

Introduction

Science—observations, measurements, accumulation of data, and analysis

Intuition—knowing something without using the process of conscious thinking

Centering—ability to pay attention to a specific area

Art—craft, skill, technique, and talent

An idea (intuition) is the first step in a scientific approach. If there is no idea, there is nothing to research, and without research (science), an idea does not develop form and usefulness.

Centering is the ability to pay attention to a specific area and to concentrate. Centering helps the intuition to be more apparent. Massage work is an art, so a professional has to trust to have intuition.

Case Report Guidelines and Case Report Structure

Report on independent clinical interventions on one client with guidance from case report supervisor and a clinic supervisor

Literature review on the presenting condition or client goal

Creating and implementing a treatment plan

Writing up the results

Discussing the implications of the outcomes

Offering suggestions for future study

Most of us will not actually conduct formal research in a research laboratory. However, we all need to be research users and evaluators to make sure we are the most informed massage therapists possible.

Additional guidelines:

Minimum of five massage therapy sessions with participating client.

Massage therapy recommended as only new intervention in the client's treatment plan

Patient confidentiality and security of health information must be maintained (no personal identification)

The Case Report

1. Cover page
2. Acknowledgements
3. Abstract/key words
4. Introduction
5. Methods
6. Results
7. Discussion
8. References

A well-written scientific report explains the scientist's goal for doing an experiment, the experimental design and execution, and the meaning of the results.

The eight sections presented here should be included in the report.

Research Literacy

Research literacy – the knowledge and understanding of scientific concepts and processes required for personal and professional decision making

Learning to be a critical thinker is the first step in becoming research literate.

Part of reading research articles involves making sure the research was conducted properly and that the information is scientifically valid and not just opinion.

Valid Research

Scientific methods objectively research a concept to determine its validity through:

Hypothesis

Experimental design

Statistical analysis of data

Interpretation of data

Validity refers only to the quality of the method used to reach a conclusion, not whether the information involved is true. For example, a researcher might come to a conclusion using valid methods, but the conclusion might later be disproved when more information becomes available.

Types of Experiments

Randomized controlled trials

Cohort studies

Outcomes research

Case series

Case report

The experiment must follow accepted design measures so that others can replicate it to see whether they get the same result.

The results of the experiment should either prove or disprove the hypothesis.

Guidelines for Levels of Evidence: ABC System

Box 5-2

Guidelines for Levels of Evidence: ABC System

Level A: Well-done, random controlled studies (RCT) with 100 or more subjects

Level B: Well-conducted case-control study; poorly controlled or uncontrolled observations studies with high potential for bias; or RCT with one or more major, or three or more minor, methodological flaws or case series or case reports

Level C: Expert opinion

Modified from Rich NC: Levels of evidence, *J Womens Health Phys Ther* 29:19, 2005.

Systematic Reviews and Meta-Analysis

Systematic review

High-level overview of primary research on a particular research question

Usually restricted to random controlled studies

Reviewers use critical thinking methods to evaluate validity of each study

Results synthesized

Final product report generated

Systematic reviews and meta-analyses combine multiple research studies that are similar in design.

Systematic Reviews and Meta-Analysis

Meta-analysis

Type of systematic review that uses statistical methods to combine and analyze multiple investigations

Two sources:

Cochrane Database of Systematic Reviews

Database of Abstracts of Reviews of Effects

Quality of Evidence

Quality of Evidence 3-point scale

Good

Fair

Poor

Strength of Recommendations

A

B

C

D

I

If no systematic reviews or meta-analyses are available, consider using other types of guidance, such as the opinions of multiple experts.

The U.S. Preventive Services Task Force, established by the Department of Health and Human Services, is a multidisciplinary team of primary care experts that uses a systematic, evidence-based approach to focus on preventive services in the clinical setting. The task force specifically bases its recommendation on a balanced evaluation of the benefits and potential for harm of a preventive service.

Current Research

Scientific research is being conducted to validate the effects of massage.

Data identify patterns of underlying physiologic mechanisms stimulated by massage.

The goal is to incorporate touch therapy into the clinical health care system in the same way exercise, relaxation therapy, and diets have been incorporated.

Treatment comparison studies will determine the best massage technique for different conditions and the arousing versus calming effects of different treatments.

Massage therapy could evolve from method orientation (e.g., Swedish massage) to physiologic outcomes with variations in pressure, speed, rhythm, direction, and duration of desired results.

General Massage Benefits and Safety

Research findings are mixed regarding efficacy of massage:

- Not a definitive treatment for various conditions

- Supportive of many other interventions by:

 - Enhancing effects

 - Managing side effects of other treatments

This means that typically massage would be a beneficial part of a wellness or health care treatment program, but it should not be expected to provide optimum outcomes if used as the only therapeutic intervention.

Safety of massage:

Benefits of receiving massage must exceed the potential for harm

Massage generally safe, but not risk-free

Serious adverse effects rare

For any treatment, safety (i.e., do no harm) is a primary concern.

WHY massage may work:

Affects the autonomic nervous system

Affects a variety of neurochemicals and hormones

Affects function of the somatic nervous system

Affects the fascia

Supports the therapeutic relationship

The reasons massage works remain elusive, but recurring findings indicate the possibility of physiologic mechanisms.

Whether massage directly affects neurochemicals that influence mood and behavior is unclear, but research in touch has shown promising results.

EXAMPLE

A client did a lot of yard work and is sore and achy. He feels stiff, and stretching is painful. Based on the information in the Frey Law study, massage most likely will be beneficial if a variety of pressures are used, and deeper pressure massage is used to target areas that hurt when the client stretches. It might be important to explain to the client that he may still feel achy, but he should be able to move more easily.

The results of a study by Frey Law et al. suggest that massage can reduce myalgia symptoms by about 25% to 50%, depending on the technique used to measure pain.

If we analyze the study by Frey Law et al., we can conclude that both deep and light pressure massage reduce the sensation of pain and that deep pressure massage helps reduce pain when stretching sore muscles. However, when no activity was involved, massage did not reduce the sensation of pain.

