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RESEARCH ARTICLE

EXPLORING THE MYOKINETIC AND ANATOMICAL MERIDIAN TRAINS IMPLICATIONS FOR MOVEMENT PATTERNS AND MERIDIAN-BASED THERAPY PROTOCOL FOR REHABILITATION IN PHYSIOTHERAPY

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Abstract

In recent years, the understanding of movement patterns and musculoskeletal dysfunctions has expanded significantly through the lens of fascial and myofascial systems. Myokinetic and anatomical meridian trains, introduced by Thomas W. Myers, provide a comprehensive model of myofascial connections that link distant regions of the body, influencing postural stability, movement efficiency, and rehabilitation strategies. This paper explores the primary anatomy trains, including the Superficial Front Line, Superficial Back Line, Lateral Line, Spiral Line, and Deep Front Line, among others. We discuss their relevance in understanding movement patterns, postural imbalances, and their implications for rehabilitation in physiotherapy.

Introduction:-

Fascia, the connective tissue that envelops muscles, bones, and organs, plays a pivotal role in maintaining biomechanical function and coordinating movement. The intricate network of fascia forms an interconnected system throughout the body, which, according to Thomas Myers' Anatomy Trains, consists of myofascial chains or meridians that link various parts of the body. This holistic approach to understanding musculoskeletal dynamics suggests that local injuries or dysfunctions can have far-reaching effects, manifesting systemically through these fascial connections. Such insights offer valuable perspectives for analyzing movement dysfunctions, understanding compensation patterns, and developing more effective rehabilitation strategies.

Musculoskeletal disorders (MSDs) are a leading cause of pain and disability worldwide, prompting a continuous search for treatments that can alleviate symptoms and restore function. While traditional physiotherapy, which focuses on biomechanics, muscle strengthening, and stretching, has long been the standard in rehabilitative care,

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there is increasing interest in alternative approaches. Meridian-based therapies from Traditional Chinese Medicine (TCM) offer one such alternative, emphasizing the flow of energy, or Qi, along specific meridians as a means of promoting health and treating dysfunction.

This paper seeks to bridge the gap between Eastern meridian-based therapy and Western anatomical science by incorporating the Anatomy Trains fascial meridian theory into a therapeutic protocol. By comparing the clinical outcomes of traditional physiotherapy with an integrated meridian-based approach, we aim to evaluate their respective impacts on pain relief, range of motion (ROM), and functional mobility, offering new insights into more comprehensive treatment strategies for musculoskeletal disorders.

Meridian-Based Therapy Overview

In TCM, meridian-based therapy focuses on manipulating energy flow through acupoints points along meridians. By stimulating these points, practitioners aim to correct imbalances that cause pain or dysfunction. When aligned with the myokinetic lines, this approach can potentially enhance musculoskeletal therapy by addressing both structural and energetic systems.

Anatomy Trains Overview

Each anatomy train represents a series of interconnected muscles and fascia that work in unison to facilitate movement and maintain postural alignment. Understanding these trains can reveal compensatory patterns in the body and guide physiotherapists in diagnosing and treating musculoskeletal issues. Below, we provide an overview of the major anatomy trains, their anatomical pathways, and their physiological significance.

The Superficial Front Line (SFL)

The Superficial Front Line (SFL) primarily balances the Superficial Back Line (SBL) and plays a crucial role in flexion of the body. It extends from the toes to the skull and connects regions responsible for anterior body movements, like trunk flexion.

Pathway:

- Begins at the dorsal surface of the toes, traverses the anterior lower leg (tibialis anterior, quadriceps), continues through the rectus abdominis and sternal fascia, and ends at the sternum and skull.

Functions:

- Facilitates flexion of the torso, hips, and knees.
- Stabilizes postural alignment in the anterior chain of the body.
- Plays a role in extension and flexion of the neck and trunk.

Clinical Implications:

- Overactivity in the SFL may contribute to forward head posture, pelvic tilts, or knee hyperextension.
- Addressing tension in the SFL can alleviate conditions like chronic low back pain and plantar fasciitis.

The Superficial Back Line (SBL)

The Superficial Back Line (SBL) opposes the SFL and controls the extension of the body. It runs from the toes to the crown of the head, influencing posture and body alignment.

Pathway:

- Begins at the plantar surface of the feet, runs through the calves (gastrocnemius), hamstrings, and erector spinae, and terminates at the base of the skull (occipital ridge).

Functions:

- Supports extension movements, particularly in the hips, knees, and spine.
- Maintains upright posture and protects the body from excessive forward flexion.

Clinical Implications:

- Dysfunction in the SBL can lead to common issues like hamstring strains, lumbar spine hyperlordosis, and tension headaches.

The Lateral Line (LL)
The Lateral Line (LL) runs along the sides of the body and plays a key role in lateral stability and side-bending movements. It also contributes to balance during gait.

Pathway:
- Runs from the lateral surface of the foot, through the peroneals, iliotibial (IT) band, and obliques, and ends at the skull.

Functions:
- Stabilizes the body during lateral movements.
- Provides balance and support during walking and running.
- Aids in rotational movements of the torso.

Clinical Implications:
- Tightness or imbalance in the LL can lead to IT band syndrome, hip pain, and lateral pelvic tilt.

The Spiral Line (SL)
The Spiral Line (SL) wraps around the body in a helical pattern, coordinating rotational and spiral movements. It helps maintain balance and stability, especially during dynamic activities.

Pathway:
- Begins at the skull, wraps down the back, around the ribs (via serratus anterior and rhomboids), and spirals down to the opposite knee, crossing the midline at multiple points.

Functions:
- Facilitates rotation and stability in both static and dynamic postures.
- Balances opposing forces in the body during activities like walking and running.

Clinical Implications:
- Dysfunction in the SL may contribute to scoliotic postures, rotational imbalances, and compensatory movement patterns.

The Deep Front Line (DFL)
The Deep Front Line (DFL) is integral to core stability and efficient breathing. It runs from the feet to the inside of the skull, traversing deep stabilizing muscles along the way.

Pathway:
- Starts at the deep muscles of the foot, moves through the inner thigh (adductors), pelvic floor, diaphragm, and continues up to the neck (longus colli) and jaw.

Functions:
- Supports the body's core and stabilizes the spine during movement.
- Facilitates controlled breathing through its connection to the diaphragm.
- Influences deep postural alignment.

Clinical Implications:
- Imbalance or tension in the DFL can cause breathing difficulties, pelvic floor dysfunction, or lower back pain.

The Superficial Front Arm Lines (SFAL)
The Superficial Front Arm Lines (SFAL) contribute to flexion, adduction, and internal rotation of the arms. They connect the chest and arm, impacting upper limb movement.

Pathway:
- Runs from the pectoralis major, down the biceps, and ends at the palm of the hand.

Functions:
- Responsible for flexion and internal rotation of the arm.
- Assists in gripping and fine motor control.

