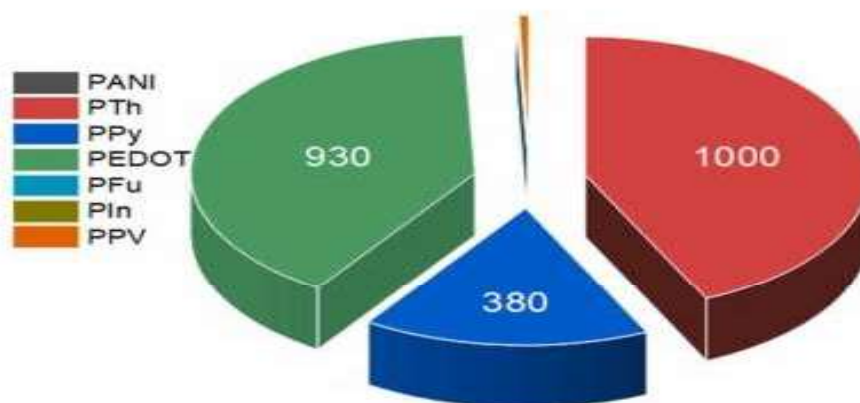


Fig. 2b. Approximate electrical conductivities of conducting polymers in S/cm. Polypyrrole (PPy), polyaniline (PANI), polythiophene (PTh), poly(3,4-ethylene-dioxythiophene) (PEDOT), poly-furan (PFu), poly-indole (PIn), and poly (p-phenylene vinylene) (PPV).

### Photochemical Reactions: Alkene Isomerization

Photochemical reactions, including alkene isomerization, are fundamental in various chemical processes, providing a basis for understanding complex biochemical and industrial reactions (Martini et al., 2012) (Fig. 3).

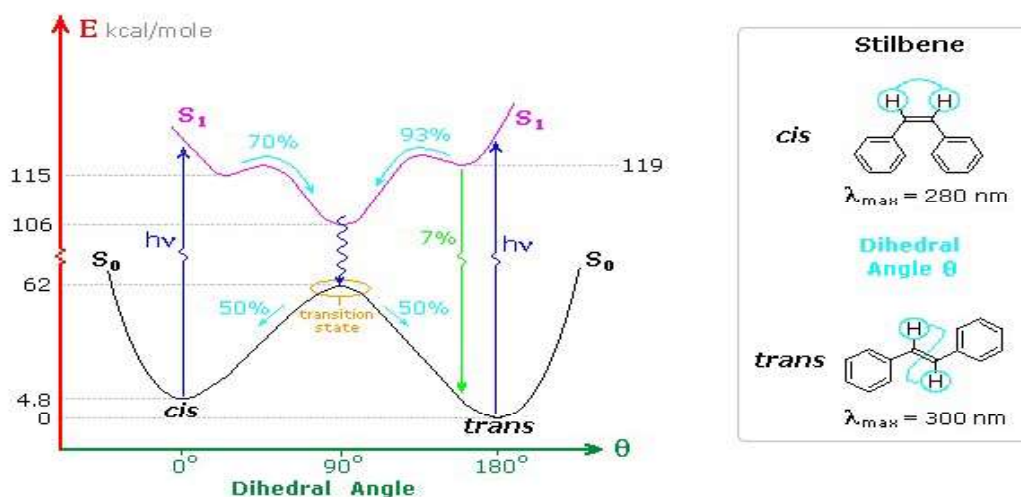


Fig. 3 Photochemical Reactions: Alkene Isomerization (Martini et al., 2012)

### Artificial Intelligence in Hand Rehabilitation Robots

AI enhances hand rehabilitation robots by optimizing human-robot collaboration and assisted training modes, improving the effectiveness and efficiency of rehabilitation programs (Alberts et al., 2002).

### Conclusion

Health is fundamental to quality of life, and innovative rehabilitation techniques, such as hand therapy using soft tissue methods, are making significant strides in treating conditions that conventional therapies often struggle with. These methods involve applying targeted pressure on specific soft tissue areas to enhance organ function, improve circulation, and support overall health. By addressing underlying issues that traditional treatments may miss, soft tissue therapy offers a novel approach to patient care. The integration of artificial intelligence into hand rehabilitation further enhances these techniques, enabling more personalized and adaptive treatment through advanced robotic systems. AI-driven rehabilitation tools improve the precision, effectiveness, and engagement of therapy, offering a promising avenue for managing complex health conditions. Together, these advancements represent a significant evolution in rehabilitation medicine, aiming to improve patient outcomes and quality of life by addressing a wider range of health challenges with more effective, personalized care.

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