Massage therapy:

May play a role in reducing detrimental stress-related symptoms

Is pleasurable

Appears to manage some muscle-type pain

General Massage Benefits and Safety: Key Points

Massage therapy :

- Supports social bonding

- Likely improves the perception of quality of life in individuals who enjoy massage

- Typically is safe when provided in a conservative and general manner using pressure levels that range from light to moderately deep, broad-based and pain free

Injury is most apt to occur with invasive “deep tissue” methods. This does not mean that deep pressure is contraindicated.

Many beneficial results are achieved by using a variety of pressure levels used intelligently. It is okay for massage to feel intense as long as the sensation is not causing an adverse response such as guarding and flinching.

Some methods are moderately painful, but the pain felt should be familiar and of the “good hurt” type.

Mechanical Effects Related to Massage Benefit

Altered pliability of connective tissue

Stimulation of nerve endings in the fasciae

Changes in local circulation

Changes in the motor tone of muscles

The benefits of massage appear to be related to the application of mechanical forces to soft tissue, such as compression and tension.

Tensegrity

Tensegrity system: continuous tensional network connected by discontinuous set of compressive elements (struts)

A tensegrity structure forms a stable yet dynamic system that interacts efficiently and resiliently with forces acting upon it.

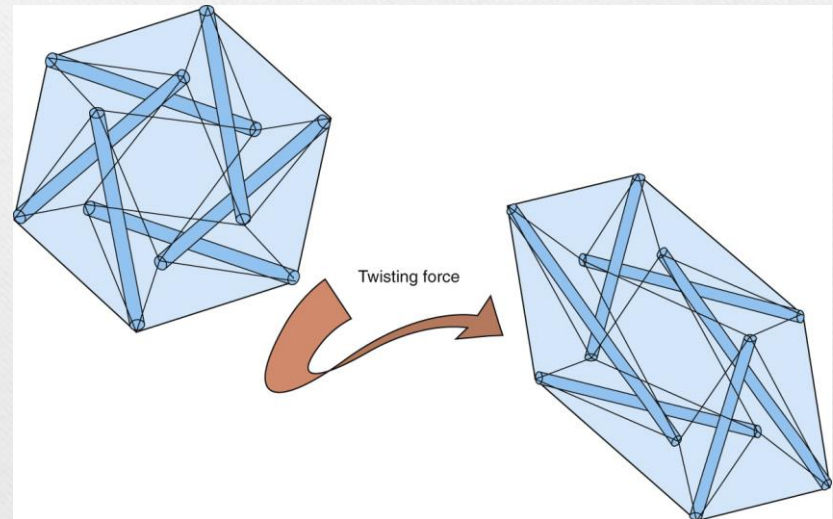
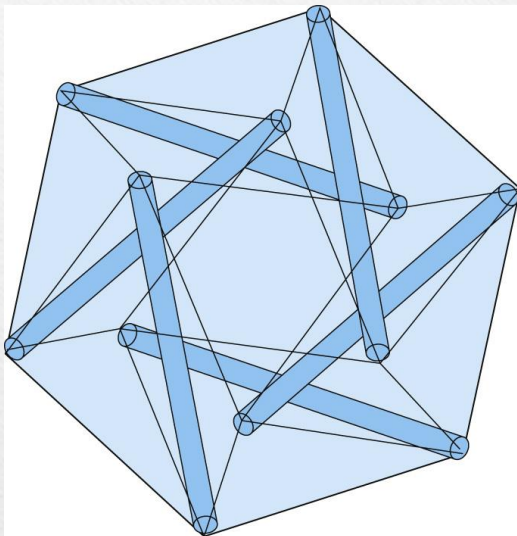


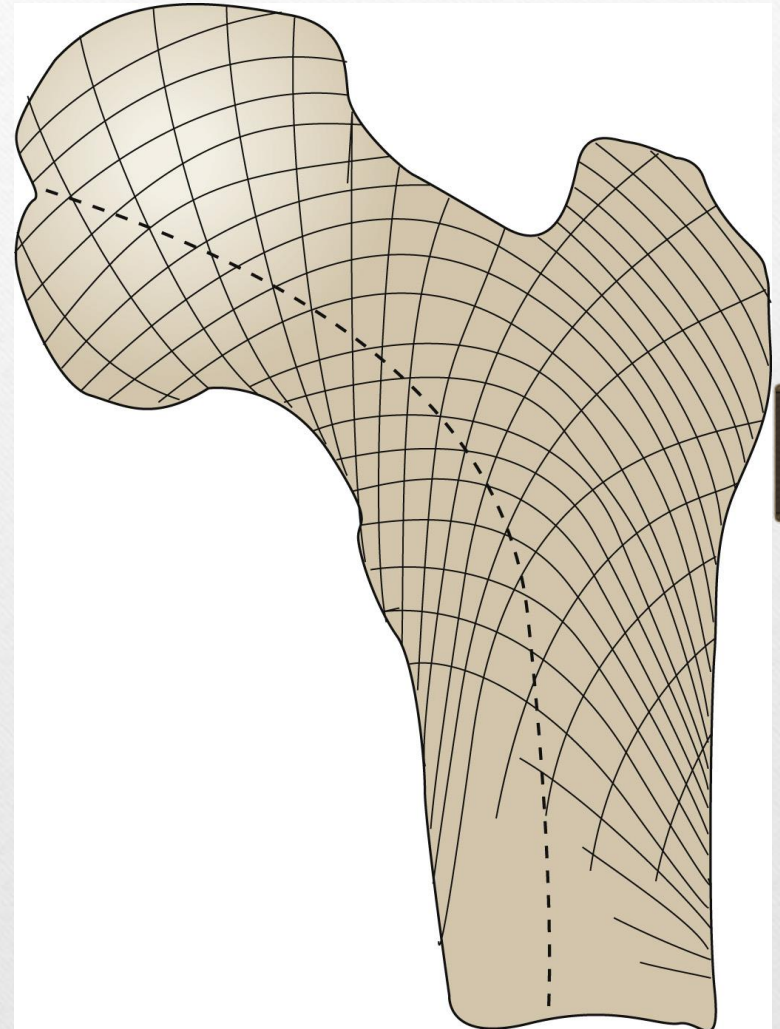
Figure 5-1 depicts a cell that is kept together by tensegrity. Figure 5-2 demonstrates that cell reacting to a twisting force.