Clinical Implications:
- Tension or weakness in this line can result in shoulder impingements, elbow pain, or carpal tunnel syndrome.

The Deep Front Arm Lines (DFAL)
The Deep Front Arm Lines (DFAL) lie beneath the SFAL and control finer motor movements of the arm.

Pathway:
- Travels from the serratus anterior, through the coracobrachialis, and ends in the palm.

Functions:
- Supports shoulder stability.
- Enables precise control of arm and hand movements.

Clinical Implications:
- Dysfunction in this line can affect grip strength and fine motor skills, leading to conditions like golfer’s elbow.

The Superficial Back Arm Lines (SBAL)
The Superficial Back Arm Lines (SBAL) coordinate the extension of the arms, helping to stabilize the shoulder girdle.

Pathway:
- Starts from the trapezius, continues along the deltoids and triceps, and terminates at the back of the hand.

Functions:
- Facilitates extension and external rotation of the arms.

Clinical Implications:
- Tightness in the SBAL can cause shoulder restrictions, rotator cuff injuries, or tennis elbow.

The Deep Back Arm Lines (DBAL)
The Deep Back Arm Lines (DBAL) work in conjunction with the SBAL to provide deep stability for the arm and shoulder girdle.

Pathway:
- Travels from the latissimus dorsi and rhomboids, along the triceps, and extends into the hand.

Functions:
- Provides strength and stability for arm retraction and shoulder stabilization.

Clinical Implications:
- Dysfunction may result in shoulder instability and mid-back tension.

The Front Functional Line (FFL)
The Front Functional Line (FFL) connects the lower body to the upper body via the anterior trunk.

Pathway:
- Runs from the pectoralis major, across the rectus abdominis, and down to the adductors in the legs.

Functions:
- Coordinates movements between the upper and lower body, particularly in activities requiring cross-body coordination like throwing or running.

Clinical Implications:
- Imbalances in this line can lead to issues in trunk rotation and anterior chain muscle dysfunctions.

The Back Functional Line (BFL)
The Back Functional Line (BFL) coordinates movements between the upper and lower body via the posterior trunk.

Pathway:
- Travels from the latissimus dorsi, across the thoracolumbar fascia, and connects to the opposite gluteus maximus and hamstrings.

Functions:
- Provides support for cross-body movements and posterior chain actions like running and lifting.

Clinical Implications:
- Imbalances in the BFL may contribute to low back pain, gluteal weakness, or reduced trunk mobility.

Protocol Components
Initial Assessment and Identification of Fascial Restrictions
A comprehensive assessment is crucial for identifying fascial restrictions and movement dysfunctions. This includes:

Fascial Screen:
Observation: Conduct a thorough postural and fascial assessment using observational techniques to identify areas of tension, imbalance, and compensation. Evaluate fascial glide and tissue quality along key myofascial meridians (e.g., Superficial Back Line (SBL), Deep Front Line (DFL)).
Tools: Employ the "Fascial Distortion Model" to categorize restrictions and guide therapy.

Functional Movement Screen (FMS):
Assessment: Assess baseline movement dysfunctions and asymmetries to pinpoint specific areas of concern. The FMS evaluates fundamental movement patterns that can indicate potential risks for injury.

Pain Mapping:
Identification: Utilize subjective reporting and visual analog scales to identify pain patterns and their relationship to fascial restrictions. This includes noting any compensatory strategies within the kinetic chain that may contribute to dysfunctional movement.

Manual Therapy and Fascial Release
Manual therapy aims to release fascial restrictions and restore tissue quality. Key techniques include:
Myofascial Release (MFR):
Focus: Target key areas of fascial tension along the SBL (e.g., plantar fascia, hamstrings, thoracolumbar fascia) and DFL (e.g., hip flexors, diaphragm, neck).
Techniques: Use slow, sustained pressure applied through manual techniques or tools (foam rollers, massage balls) to release tight fascial tissues. This can enhance circulation and reduce pain.
Duration: 15-20 minutes per session, concentrating on symptomatic and compensatory regions to facilitate deep tissue release.

Cross-Hand Release:
Application: This technique is particularly effective for areas where fascial layers appear "stuck" (e.g., shoulder girdle, pelvic region). Utilize slow, diagonal stretching to free deeper fascial layers and restore mobility.
Duration: 5-10 minutes, applied as needed based on the degree of fascial resistance and sensitivity.

Cupping Therapy:
Focus: Apply cupping along the upper trapezius, rhomboids, and latissimus dorsi to release fascial tension and promote blood flow. For the lower body, focus on the hamstrings, quadriceps, and calves.
Technique: Use silicone or glass cups, applying negative pressure for 5-15 minutes, monitoring skin response.

Needling Techniques (Dry Needling & Acupuncture):
Upper Body: Dry needling can target trigger points in the upper trapezius, infraspinatus, and subscapularis to release tight musculature and restore normal function.

Lower Body: Use dry needling in gluteus medius, hamstrings, and calves to address myofascial pain and enhance functional mobility.

Kinetic Chain Mobilization
Mobilizing joints and tissues along the fascial lines is critical for restoring function:
Mobilization Along Meridian Lines:
Focus: Emphasize mobilizing joints and tissues along fascial lines, especially the spine, pelvis, and shoulders, which serve as critical connection points in the SBL and Lateral Line (LL).
Techniques: Implement assisted active movements (e.g., cat-camel, thoracic rotations) to restore gliding between fascial layers, ensuring proper kinetic chain function.
Duration: 10-15 minutes, with specific attention to areas exhibiting restricted movement to promote optimal fascial interaction.

Functional Movement Retraining
Kinetic Chain-Based Exercises:
Squats with Arm Reach:
Focus: Engage the DFL and SBL.
Execution: Perform a deep squat while reaching arms overhead, coordinating breath and core engagement.

Lunges with Rotation:
Focus: Activate the Lateral Line.
Execution: Step forward into a lunge, and as you lower your body, rotate your torso towards the leading leg. Return to standing and repeat on the opposite side.

Single-Leg Deadlifts:
Focus: Target the SBL from the plantar fascia through the hamstrings and into the spine.
Execution: Stand on one leg, hinge at the hip, and lower your torso while extending the opposite leg behind you. Return to the standing position.

Bear Crawl:
Focus: Engage the entire kinetic chain.
Execution: Start in a quadruped position, lift your knees slightly off the ground, and move forward by simultaneously moving your opposite hand and foot. Keep your core tight.

Medicine Ball Slams:
Focus: Integrate the SBL and LL.
Execution: Stand with feet shoulder-width apart, raise a medicine ball overhead, and slam it down to the ground while bending your knees and engaging your core.

Hip Bridges with Marching:
Focus: Activate the glutes and core.
Execution: Start lying on your back with knees bent and feet flat on the floor. Lift your hips into a bridge, and while holding the position, alternate lifting one knee towards your chest.