Tensegrity

Attaching tendons and muscles to the bones results in a three-dimensional tensegrity network that supports and moves the body.

Tensegrity of the body explains how inflexibility or shortening in one tissue influences the structure and movement of other parts.

Figure 5-3 shows the head of a femur, which is a tensegrity structure because it uses both compression and tension-resisting elements to support weight.



Myofascial System

Three-dimensional continuum

No individual muscle

Everything moves in body

Slides over and around

Slippery fluid

The concept of the three-dimensional continuum means that we cannot truly separate muscle or any other type of tissue from the surrounding fascia or the body as a whole.

If tissues cannot slide as they are supposed to, inflammation and reduced range of motion and strength can result.

Fascia

Formed by crimped/wavy collagen fibers and elastic fibers arranged in distinct layers

Aligned in a different direction in each layer

Embedded in ground substance

Can be stretched

The concept of the three-dimensional continuum means that we cannot truly separate muscle or any other type of tissue from the surrounding fascia or the body as a whole.

If tissues cannot slide as they are supposed to, inflammation and reduced range of motion and strength can result.

Subcutaneous fascia

Forms elastic sliding membrane essential for:

Thermal regulation

Metabolic exchanges

Protection of vessels and nerves

Subcutaneous fascia is tissue containing body fat that is located under the skin but on top of muscle.

Deep fascia

Stiffer and thinner

Surrounds and compartmentalizes muscles

Forms the structures that attach soft tissues to bone

Forms a complex latticework of connective tissue

Deep fascia is designed to sense and assist in organizing movements. Whenever a body part moves in any direction, a myofascial, tensional rearrangement occurs within the corresponding fascia.

Changes in the gliding of the fascia (e.g., too loose, too tight, or twisted) cause altered movement and thus tissue adaption.

Mechanoreceptors

Sensory receptors embedded in fascia

Make fascia a sensory organ

Trigger changes in ANS

Mechanoreceptors make fascia a sensory organ, which has free nerve endings that respond to mechanical force stimulation.

When connective tissues are out of balance, resulting in soft tissue strain, mechanoreceptors in the fascia can trigger changes in the autonomic nervous system.

Mechanical Stimulation and Interfascial Water

Stretching of the fascia squeezes out water

Mechanical stimuli causes smooth muscle–like contraction and relaxation responses of the whole tissue

Squeezing and refilling effects in the semiliquid ground substance

Interfascial water

Vicinal (crystalline) water

Exhibits structural organizations that differ from those of common bulk water.

Interfascial water at times also can demonstrate a tendency to behave in a crystalline manner.

Water content of fascia partly determines its stiffness

Stretching or compression of fascia causes extrusion of water, making tissues more pliable and supple

Stiffness returns when water is taken back up

During mechanical stimulation, structures can be mobilized and stretched more effectively and comfortably than when they were densely packed with water.

Muscle energy technique—type contractions and stretches almost certainly have similar effects on the water content of connective tissue, as do myofascial release methods, and the multiple force—loading elements of massage.

During massage:

Therapist finds area of tightness/bind where normal sliding of fascia does not occur

Mechanical force applied to allow tissues to normalize by becoming more pliable by:

- Change in the water content

- Sending signals to adjacent and distant areas of the body

Mechanical Effects

Related to Massage Benefit: Key Points

Benefits of massage may occur when we normalize tissues by introducing mechanical forces

Fascia is everywhere, connecting everything

Body functions as a single, integrated unit instead of individual parts

Focused tension (stretching) = most effective mechanical force for influencing fascia

We still do not know the specific massage applications that best influence the fascia.

Force applied during massage must move the tissue until it binds, at which point just a bit more force is applied and then held

How often force should be applied has not yet been determined definitively.

The currently accepted range for how long force should be applied is 15 seconds to 3 minutes.

Expert opinion ranges from daily to weekly as to how often force should be applied. However, these opinions may be related more to the way massage is practiced, following the “best to get a massage once a week” axiom.

Fluid Movement—Blood and Lymph

Circulation

Blood circulation may be affected by massage

Research into the effects of massage on blood circulation is sparse.

Exercise and lactic acid

Massage may help with DOMS

Postexercise stiffness, properly called delayed onset muscle soreness, is due mostly to damage to the muscle, not to an accumulation of lactic acid or lactic acid crystals in the muscle.

Lymph movement

Not enough evidence to prove demonstrable effects of massage

Difficult to state confidently that massage influences the movement of body fluids

Mechanical forces applied during massage at least affect the fluid in a particular area while the tissue is massaged

Squeezing and compressing fluid in tissue should help body move and process various body fluids

The use of methods thought to influence blood and lymph movement is appropriate.

More research is needed before a specific massage effect on blood and lymphatic movement can be stated with confidence.

Massage professionals must explain to clients that although the methods appear to be clinically effective, research as yet is unable to prove the outcomes.

Research Related to Massage, Tissue Healing, and Musculoskeletal Pain

Chronic pain

- Varying levels of evidence

- Massage therapy effect for low back pain

- May have clinical benefits for treating chronic neck pain

- May help with chronic tension-type headache

Scar tissue

- May help manage scar tissue formation and promote pliability in scar tissue

Researchers found no significant difference between relaxation and structural massage in terms of relieving disability or symptoms for low back pain.

Overall Research in Support of Massage: Key Points

Appears to reduce stress

Is pleasurable

Improves the perceived quality of life

Changes the shape of the fascia

Overall it appears that a general full body massage can directly and indirectly influence many structures and functions to help the person adapt and cope and to help restore function.

Overall Research in Support of Massage: Key Points

May influence the entire body even if only one area is massaged

May help move fluids around

Is safe when provided in a conservative and general manner with sufficient pain-free pressure

Benefits can be derived from the quiet, nurturing presence of the massage therapist, the duration of the massage, the massage environment, and the unlimited variations in methods, pressure, speed, and so forth.