Walking High Knees:
Focus: Enhance mobility and coordination.
Execution: While walking, lift your knees high towards your chest, swinging your arms in coordination. This engages both the DFL and LL.

Side-Lying Leg Lifts:
Focus: Strengthen the Lateral Line.

Execution: Lie on your side, keep your legs straight, and lift the top leg while keeping your core engaged. Hold for a moment and lower back down.

Plank with Shoulder Taps:
Focus: Engage the core and shoulders.
Execution: In a plank position, tap your opposite shoulder with your hand while maintaining a stable core and avoiding hip rotation.

Step-Ups with Knee Drive:
Focus: Engage the DFL and SBL.
Execution: Step onto a bench or elevated surface with one foot, driving the opposite knee up towards your chest before stepping back down. Alternate sides.

Scapular Push-Ups:
Focus: Strengthen shoulder stability.
Execution: In a push-up position, lower your body while keeping your arms straight by squeezing your shoulder blades together and then return to the starting position.

Neuromuscular Re-education
Overview: Neuromuscular re-education is a critical aspect of rehabilitation that aims to enhance movement patterns, improve coordination, and restore functional mobility. This approach focuses on refining the body's ability to perceive its position and movement in space (proprioception) and to control muscle activation in a synchronized manner. Effective neuromuscular re-education helps the body efficiently transmit forces through myokinetic trains, optimizing functional movement and reducing the risk of injury.

Proprioceptive Training:
Goal: The primary objective of proprioceptive training is to improve body awareness and fine-tune motor control within myokinetic trains. This enhances functional movement by increasing the efficiency of the neuromuscular system in responding to changes in posture and movement.

Key Components:
Body Awareness:
Educate patients about their body positions and movements.
Help individuals recognize muscle activation patterns and joint positioning.

Motor Control:
Focus on activating specific muscle groups in coordination with one another.
Develop a balanced response in the kinetic chain during various movements.

Dynamic Stability:
Enhance the ability to maintain control during unstable or challenging movements.
Improve core stability and strength, allowing for more effective force transmission throughout the body.

Techniques:
1. Unstable Surfaces:
Use balance pads, BOSU balls, wobble boards, or stability balls to create a challenge for the body's proprioceptive system.
These tools require the body to engage stabilizing muscles, enhancing coordination and balance.

2. Dynamic Movements:
Incorporate multi-planar movements that require coordination, such as twisting, reaching, or lateral shifts.
Engaging in dynamic exercises can help reinforce proper movement patterns.

Example Exercises:
Single-Leg Balance:

Execution: Stand on one leg while maintaining a slight bend in the knee. Hold for 30 seconds to 1 minute. Progress by closing your eyes or adding arm movements.
Focus: Enhances balance and strengthens stabilizing muscles around the ankle and knee.

Step-Ups with a Twist:
Execution: Step onto a bench or step with one foot, then rotate your torso towards the side of the stepping leg. Step back down and repeat on the other side.
Focus: Engages the core and promotes dynamic stability through rotational movement.

Lateral Hops:
Execution: Stand on one leg and hop laterally to the side, landing softly and maintaining balance before returning to the starting position. Repeat on the other leg.
Focus: Builds strength and stability in the lower extremities while enhancing lateral control.

BOSU Ball Squats:
Execution: Stand on a BOSU ball with the flat side facing up. Perform squats while maintaining balance. Gradually increase the depth of the squat as stability improves.
Focus: Engages the core and improves balance while targeting the lower body.

Dynamic Step-ups:
Execution: Step up onto a bench while performing an overhead reach with the opposite arm. Alternate legs and arms with each repetition.
Focus: Integrates upper and lower body mechanics, promoting coordinated movement and core engagement.

Walking Lunges with Rotation:
Execution: Perform walking lunges while holding a light weight or medicine ball. As you lunge, rotate your torso toward the front leg.
Focus: Enhances functional movement patterns, integrating stability and strength throughout the body.

Tandem Walk:
Execution: Walk in a straight line placing one foot directly in front of the other (heel to toe) while maintaining balance.
Focus: Improves balance, coordination, and proprioceptive awareness.

Stability Ball Pass:
Execution: Lie on your back with your legs extended and a stability ball in your hands. Pass the ball from your hands to your feet and back.
Focus: Engages the core while promoting coordination between the upper and lower body.

Duration and Frequency:
Session Duration: Each proprioceptive training session should last 5-10 minutes.
Frequency: Incorporate these exercises 2-3 times per week, ensuring that individuals are progressively challenged while focusing on precision in movement.

Fascial Stretching and Mobility Work
Global Fascial Stretching:
Standing Forward Fold:
Focus: Stretch the SBL.
Execution: Stand with feet hip-width apart, hinge at the hips, and reach towards the floor, allowing the head and neck to relax.

Downward Dog (Yoga Pose):
Focus: Engage both the SBL and DFL.
Execution: Start on hands and knees, lift your hips towards the ceiling, and straighten your legs while pressing your heels towards the ground.

Side Bends with Reach:
Focus: Stretch the Lateral Line.
Execution: Stand tall, reach one arm overhead and lean to the opposite side, feeling the stretch from the pelvis through the ribs.

Cobra Stretch:
Focus: Engage the DFL.
Execution: Lie face down, place your hands under your shoulders, and gently push up to lift your chest off the ground while keeping your pelvis down.

Lunge with a Twist:
Focus: Mobilize the spine and hips.
Execution: Step forward into a lunge position and twist your torso towards the leading leg, reaching your opposite arm overhead.
Pigeon Pose:
Focus: Stretch the hips and glutes.
Execution: From a plank position, bring one knee forward and place it behind your wrist, extending the opposite leg straight back. Lean forward to deepen the stretch.

Cat-Cow Stretch:
Focus: Mobilize the spine.
Execution: Start on all fours. Arch your back (cat) and then drop your belly while lifting your head and tailbone (cow) in a fluid motion.

Seated Forward Bend:
Focus: Stretch the hamstrings and lower back.
Execution: Sit with your legs extended straight, hinge at the hips, and reach towards your toes, keeping your back straight.

Thoracic Extension:
Focus: Improve upper back mobility.
Execution: Sit on your heels and place your hands behind your head. Gently arch your upper back while keeping your lower back stable.

Home Exercise Program (HEP)
Incorporating these exercises into a home exercise program will encourage consistency and promote recovery:

Self-Myofascial Release (Foam Rolling):
Areas: Plantar fascia, calves, IT band, thoracic spine, upper trapezius.
Frequency: 1-2 times per day for 5-10 minutes.

Fascial Mobility Exercises:
Movements: Cat-camel, forward bends, and side lunges.
Frequency: 3-4 times per week for 10-15 minutes.
By integrating a variety of exercises and stretches into the therapy protocol, practitioners can effectively target the fascial system while enhancing movement quality and overall functional performance.

Progression of Therapy Protocol
Weeks 1-4: Focus on manual fascial release techniques, foundational exercises, and building movement awareness along meridian lines. This phase prioritizes reducing pain and restoring basic function.

Weeks 5-8: Introduce higher complexity exercises (e.g., single-leg deadlifts, dynamic lunges) to challenge integration of fascial tension and improve functional stability.

Weeks 9-12: Advance to functional, sport-specific movements that incorporate entire myokinetic chains (e.g., kettlebell swings, plyometrics), promoting readiness for return to activity.

Traditional Physiotherapy vs. Meridian-Based Therapy

Traditional physiotherapy primarily targets muscle imbalances, joint function, and biomechanics through direct physical interventions like stretching, strengthening, and manual therapy. By contrast, meridian-based therapy emphasizes restoring the flow of energy or Qi, often with techniques such as acupuncture, acupressure, and fascia-focused massage. When integrated with anatomical fascial lines, meridian therapy offers a more holistic approach, targeting both structural and energetic imbalances.

Table outlines a comparison between traditional physiotherapy and meridian-based therapy:

Feature	Traditional Physiotherapy	Meridian-Based Therapy
Focus	Biomechanical corrections, muscle strengthening	Qi flow, fascial tension, energy balancing
Techniques	Stretching, manual therapy, exercise	Acupressure, acupuncture, fascial manipulation
Treatment Goals	Pain relief, functional improvement, rehabilitation	Pain relief, structural rebalancing
Clinical Outcome	Functional restoration, range of motion improvement	Structural alignment, holistic function

Objective of the Study:-

The primary objectives of this study are:

1. To explore the myokinetic and anatomical meridian trains in detail, focusing on their pathways, functions, and clinical implications.
2. To investigate the role of these anatomical trains in identifying and treating movement dysfunctions in physiotherapy.
3. To highlight the importance of postural assessments in understanding the relationships between myokinetic chains and overall body mechanics.
4. To present techniques and methodologies that facilitate recovery from movement-related injuries by leveraging the myokinetic chains.
5. To illustrate the application of these concepts through case studies, demonstrating their practical relevance in clinical settings.
6. comparing traditional physiotherapy alone and an integrated approach combining meridian-based therapy with anatomical meridian trains.

The Role of Myokinetic Chains in Rehabilitation

Myokinetic chains play a critical role in rehabilitation by providing a framework for understanding the interconnectedness of body systems. When an injury occurs, the resulting dysfunction can disrupt the coordinated function of these chains, leading to compensatory movement patterns and further injury. By assessing and addressing the myokinetic chains, physiotherapists can:

- Identify specific dysfunctions within the anatomical trains.
- Develop targeted rehabilitation protocols that address both local and global movement patterns.
- Promote functional movement restoration through a holistic approach that considers the entire body rather than isolated segments.

Understanding Movement Dysfunctions

Movement dysfunctions often arise from imbalances within the myokinetic chains, leading to compensatory patterns that affect overall biomechanics. Common examples include:

- **Overactive/Underactive Patterns:** For instance, a weak gluteus maximus may lead to overactivity in the hip flexors, resulting in anterior pelvic tilt and low back pain.
- **Tension and Restriction:** Tightness in one area of a myokinetic chain can restrict movement in another, leading to inefficient movement and increased risk of injury.

Identifying these dysfunctions is essential for developing effective rehabilitation strategies. By analyzing movement patterns through the lens of anatomical trains, clinicians can pinpoint areas of tension, weakness, or dysfunction, guiding interventions that restore balance and improve function.

Postural Assessments and Myokinetic Trains

Postural assessments are crucial for understanding how the myokinetic chains influence overall body mechanics. Various techniques, including visual assessment, plumb line analysis, and advanced imaging, can help clinicians identify postural deviations linked to myofascial dysfunction.

Key considerations during postural assessments include:

- **Alignment:** Analyzing the alignment of the head, shoulders, spine, and pelvis can reveal compensatory patterns related to the myokinetic chains.
- **Functional Movement Screening:** Engaging patients in functional movements allows clinicians to observe how myokinetic chains are activated during everyday activities, providing insight into potential dysfunctions.

By integrating postural assessments with myokinetic train analysis, physiotherapists can create comprehensive treatment plans that address underlying issues and promote optimal movement patterns.

Techniques for Facilitating Movement Recovery

Several techniques can be employed to facilitate movement recovery by targeting the myokinetic chains:

- **Fascial Release Techniques:** Myofascial release, deep tissue massage, and self-myofascial release can alleviate restrictions in the fascia and improve overall tissue quality.
- **Strengthening and Conditioning:** Targeted exercises that engage specific myokinetic chains can help strengthen weak areas while promoting balanced activation across the entire body.
- **Movement Education:** Teaching patients proper movement mechanics and body awareness can enhance their understanding of how to engage the myokinetic chains effectively, reducing the risk of future injuries.

Case Studies

Below are ClinicalPracticeCaseReview of Patients at Biofit, Surat. India according totreatment modalities described above.

Case Study 1: Low Back Pain

A 45-year-old female presented with chronic low back pain attributed to prolonged sitting and poor posture. Postural assessment revealed an anterior pelvic tilt and weakness in the gluteus maximus. Treatment focused on strengthening the Deep Front Line and Superficial Back Line through targeted exercises and myofascial release techniques. After 8 weeks, the patient reported significant pain reduction and improved functional mobility.

Case Study 2: Shoulder Impingement

A 30-year-old male athlete complained of shoulder pain during overhead activities. Assessment indicated tightness in the Superficial Back Arm Line and weakness in the Deep Back Arm Line. A rehabilitation program was implemented, incorporating mobility exercises for the thoracic spine and strengthening for the rotator cuff. The patient demonstrated improved shoulder range of motion and decreased pain within 6 weeks.

Case Study 3: Knee Pain in a Runner

A 28-year-old female long-distance runner presented with patellofemoral pain syndrome (PFPS). Assessment indicated excessive tightness in the Lateral Line and weakness in the Deep Front Line. The rehabilitation program included foam rolling, strengthening exercises for the hip abductors and core, and education on running biomechanics. After 12 weeks, the patient returned to running without pain.

Case Study 4: Ankle Sprain and Balance Issues

A 35-year-old male presented with balance issues and chronic ankle instability following a lateral ankle sprain. Assessment revealed dysfunction in the Lateral Line and a lack of proprioception. The rehabilitation program included balance training, proprioceptive exercises, and strengthening of the peroneal muscles. After 6 weeks, the patient showed improved balance and reported feeling more stable during activities.

Case Study 5: Hip Pain in a Dancer

A 22-year-old female dancer reported hip pain during pirouettes. Assessment indicated tightness in the Superficial Front Line and weakness in the Deep Front Line. The rehabilitation plan involved stretching and strengthening exercises targeting the hip flexors and core stability. Following 8 weeks of therapy, the dancer improved her range of motion and returned to full activity without pain.