The Research Process

Definition and origin of research

Research can be defined as a process in which researchers explore one or more areas of interest (called factors or variables) by analyzing numeric and/or verbal data (collected information) to advance the understanding of that subject.

Ethics in Research

Ethics concerns in research:

Informed consent

Confidentiality

Ability to exit the study at any time without prejudice

Debriefing

These are some of the ethical issues researchers must face.

The advancement of science must not occur at the expense of the safety and well-being of research participants.

Research in Plain Language

Eight steps of the scientific method:

1. Defining the question
2. Locating resources and gathering information and materials
3. Forming a hypothesis (or hypotheses)
4. Planning data collection methods
5. Collecting data
6. Organizing and analyzing the data
7. Interpreting the data and drawing conclusions
8. Communicating the results

The scientific method is a model for conducting scientific research. A specific vocabulary is used during the research process.

1. Defining the Question

1. What they want to know
2. The reason for asking the question
3. What the answer will tell them
4. How the information can be beneficial
5. Whether the question can be answered through research

This first step of the scientific method involves narrowing down possible topics and then choosing the question that will be the focus of the research.

To develop a research question, the researchers must identify five specific goals.

2. and 3. Locating Resources, Gathering Information and Materials, and Forming a Hypothesis

Researchers need to:

Educate themselves on the topic to be studied by reading the existing literature and talking to experts

Search through any pertinent research that had already been done

Develop a hypothesis

Based on their knowledge of the topic, the researchers should be able to make an educated guess as to what may happen at the end of the experiment.

The hypothesis is important, because it will be compared to the factual information gained from the experiment.

4. Planning Data Collection Methods

What steps are necessary to find the answer to the research question (i.e., to test the hypothesis)?

What data need to be collected?

How will the data be collected?

What equipment, supplies, facilities, assistants, test subjects, support people, and so on will be required?

The fourth step of the scientific method involves drawing up a specific, detailed plan for conducting the research.

During this planning phase, these questions must be answered.

What is the reference point (control) with which the data will be compared?

How many samples, sites, tests, and so on are required?

What variables will be manipulated and in what ways?

What record-keeping techniques will be used (e.g., data sheet, journal)?

How will data collection techniques be organized?

What are the sequential steps to the research?

What are the schedule, time line, and time expenditure?

What are the financial obligations?

To complete this fourth step, the researchers must decide on the type of research design to use.

Types of Scientific Research

Observational research

Studies the relationship between a specific factor and some aspect of health or illness

May suggest an association, but it cannot be used to determine cause and effect

Compared to experimental studies, observational research designs are very simple.

Epidemiologic study

Analytic study

Descriptive study

Cross-sectional study

Cohort study

Case control study

Regardless of the method used, the important point to understand about the results of observational studies is that they are observations of associations and nothing more. They can tell us what but not why.

Types of Scientific Research

Experimental research

Basic research generates data by investigating biochemical substances or biologic processes

In vitro – conducted in test tubes

In vivo – conducted with animals

Study subjects

Experimental group

Control group

Therapeutic massage is extremely difficult to test in vitro.

For experimental research, study subjects, whether human or animal, are selected according to relevant characteristics and are then randomly assigned to an experimental group (i.e., the group that will receive the treatment or intervention) or a control group (i.e., the group that does not receive the treatment).

Experimental research

Clinical trial – uses human subjects to evaluate the effectiveness and safety of a nutrient treatment by monitoring its effect on large groups of people

Phase I: Researchers test new treatment or intervention in small group of people for first time to test safety; determine safe dosage range and identify side effect.

Phase II: Treatment is given to a larger group to determine efficacy and further evaluate safety.

Phase III: Treatment is given to large groups for confirmation of effectiveness and side effects, compare it to commonly used treatments, and collect information.

Phase IV: Studies are done after treatment has been marketed to gather information about effects in various populations groups and side effects of long term use.

To conduct a clinical trial, researchers must follow a series of steps, or phases, each of which is designed to answer a separate research question.

Meta-analysis

Performed to reconcile differences among studies or to consolidate relevant findings across studies

Most appropriate method for examining studies that investigate the same question and use similar methods to measure relevant variables

Meta-analysis has limitations. Data from flawed studies may be included, or the analysis may include data from studies that used different methods to measure variables, resulting in a comparison of apples and oranges.

5. Collecting Data

All relevant data must be recorded.

Researchers must keep track of the step-by-step process.

Objectivity must be maintained in the data collection.

Researchers must collect all the information (data) that could affect the answer to the research question.

6. Organizing and Analyzing the Data

Organized and summarized

Presented graphically (e.g., bar graphs, tables, pie charts, line graphs) so that others can see the results clearly

Tested to determine whether the results are significant

In the sixth step of the scientific method, the researchers pull together the data collected and examine them more closely. The information is compared and contrasted.

7. Interpreting the Data and Drawing Conclusions

What alternative hypotheses might explain these results?

Were all relevant data, including extremes, or “oddball” data, analyzed?

How might the sampling or data collection methods have affected these results?

What answer do the results provide to the original question?

How do the results compare to what was expected to happen (the hypothesis)?

What can be concluded from the results? How do the conclusions affect the community or the “big picture” (implications)?

The researchers analyze the data and determine their conclusions.

8. Communicating the Results

Who is the audience? (Who wants to read the research?)

What is the best way to communicate the information (e.g., written report, oral or poster presentation, video)?

What visual aids will help the audience clearly understand this research?

In the final step of the scientific method, the research and its findings are presented to the public. Important questions must be considered in this process.

An introduction to the research question, the purpose of the research, and why it is interesting or matters

A description of methods used to collect data

The results

The conclusions

Questions raised by the research

In addition, these components must be addressed.

Reading and Interpreting a Research Paper

Important factors:

Study limitations

Way study was conducted

Study design

Randomness of participant selection

Sample size

Statistical significance

The reader (consumer) of research must review the methodology of a study to make sure the objective of the analysis is clearly stated and that the researchers explain the limitations of their findings so that the results can be put into context.

Important factors :

Communication of potential risk

Absolute risk

Relative risk

Proper perspective of potential risk/benefit

Clarification of cause and effect

Absolute risk is the chance a person will develop a specific disease or potential injury over a specified period. Relative risk puts the chance in comparative terms by describing the outcome rate for people exposed to the factor in question compared with the outcome rate for those not exposed to the factor. In most cases, the absolute risk is a far more relevant statistic for the public.)

Framework for Reading a Research Article: Structure, Function, and Implied Criteria for Evaluation

1. Preliminary section
2. Introduction
3. Method
4. Results
5. Discussion
6. Conclusion

A research report has six major sections (with subsections) that serve specific purposes.

Preliminary Section (Title and Abstract)

First section of research article

Contains the title and abstract of the study

A well-written abstract gives the reader a precise idea of what the study found, allowing the person to decide whether to read the entire report.

Introduction

Introduction – provides context for rest of report

Five subsections:

- General literature review

- Specific literature review

- Purpose statement via identifying the research question

- Rationale for the study's research hypothesis

- Statement of the research hypothesis

The two literature review subsections serve a dual purpose:

(1) They establish in the reader's mind the researchers' familiarity with the existing sources of information in the research problem area.

(2) They inform the reader of the information and insight needed to better comprehend the current research report.

Method

Method section

Provides detailed account of the methodology used to carry out the study

Identifies and explains the various research procedures used at different stages of the study

Subsections:

Participants and sampling procedures

Research method and design

Variables investigated

Instrumentation

Results

Results section

Provides the reader with a full accounting of the outcomes or results of the data analysis performed in the study

Discussion

Opportunity to:

Reflect on the manner in which the study was conducted, including its limitations and delimitations (boundaries)

Elaborate on the interpretation of the study's findings

Acknowledge the significance of the study's results and their relationship to earlier research findings in the problem area investigated

Theorize as to the reason or reasons the results were obtained

Suggest areas of further research

The final section of the report's main body is the discussion of the study's findings.

Conclusion

(References and Other Material)

Conclusion:

Bibliographic citations for each of the sources actually cited in the research report

Often includes information in appendices, authors' notes, and footnotes

The bibliographic listing constitutes the references and is very important not only in terms of giving detailed credit to sources used in the study, but also in providing the reader with the necessary information for accessing the sources cited.

Criteria for Critiquing a Research Article

Preliminary Section

Does the title of the study provide a basis for identifying the type of study, major variables, and participants?

Does the abstract summarize the main body of the report? Does it focus on the research question, research hypothesis, participants, research method and design, major variables, instruments, statistical techniques, principal findings, and conclusions?

The specific questions listed on the following slides can help you evaluate the designated sections and subsections of a research article.

Introduction

Does it contain professional literature that has bearing on the study reported? Does it provide an overview of the research problem area and more specific coverage of individual studies?

Is the purpose of the study clearly identified by the research question?

Introduction

Is a rationale or justification, based on various features of the professional literature, presented as a context or framework for the study's research hypothesis?

Do the authors state the study's research hypothesis in such a way that the predicted answer to the study's research question is clear and unambiguous?

Method

Are the study's participants clearly characterized, along with the inclusion and exclusion criteria used to choose them?

Did the researchers justify the number of participants constituting the sample size?

Method

Was an accessible population of potential participants acknowledged, along with an indication of how the sample was derived from such a population, whether through random selection or some other procedure?

Did the authors specify the manner in which the participants were assigned to the two or more comparison groups, whether through random assignment or some other means?

Was any clarification provided as to how the ethical aspects of the study were governed, particularly with regard to protection of the participants, the overall integrity of the research, and prior approval of the study by an IRB?

Method

Were the study's variables detailed in a comprehensive fashion so that their manipulation and measurement could be replicated?

Did the authors clearly specify the equipment and instruments used to manipulate and measure the variables and did they provide documentation of the technical factors?

Results

Were the data analysis techniques used identified and justified?

Were the results of the study communicated?

Were tables and figures used appropriately to present the data analyses in a comprehensible manner?

Discussion

Did the researchers reflect on the manner in which the study was designed and conducted with regard to any limitations and/or delimitations?

Did the authors elaborate on the interpretation of the study's findings beyond the interpretation that was begun in the results section?

Did the researchers address the significance of the study and its findings, particularly as they relate to earlier studies in the problem area investigated?

Were possible intervening variables addressed that might explain the reason or reasons the results were obtained?

Were recommendations made regarding follow-up studies that might fully or partly replicate or at least augment the current study?

Conclusion

Does the list of references accurately reflect each of the sources cited in the research report and is the list presented in a consistent bibliographic citation style?

Does the research report contain any appendices that provide more detailed information than that given earlier in the article?

Is any information provided, in the form of authors' notes, that gives insight into the funding support for the study?

Are any footnotes provided that elaborate on one or more aspects of the study and that would have been misplaced or distracting if embedded in the main body of the report?

The best way to become adept at interpreting and critiquing a research article is to practice. You can do this by finding an article on PubMed and applying the process.

Relating Physics to Massage Therapy, and Translating Evidence into the Practical Application of Massage

Touch, Massage Therapy, and Physics

Physics

The scientific study of matter, energy, force, and motion and the ways they interact

The general analysis of nature, which we study to understand how the universe functions

Because all living beings are part of nature, principles of physics apply to us, which means that these principles are involved in massage therapy.

Therefore, studying basic physics terminology and principles can help you better understand massage application and outcomes.

Tangible physics aspects of massage:

Matter

Force

Motion

Energy

Other common terms from physics that are used to describe physical phenomenon experienced during massage are entrainment, resonance, tensegrity, and attunement.

A further understanding of these four concepts can help us understand the massage experience.

Entrainment

Physical phenomenon that occurs when rhythms synchronize

Underlying benefit of many bodywork disciplines, including massage

Entrainment strengthens the bond that forms in the therapeutic treatment and increases the likelihood of a successful massage outcome.

Resonance

In massage:

Involves the alignment of psychobiological states between a client/patient and a therapist

In physics:

Oscillation – tendency of an object to move back and forth or up and down

At the cellular level, all components oscillate; this means that all cells have resonance.