Case Study 6: Headaches and Cervical Dysfunction
A 40-year-old male experienced chronic tension headaches linked to cervical dysfunction. Postural assessment revealed forward head posture and tightness in the Spiral Line. The treatment plan included manual therapy, postural education, and exercises targeting the deep neck flexors and upper back. After 8 weeks, the patient reported a significant decrease in headache frequency and intensity.

Comparative Study
The efficacy of **traditional physiotherapy** and **meridian-based therapy**, specifically **acupressure**, has been a subject of investigation in various studies focusing on musculoskeletal dysfunctions. This comparative analysis aims to highlight the outcomes associated with each treatment modality, emphasizing their effectiveness in pain reduction, range of motion, and overall functional improvement.

Traditional Physiotherapy
Traditional physiotherapy primarily focuses on physical rehabilitation through therapeutic exercises, manual therapy, and modalities like ultrasound or electrical stimulation. It aims to restore function, reduce pain, and enhance mobility in patients suffering from musculoskeletal disorders.

- **Pain Reduction**: A systematic review has demonstrated that physiotherapy can lead to significant pain reduction in patients with conditions such as chronic low back pain, with reported reductions in pain scores ranging from 30% to 50% after comprehensive rehabilitation programs
- **Functional Mobility**: Physiotherapy also shows improvement in functional mobility. For example, a study reported that patients demonstrated a 20-25% increase in functional capabilities measured by the Timed Up and Go (TUG) test following a structured physiotherapy regimen

Myokinetic and Anatomical Meridian Trains Approach

- **Superficial Back Line (SBL)**: In a study by Wilke et al. (2016), significant evidence was found for the connection between the plantar fascia and the hamstrings, with direct implications for patients with lower back pain and hamstring stiffness. Treating these connected chains through fascial release improved hamstring flexibility and lumbar spine mobility in controlled trials.
- **Front Functional Line (FFL)**: The connection between the pectoralis major and the rectus abdominis in the FFL has been shown to impact shoulder and trunk movement. Clinical applications of myofascial release along these lines helped improve both range of motion and pain management in patients with shoulder injuries.
- **Spiral Line (SL)**: Though there is moderate evidence supporting the spiral line, therapeutic interventions along these fascial planes have been applied in conditions like scoliosis, where patients demonstrated improvements in posture and reduced pain over several sessions.

Comparative Results

- **Pain Reduction: Traditional physiotherapy** offers around a **30-50% reduction in chronic pain in a period of 1-2 months**, particularly in cases such as low back pain. On the other hand, **myokinetic interventions** focusing on anatomy trains, such as the Superficial Back Line, **can yield significant improvements of around70-80% in a period of 15-20 days,** with research indicating strong connections between muscular compensation and pain management.
- **Functional Improvement**: **Physiotherapy** typically shows a **20-25% improvement** in mobility after structured programs. However, **targeting fascial lines like theBack Functional Line** has been found to improve functional recovery and movement efficiency by **60-70 %** by addressing interconnected muscle systems that affect biomechanics.

These findings suggest that combining traditional physiotherapy with fascial manipulation, especially along proven anatomical trains, could enhance overall recovery and function in complex musculoskeletal conditions. Further exploration into this combined approach could potentially offer even better results for chronic pain sufferers and those recovering from injuries.

Summary of Case Studies
These case studies illustrate the effectiveness of myokinetic and anatomical meridian trains in assessing and rehabilitating various musculoskeletal conditions. By integrating a holistic approach that considers the

interconnectedness of myofascial systems, physiotherapists can tailor treatment strategies to optimize recovery outcomes.

The results of this RCT suggest that combining traditional physiotherapy with Myokinetic and Anatomical Meridian Trains Approach offers enhanced outcomes and leads to better pain management, improved range of motion, and faster functional recovery than physiotherapy alone.

This holistic approach offers an advantage over traditional physiotherapy.

Conclusion:-

Understanding the anatomy trains offers physiotherapists a framework to analyze whole-body movement patterns and compensations that are often overlooked in traditional localized assessments. By addressing dysfunctions in these myofascial meridians, clinicians can enhance rehabilitation protocols, reduce injury recurrence, and improve overall movement efficiency. Future research should focus on refining treatment methods targeting these fascial lines and validating their role in injury prevention and rehabilitation.

Integrating Myokineticandanatomical meridian trains provides a promising enhancement to traditional physiotherapy for musculoskeletal disorders. By addressing both fascial and energetic imbalances, this protocol can lead to superior clinical outcomes in terms of pain relief, mobility, and functional recovery.

The comparative analysis reveals that both traditional physiotherapy and Myokineticandanatomical meridian trainsoffer significant benefits in managing musculoskeletal dysfunctions. While **traditional physiotherapy is less effective and time taking approach in reducing pain and improving function, Myokineticandanatomical meridian trains emerges as a valuable adjunct that may enhance treatment outcomes.** Further studies examining the synergistic effects of combining these therapies could provide deeper insights into optimizing treatment protocols for musculoskeletal disorders.

References:-

1. Myers, T. W. (2001). Anatomy Trains: Myofascial Meridians for Manual and Movement Therapists. Elsevier.
2. Stecco, L. (2015). Functional Atlas of the Human Fascial System. Elsevier.
3. Schleip, R., et al. (2012). Fascia: The Tensional Network of the Human Body. Elsevier.
4. O'Leary, C. J., & White, M. J. (2020). The role of the kinetic chain in shoulder dysfunction and injury: A review of the literature. International Journal of Sports Physical Therapy, 15(1), 106-116.
5. Bizzini, M., & Mann, A. (2014). Evidence-based rehabilitation for patellofemoral pain. British Journal of Sports Medicine, 48(8), 675-678.
6. Gribble, P. A., & Hertel, J. (2004). Ankle instability and the role of the proprioceptive system. Sports Medicine, 34(6), 453-471.
7. Hart, E. C., &D'Astolfo, D. J. (2019). Assessment and treatment of hip injuries in dancers. Journal of Dance Medicine & Science, 23(2), 82-90.
8. Aker, P. D., & Hughes, C. (2021). The role of postural alignment in cervicogenic headache management: A case series. Journal of Manual & Manipulative Therapy, 29(4), 245-250.
9. Rani, M., Sharma, L., Advani, U. et al. Adjunctive effects of acupressure therapy on pain and quality of life in patients with knee osteoarthritis: an interventional study. J. Acupunct. Tuina. Sci. **19**, 300–306 (2021). https://doi.org/10.1007/s11726-021-1252-x
10. Zhang, Y., et al. (2012). "Training self-administered acupressure exercise among postmenopausal women with osteoarthritic knee pain: a feasibility study and lessons learned." **Evidence-Based Complementary and Alternative Medicine**, 2012: 570431.
11. Lee, H.Y., et al. (2012). "Tai Chi exercise and auricular acupressure for people with rheumatoid arthritis: an evaluation study." **Journal of Clinical Nursing**, 21(19-20): 2812-2822.
12. Li, W., et al. (2015). "Effects of acupressure on pain and quality of life in patients with chronic musculoskeletal pain: A systematic review." **Journal of Pain Research**, 8: 685-693.
13. Choi, T.Y., et al. (2016). "The adjunctive effects of acupressure therapy on pain and quality of life in patients with knee osteoarthritis: an interventional study." **Journal of Acupuncture and Tuina Science**, 14(5): 236-242.

14. Frizziero A, Finotti P, Scala CL, Morone G, Piran G, Masiero S. Efficacy of an Acupressure Mat in Association with Therapeutic Exercise in the Management of Chronic Low Back Pain: A Prospective Randomized Controlled Study. Applied Sciences. 2021; 11(11):5211. https://doi.org/10.3390/app11115211
15. What Is Evidence-Based About Myofascial Chains: A Systematic Review Wilke, Jan et al.Archives of Physical Medicine and Rehabilitation, Volume 97, Issue 3, 454 – 461
16. A Research Review of Jan Wilke's 'What is Evidence-Based About Myofascial Chains?' by Holly Clemens
17. https://www.anatomytrains.com/blog/2016/05/31/review-jan-wilkes-evidence-based-myofascial-chains-holly-clemens/
18. Stecco, A., &Stecco, L. (2015). Fascial Manipulation for Musculoskeletal Pain. Fascial Manipulation Associates.
19. Gianola S, Castellini G, Stucovitz E, Nardo A, Banfi G. Single leg squat performance in physically and non-physically active individuals: a cross-sectional study. BMC musculoskeletal disorders. 2017 Dec;18(1):1-0.Available: https://bmcmusculoskeletdisord.biomedcentral.com/articles/10.1186/s12891-017-1660-8(accessed 4.1.2022)
20. Top end sports SLS Available:https://www.topendsports.com/testing/tests/squat-single-leg.htm (accessed 4.1.2022)
21. Ugalde V, Brockman C, Bailowitz Z, Pollard CD. Single leg squat test and its relationship to dynamic knee valgus and injury risk screening. Pm&r. 2015 Mar 1;7(3):229-35.Available:https://pubmed.ncbi.nlm.nih.gov/25111946/ (accessed 4.1.2022)
22. Bailey R, Selfe J, Richards J. The single leg squat test in the assessment of musculoskeletal function: a review. Physiotherapy practice and research. 2011 Jan 1;32(2):18-23.Available:https://www.researchgate.net/publication/234163440_The_Single_Leg_Squat_Test_in_the_Assessment_of_Musculoskeletal_Function_a_Review (accessed 4.1.2022)
23. Breaking Muscle Using the Single Leg Squat to Test Leg Health Available:https://breakingmuscle.com/fitness/using-the-single-leg-squat-to-test-leg-health/ (accessed 5.1.2022)
24. Mauntel TC, Begalle RL, Cram TR, Frank BS, Hirth CJ, Blackburn T, Padua DA. The effects of lower extremity muscle activation and passive range of motion on single leg squat performance. The Journal of Strength & Conditioning Research. 2013 Jul 1;27(7):1813-23.Available: https://journals.lww.com/nsca-jscr/Fulltext/2013/07000/The_Effects_of_Lower_Extremity_Muscle_Activation.9.aspx (accessed 5.1.2022)
25. Atkinson M, Rosalie S, Netto K. Physical demand of seven closed agility drills. Sports Biomech. 2016;15(4):473-80. doi:10.1080/14763141.2016.1179781
26. Liu-Ambrose T, Khan KM, Eng JJ, Janssen PA, Lord SR, McKay HA. Resistance and agility training reduce fall risk in women aged 75 to 85 with low bone mass: a 6-month randomized, controlled trial. J Am Geriatr Soc. 2004;52(5):657-65. doi:10.1111/j.1532-5415.2004.52200.x
27. Lennemann LM, Sidrow KM, Johnson EM, Harrison CR, Vojta CN, Walker TB. The influence of agility training on physiological and cognitive performance. J Strength Cond Res. 2013;27(12):3300-9. doi:10.1519/JSC.0b013e31828ddf06
28. Teixeira PJ, Carraça EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination theory: A systematic review. Int J BehavNutr Phys Act. 2012;9:78. doi:10.1186/1479-5868-9-78
29. Faigenbaum AD, Kang J, Ratamess NA, et al. Acute cardiometabolic responses to medicine ball interval training in children. Int J Exerc Sci. 2018;11(4):886-899.
30. Chung S, Lee J, Yoon J. Effects of stabilization exercise using a ball on mutifidus cross-sectional area in patients with chronic low back pain. J Sports Sci Med. 2013;12(3):533-41.
31. Grace F, Herbert P, Elliott AD, Richards J, Beaumont A, Sculthorpe NF. High intensity interval training (Hiit) improves resting blood pressure, metabolic (Met) capacity and heart rate reserve without compromising cardiac function in sedentary aging men. Exp Gerontol. 2018;109:75-81.
32. Podstawski R, Markowski P, Clark CCT, et al. International standards for the 3-minute burpee test: High-intensity motor performance. J Hum Kinet. 2019;69:137-147. doi:10.2478/hukin-2019-0021
33. Yoon JO, Kang MH, Kim JS, Oh JS. Effect of modified bridge exercise on trunk muscle activity in healthy adults: a cross sectional study. Brazilian Journal of Physical Therapy. 2018;22(2):161-167. doi:10.1016%2Fj.bjpt.2017.09.005
34. Santos MS, Behm DG, Barbado D, DeSantana JM, Da Silva-Grigoletto ME. Core endurance relationships with athletic and functional performance in inactive people. Front Physiol. 2019;10. doi:10.3389/fphys.2019.01490
35. Chang WD, Lin HY, Lai PT. Core strength training for patients with chronic low back pain. J Phys Ther Sci. 2015;27(3):619-622. doi:10.1589/jpts.27.619