Entrainment, therefore, begins on the cellular level. Body rhythms are affected by biologic oscillators. In turn, the body rhythms of the therapist affect the body rhythms of the client, and vice versa.

Resonators

Resonator – device or system that has resonance or shows resonant behavior

Resonance frequencies are the frequencies at which a resonator oscillates

Electromagnetic or mechanical

*Based on the working process of an MRI,
the body apparently exhibits resonance.*

Crystals as Resonators

Liquid crystals

- Exist between solid and liquid phases

- Can be manipulated with mechanical, magnetic, or electrical forces

- Are temperature sensitive

Connective tissue and other structures in the body display the properties of liquid crystals

Crystalline material performs two functions:

(1) it acts as a good resonator, keeping the resonant frequency constant; and

(2) its piezoelectric property converts mechanical vibrations into an oscillating voltage.

The resonant frequency of a crystal oscillator is changed by mechanically loading it so that it changes shape.

Today we can actually see the liquid crystal structure through special imaging methods that use harmonics.

Fascia is a liquid crystal

Piezoelectric in nature

Mechanical loading causes release of electrons

Energy release influences the fascial ground substance to shift from a gel or stiff state to a more liquid or pliable state

Massage can make the client feel less stiff and more pliable.

Clay is a good example. It is stiff and cold when you start squeezing and pressing it, but after a time it becomes warm, soft, and pliable.

Tensegrity

Balance between the tension (pulling force) components and the compression (pushing force) components of a structure

Property of tensional integrity provides a way to distribute forces to all interconnected elements while “tuning” the whole system mechanically as one

When pull equals push, a structure is strong yet flexible.

In biologic structures, such as muscles and bones or rigid and elastic cell membranes, a balance exists between tensioned and compressed parts.

Attunement

To bring into a harmonious or responsive relationship

Mirror neurons

Play a major role in the imitation necessary for learning and the ability to empathize with others

Intentional attunement – a state that generates a peculiar quality of familiarity with other individuals

In massage therapy, rapport is another term that can be used to describe the concept of attunement.

Humans especially tend to subconsciously mimic and model the facial expressions, vocalizations, postures, and movements of others, especially when an interdependent or survival relationship exists. Understanding the communication of body language processed by mirror neurons is a fundamental aspect of attunement.

Practical Application

Physiologic effects of massage:

Mechanical methods: physiologic responses are a result of direct application of methods (forces)

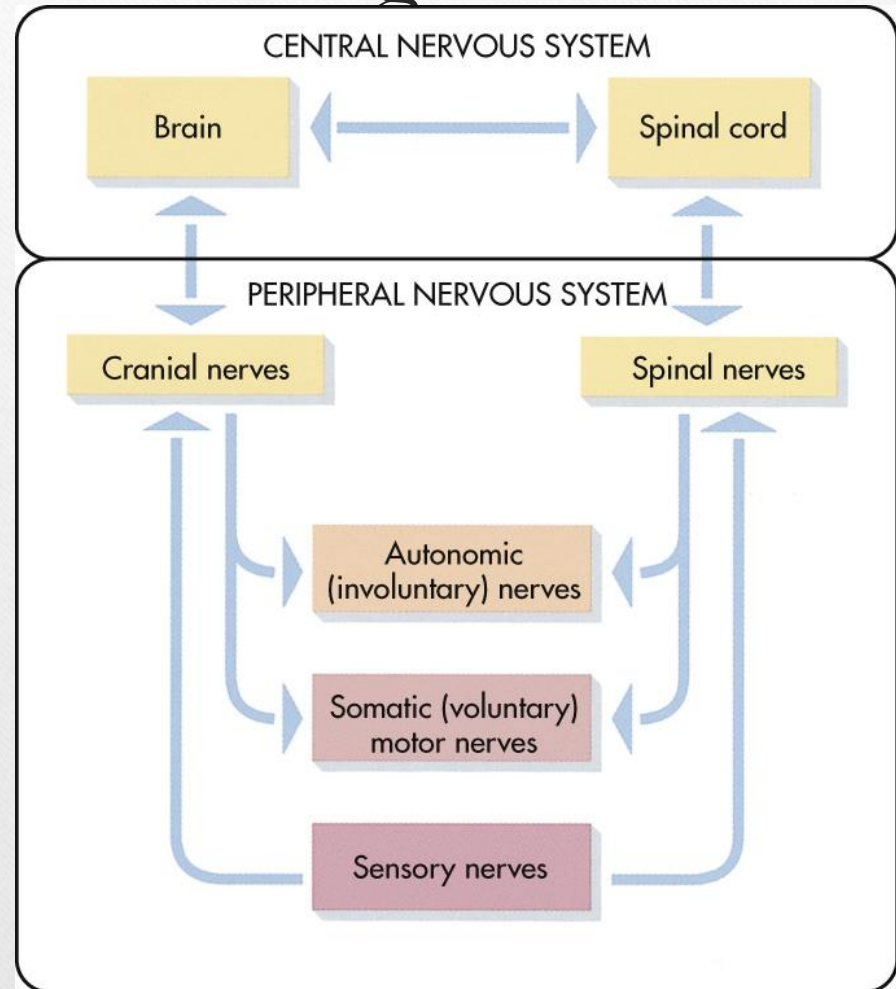
Reflexive methods: physiologic responses are a result of homeostatic loops (stimulus)

A reflex is an involuntary response to a stimulus, and massage can be the source of the stimulus. Because reflexes are specific, predictable, adaptive, and purposeful, they explain most of the benefits of massage.

The neuroendocrine system, connective tissues, circulation, and energy systems are all influenced by massage.

Nervous/Neuroendocrine System: Effects of Massage

Divisions of
the nervous system



The responses to massage and its effects on the nervous system are primarily reflexive.

The nervous system responds to massage through the stimulation of sensory receptors and disruption of an existing pattern in the central nervous system control centers. This results in a shift of motor impulses, most often in the peripheral nervous system (PNS) and establishes homeostasis. Usually, both somatic and autonomic portions of the PNS are influenced as balance is restored.

Neuroendocrine Interactions

The endocrine and nervous systems form a feedback loop.

Neurotransmitters and hormones carry messages that regulate physiologic functions.

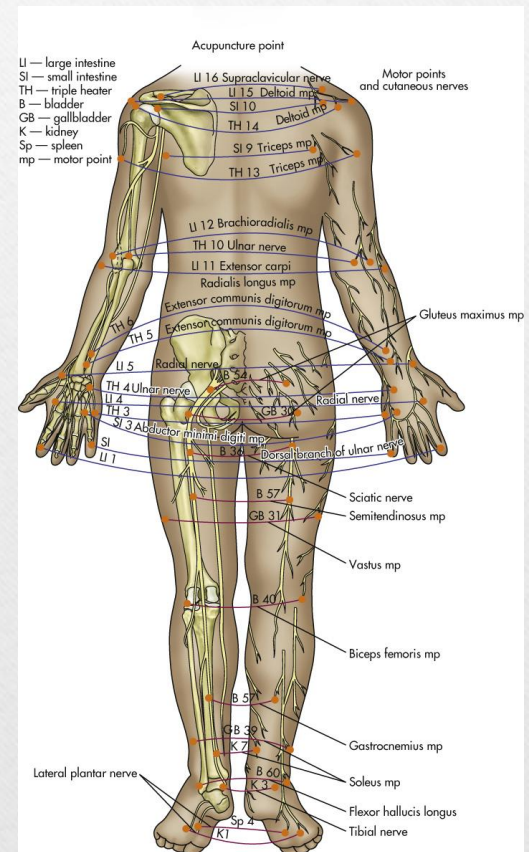
Dysregulation of the proportion of neurotransmitters and hormones affects behavior, mood, attentiveness, anger, and depression.

The endocrine system is regulated by the nervous system, and the endocrine system, in turn, influences the nervous system, producing a large feedback loop. The feedback system and autoregulation is linked with all the body functions.

Neurotransmitters are neuroendocrine chemicals found in the synapses of the nerve, whereas a hormone is found in the bloodstream or lymphatic system.

Acupuncture Studies and Implications for Massage

Acupuncture and acupressure points fall over significant neuromuscular points



Acupuncture is just one system of alternative medicine that has attracted the attention of researchers.

More than a dozen projects involving the analgesic effects of acupuncture are currently receiving funding from the NIH's National Institute for Complementary and Alternative Medicine (NCCAM).

Acupressure can be administered manually. Scientific research on this technique, which might be more relevant for the field of massage therapy, is less common.

Influence of Massage on Neuroendocrine Substances

Increases the levels of dopamine, serotonin, enkephalins, endorphins, dynorphins, endocannabinoids, and oxytocin

Regulates epinephrine and norepinephrine

Increases availability of growth hormone

Massage can strengthen the immune system because it increases the levels of serotonin, dopamine, and endorphins, which in turn stimulate the activity of natural killer cells in the immune system. This response indicates that massage may be beneficial in managing viral disease and some cancer.

Massage regulates the levels of adrenaline and noradrenaline through stimulation or inhibition of the sympathetic and parasympathetic nervous systems.

ANS Effects of Massage

Effects of massage are processed through the autonomic nervous system (ANS)

Sympathetic activation and stress

Parasympathetic pattern and conservation withdrawal

Entrainment

Body/mind effect

Toughening/hardening

Placebo effect

The ANS regulates both the sympathetic (excitation) response and the parasympathetic (relaxation) response. Both systems are kept in homeostasis through a feedback loop that affects and is affected by the endocrine glands.)

Emotions outlast the stimulus that initiates them because the limbic system has a prolonged after-discharge property.

Activation of ANS experienced as stress

General adaptation syndrome (sympathetic activation) has three stages:

Alarm reaction

Resistance reaction

Exhaustion reaction

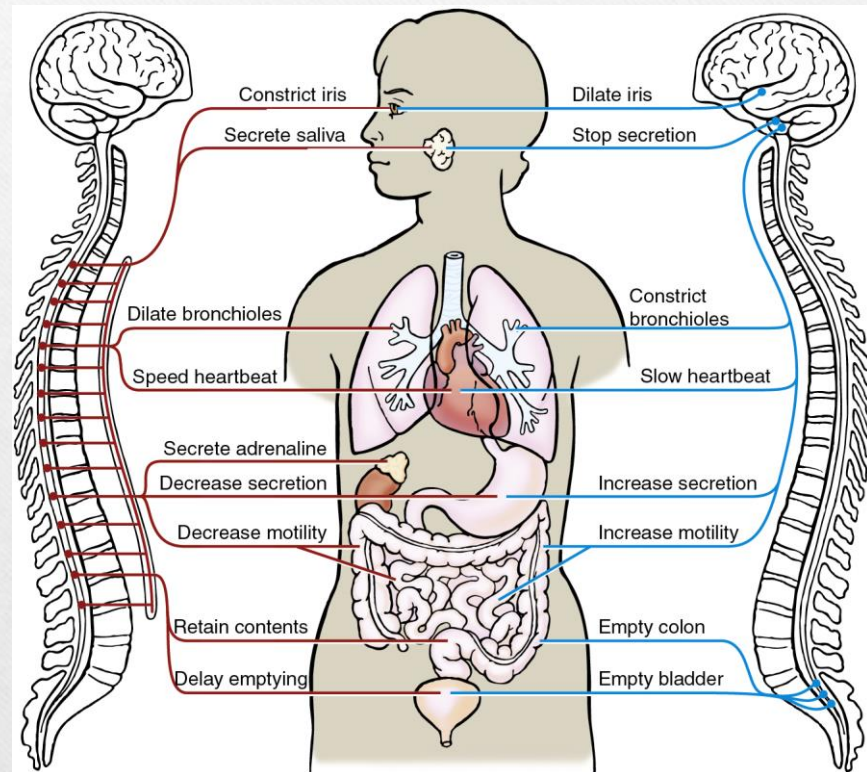
The hormones epinephrine and norepinephrine are released in response to stress. During this alarm reaction phase, the blood pressure is increased, muscles are tense, circulation patterns shift, and digestion and elimination stop. Long-term stress triggers the release of cortisol, which induces effects similar to those of the drug cortisone (e.g., peptic ulcer, weakness

Muscle patterns associated with sympathetic and parasympathetic systems

Body system function is influenced by ANS activity

The sympathetic and parasympathetic systems work together through a feedback loop that also involves the endocrine system.