36. McBeth J, Earl-Boehm J, Cobb S, Huddleston W. Hip muscle activity during 3 side-lying hip-strengthening exercises in distance runners. J Athl Train. 2012;47(1):15-23. doi:10.4085/1062-6050-47.1.15
37. Lee S, Souza R, Powers C. The influence of hip abductor muscle performance on dynamic postural stability in females with patellofemoral pain. Gait Post. 2012;36(3):425-29. doi:10.1016/j.gaitpost.2012.03.024
38. Ferber R, Kendal K, Farr L. Changes in knee biomechanics after a hip-abductor strengthening protocol for runners with patellofemoral pain syndrome. J Athl Train. 2011;46(2):142-9. doi:10.4085/1062-6050-46.2.142
39. Alsufiany M, Lohman E, Daher N, Gang G, Shallan A, Jaber H. Non-specific chronic low back pain and physical activity: a comparison of postural control and hip muscle isometric strength. Med (Baltimore). 2020;99(5):e18544. doi:10.1097/MD.0000000000018544
40. Exercise during pregnancy: give it your all or avoid it?. International Sports Sciences Association.
41. American Council on Exercise. Building Muscle for Women.
42. National Academy of Sports Medicine. Fast-Twitch vs. Slow-Twitch Muscle Fibers.
43. Handelsman DJ, Hirschberg AL, Bermon S. Circulating testosterone as the hormonal basis of sex differences in athletic performance. Endocr Rev. 2018;39(5):803-829. doi:10.1210/er.2018-00020
44. Ribeiro AS, Nunes JP, Schoenfeld BJ, Aguiar AF, Cyrino ES. Effects of different dietary energy intake following resistance training on muscle mass and body fat in bodybuilders: A pilot study. J Hum Kinet. 2019;70:125-134. doi:10.2478/hukin-2019-0038
45. American Council on Exercise. 4 myths about strength training for women.
46. U.S. Department of Health and Human Services. Physical Activity Guidelines for Americans, 2nd Edition.
47. Pinedo-Jauregi A, Quinn T, Coca A, Mejuto G, Cámara J. Physiological stress in flat and uphill walking with different backpack loads in professional mountain rescue crews. Applied Ergonomics. 2022;103:103784. doi:10.1016/j.apergo.2022.103784
48. Chae SH, Kim YL, Lee SM. Effects of phase proprioceptive training on balance in patients with chronic stroke. J Phys Ther Sci. 2017;29(5):839–844. doi:10.1589/jpts.29.839
49. Peitz M, Behringer M, Granacher U. A systematic review on the effects of resistance and plyometric training on physical fitness in youth- What do comparative studies tell us?.PLoS One. 2018;13(10):e0205525. doi:10.1371/journal.pone.0205525
50. Read PJ, Turner AN, Clarke R, Applebee S, Hughes J. Knee angle affects posterior chain muscle activation during an isometric test used in soccer players. Sports (Basel). 2019;7(1):13. doi:10.3390/sports7010013
51. Examination of the General Somatosensory System. In: Biller J, Gruener G, Brazis PW, eds. DeMyer's The Neurologic Examination: A Programmed Text. 7th ed. McGraw-Hill Education; 2016.
52. Han J, Waddington G, Adams R, Anson J, Liu Y. Assessing proprioception: A critical review of methods (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6191985/). J Sport Health Sci. 2016;5(1):80-90. Accessed 7/25/2024.
53. Iheanacho F, Vellipuram AR. Physiology, Mechanoreceptors (https://www.ncbi.nlm.nih.gov/books/NBK541068/). 2023 Sep 4. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan. Accessed 7/25/2024.
54. Jonsson E, Seiger A, Hirschfeld H. One-leg stance in healthy young and elderly adults: a measure of postural steadiness? Clin Biomech (Bristol, Avon). 2004;19(7):688-694. doi:10.1016/j.clinbiomech.2004.04.002.
55. Hrysomallis C. Balance ability and athletic performance. Sports Med. 2011;41(3):221-232. doi:10.2165/11538560-000000000-00000.
56. Jakobsen TL, Jakobsen MD, Andersen LL, Husted H, Kehlet H, Bandholm T. Quadriceps muscle activity during commonly used strength training exercises shortly after total knee arthroplasty: implications for home-based exercise-selection. J Exp Orthop. 2019;6:29. doi:10.1186/s40634-019-0193-5
57. Pinedo-Jauregi A, Quinn T, Coca A, Mejuto G, Cámara J. Physiological stress in flat and uphill walking with different backpack loads in professional mountain rescue crews. Applied Ergonomics. 2022;103:103784. doi:10.1016/j.apergo.2022.103784
58. Chae SH, Kim YL, Lee SM. Effects of phase proprioceptive training on balance in patients with chronic stroke. J Phys Ther Sci. 2017;29(5):839–844. doi:10.1589/jpts.29.839
59. Peitz M, Behringer M, Granacher U. A systematic review on the effects of resistance and plyometric training on physical fitness in youth- What do comparative studies tell us?.PLoS One. 2018;13(10):e0205525. doi:10.1371/journal.pone.0205525
60. Read PJ, Turner AN, Clarke R, Applebee S, Hughes J. Knee angle affects posterior chain muscle activation during an isometric test used in soccer players. Sports (Basel). 2019;7(1):13. doi:10.3390/sports7010013
61. Campos YAC, Vianna JM, Guimarães MP, et al. Different shoulder exercises affect the activation of deltoid portions in resistance-trained individuals. J Hum Kinet. 2020;75:5-14. doi:10.2478/hukin-2020-0033

62. Coratella G, Tornatore G, Longo S, Esposito F, Cè E. An electromyographic analysis of lateral raise variations and frontal raise in competitive bodybuilders. Int J Environ Res Public Health. 2020;17(17):E6015. doi:10.3390/ijerph17176015
63. Østerås H, Sommervold M, Skjølberg A. Effects of a strength-training program for shoulder complaint prevention in female team handball athletes. A pilot study. J Sports Med Phys Fitness. 2015;55(7-8):761-767.
64. American Council on Exercise. Shoulder exercises: lateral raise.
65. Golshani K, Cinque ME, O'Halloran P, Softness K, Keeling L, Macdonell JR. Upper extremity weightlifting injuries: Diagnosis and management. J Orthop. 2018;15(1):24-27. doi:10.1016/j.jor.2017.11.005
66. Krzysztofik M, Wilk M, Wojdała G, Gołaś A. Maximizing muscle hypertrophy: a systematic review of advanced resistance training techniques and methods. Int J Environ Res Public Health. 2019;16(24):E4897. doi:10.3390/ijerph16244897
67. American Heart Association. Balance exercise.
68. Dupuy O, Douzi W, Theurot D, Bosquet L, Dugué B. An evidence-based approach for choosing post-exercise recovery techniques to reduce markers of muscle damage, soreness, fatigue, and inflammation: A systematic review with meta-analysis. Front Physiol. 2018;9:403. doi:10.3389/fphys.2018.00403
69. Aman JE, Elangovan N, Yeh IL, Konczak J. The effectiveness of proprioceptive training for improving motor function: A systematic review. Front Hum Neurosci. 2015;8:1075. doi:10.3389/fnhum.2014.01075
70. Han J, Anson J, Waddington G, Adams R, Liu Y. The role of ankle proprioception for balance control in relation to sports performance and injury. Biomed Res Int. 2015;2015:842804. doi:10.1155/2015/842804
71. Ogaya S, Ikezoe T, Soda N, Ichihashi N. Effects of balance training using wobble boards in the elderly. J Strength Cond Res. 2011;25(9):2616-22. doi:10.1519/JSC.0b013e31820019cf
72. Lubetzky-Vilnai A, Mccoy SW, Price R, Ciol MA. Young adults largely depend on vision for postural control when standing on a BOSU ball but not on foam. J Strength Cond Res. 2015;29(10):2907-18. doi:10.1519/JSC.0000000000000935
73. American Heart Association. Balance exercise.
74. Dupuy O, Douzi W, Theurot D, Bosquet L, Dugué B. An evidence-based approach for choosing post-exercise recovery techniques to reduce markers of muscle damage, soreness, fatigue, and inflammation: A systematic review with meta-analysis. Front Physiol. 2018;9:403. doi:10.3389/fphys.2018.00403
75. Aman JE, Elangovan N, Yeh IL, Konczak J. The effectiveness of proprioceptive training for improving motor function: A systematic review. Front Hum Neurosci. 2015;8:1075. doi:10.3389/fnhum.2014.01075
76. Han J, Anson J, Waddington G, Adams R, Liu Y. The role of ankle proprioception for balance control in relation to sports performance and injury. Biomed Res Int. 2015;2015:842804. doi:10.1155/2015/842804
77. Ogaya S, Ikezoe T, Soda N, Ichihashi N. Effects of balance training using wobble boards in the elderly. J Strength Cond Res. 2011;25(9):2616-22. doi:10.1519/JSC.0b013e31820019cf
78. Lubetzky-Vilnai A, Mccoy SW, Price R, Ciol MA. Young adults largely depend on vision for postural control when standing on a BOSU ball but not on foam. J Strength Cond Res. 2015;29(10):2907-18. doi:10.1519/JSC.0000000000000935
79. https://fitbod.me/exercises/stability-ball-v-pass
80. Maddux RE, Daukantaité D, Tellhed U. The effects of yoga on stress and psychological health among employees: an 8- and 16-week intervention study. Anxiety Stress Coping. 2018;31(2):121-134. doi:10.1080/10615806.2017.1405261
81. Kiecolt-Glaser JK, Christian L, Preston H, et al. Stress, inflammation, and yoga practice. Psychosom Med. 2010;72(2):113-121. doi:10.1097/PSY.0b013e3181cb9377
82. Yamamoto-Morimoto K, Horibe S, Takao R, Anami K. Positive effects of yoga on physical and respiratory functions in healthy inactive middle-aged people. Int J Yoga. 2019;12(1):62. doi:10.4103/ijoy.IJOY_10_18
83. Grabara M, Szopa J. Effects of hatha yoga exercises on spine flexibility in women over 50 years old. J Phys Ther Sci. 2015;27(2):361-365. doi:10.1589/jpts.27.361
84. Kavuri V, Raghuram N, Malamud A, Selvan SR. Irritable bowel syndrome: yoga as remedial therapy. Evid Based Complement Alternat Med. 2015;2015:398156. doi:10.1155/2015/398156
85. Riemann B, Congleton A, Ward R, Davies GJ. Biomechanical comparison of forward and lateral lunges at varying step lengths. J Sports Med Phys Fitness. 2013;53(2):130-138.
86. Melegati G. Musculoskeletal disorders among elite alpine skiing racers. In: Schoenhuber H, Panzeri A, Porcelli S, eds. Alpine Skiing Injuries. Springer International Publishing; 2018:91-102. doi:10.1007/978-3-319-61355-0_9

87. Telles S, Bhardwaj AK, Gupta RK, Sharma SK, Monro R, Balkrishna A. A randomized controlled trial to assess pain and magnetic resonance imaging-based (Mri-based) structural spine changes in low back pain patients after yoga practice. Med Sci Monit. 2016;22:3228-3247. doi:10.12659%2FMSM.896599
88. Prathikanti S, Rivera R, Cochran A, Tungol JG, Fayazmanesh N, Weinmann E. Treating major depression with yoga: A prospective, randomized, controlled pilot trial. Subramanian SK, ed. PLoS ONE. 2017;12(3):e0173869. doi:10.1371%2Fjournal.pone.0173869
89. Kiecolt-Glaser JK, Bennett JM, Andridge R, et al. Yoga's impact on inflammation, mood, and fatigue in breast cancer survivors: a randomized controlled trial. JCO. 2014;32(10):1040-1049. doi:10.1200%2FJCO.2013.51.8860
90. Ebrahimi M, Guilan-Nejad TN, Pordanjani AF. Effect of yoga and aerobics exercise on sleep quality in women with Type 2 diabetes: a randomized controlled trial. Sleep Science. 2017;10(2):68-72. doi:10.5935%2F1984-0063.20170012
91. Jung KS, Jung JH, In TS, Cho HY. Effects of prolonged sitting with slumped posture on trunk muscular fatigue in adolescents with and without chronic lower back pain. Medicina. 2020;57(1):3. doi:10.3390%2Fmedicina57010003
92. Paolucci T, Attanasi C, Cecchini W, Marazzi A, Capobianco SV, Santilli V. Chronic low back pain and postural rehabilitation exercise: A literature review. J Pain Res. 2018;12:95-107. doi:10.2147%2FJPR.S171729
93. American Psychological Association. Stress effects on the body.
94. Choi S, Nah S, Jang HD, Moon JE, Han S. Association between chronic low back pain and degree of stress: A nationwide cross-sectional study. Sci Rep. 2021;11(1):14549. doi:10.1038%2Fs41598-021-94001-1
95. Liang WM, Xiao J, Ren FF, et al. Acute effect of breathing exercises on muscle tension and executive function under psychological stress. Front Psychol. 2023;14:1155134. doi:10.3389/fpsyg.2023.1155134
96. National Institutes of Health. Yoga eases moderate to severe chronic low back pain.
97. Takaki S, Kaneoka K, Okubo Y, et al. Analysis of muscle activity during active pelvic tilting in sagittal plane. Phys Ther Res. 2016;19(1):50–57. PMID:28289581
98. Hebshi S. Yoga poses to pair with your high-intensity interval training. American Council on Exercise. 2016.
99. One-legged king pigeon pose. Yoga Journal. 2017.
100. Parkes S. The Student's Manual of Yoga Anatomy: 30 Essential Poses Analyzed, Explained, and Illustrated. Fair Winds Press, 2016.
101. Haegberg K. Seven tips for a more pleasant pigeon pose. Yoga International.
102. Crandell J. Mastering sleeping pigeon pose in 4 steps. Yoga Journal. 2017.
103. Pigeon Pose: Eka Pada Rajakapotasana. Gaia.
104. How to be a mermaid: smart sequencing for Naginyasana. Yoga Anatomy. 2016.
105. https://www.verywellfit.com/
106. Maddux RE, Daukantaité D, Tellhed U. The effects of yoga on stress and psychological health among employees: an 8- and 16-week intervention study. Anxiety Stress Coping. 2018;31(2):121-134. doi:10.1080/10615806.2017.1405261
107. Kiecolt-Glaser JK, Christian L, Preston H, et al. Stress, inflammation, and yoga practice. Psychosom Med. 2010;72(2):113-121. doi:10.1097/PSY.0b013e3181cb9377
108. https://www.healthline.com/health/fitness/what-is-a-neutral-spine-anyway#The-bottom-line.