Sympathetic responses are usually excitatory, whereas parasympathetic responses relax and restore.



Parasympathetic patterns

have a restorative function,
reduce physical activity, and
increase digestion and elimination.

Conservation withdrawal is the result of intense negative experiences, such as abuse, neglect, or starvation.

Massage counters the effects of sympathetic overarousal by encouraging parasympathetic dominance and vagus nerve stimulation.

Entrainment is the coordination of or synchronization to a rhythm.

Body rhythm is entrained by:

Heart rate/respiratory rate/thalamus synchronization

External rhythm (repetitive motion or sound)

To encourage entrainment, massage is given in a quiet, rhythmic manner.

The rhythmic application of massage and the proximity of a centered and compassionate professional's breathing rate and heart rate support the restorative entrainment if the body rhythm is out of synchronization.

The body/mind link interacts with the ANS in:

Altered states of consciousness

State-dependent memory

Toughening/hardening – reaction to repeated exposure to stimuli that elicit arousal responses

Massage may work as placebo effect

Emotions are registered in the body through the ANS and endocrine system. A definite chemical factor is involved in the arousal of emotions based on production of neurotransmitters and hormones. If these chemicals are released during massage, the individual may once again feel the chemical arousal of an emotion, which can trigger memory.

Massage influences autonomic functioning and decreases sympathetic stress hormones.

The wider effects of massage on the ANS include:

Helping restore self-regulation (internal control)

Stimulating changes in mood and excitement levels

Inducing the relaxation/restorative response

Compression increases sympathetic responses and temporarily lifts depression.

Slow, repetitive rocking or rhythmic movement increases relaxation responses.

Acupressure causes sympathetic inhibition through stimulation of endorphins and relieves pain.

Somatic Effects of Massage

Somatic division of the peripheral nervous system (PNS) affected by massage:

- Neuromuscular mechanisms

- Hyperstimulation mechanisms

- Counterirritation

- Reduction of impingement

The somatic division of the PNS controls movement, muscle contraction, relaxation, and muscle tone

Neuromuscular mechanisms—muscles respond to nervous system signals by contracting or relaxing

Proprioceptors include:

- Muscle spindles

- Tendon organs

- Joint kinesthetic receptors

The proprioceptors are nerve receptors that provide constant monitoring and protective function. They receive and transmit information about body position, muscle tension, joint position and activity, speed and direction of movement, and equilibrium

The somatic effects of massage are primarily reflexive.

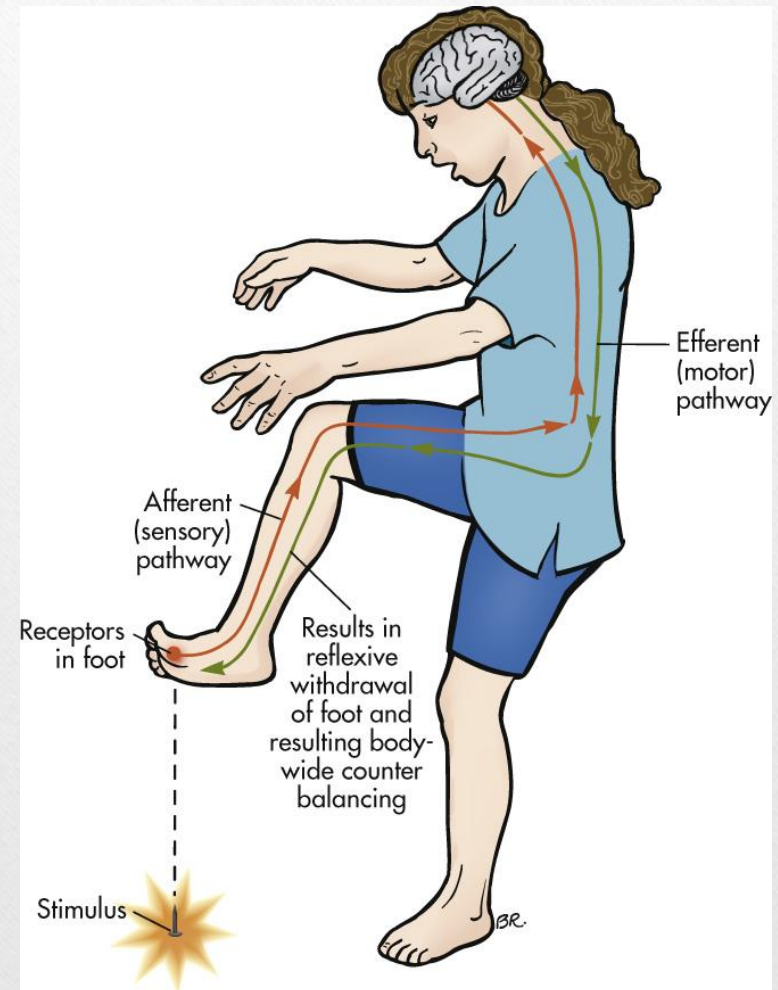
Reflex responses:

Stretch reflex

Tendon reflex

Flexor reflex

Crossed extensor reflex



Stimulating receptors in one area can lead to many outgoing impulses and can affect many muscles.

The stretch reflex automatically causes a muscle to contract when it is lengthened, sometimes resulting in excess muscle tension.

Massage therapists take advantage of the tendon reflex by contracting and then lengthening muscles.

The flexor and crossed extensor reflexes are shown in the picture. In response to pain, the flexor reflex initiates withdrawal at the same time that the crossed extensor reflex maintains balance.

Basic goals of massage of neuromuscular mechanisms:

To substitute a different neurologic signal stimulation to support a normal muscle resting length through stretching or strengthening of muscles and connective tissue

To reeducate the muscle involved

Massage directly stimulates the reflex mechanisms.

The effectiveness of massage techniques depends on how efficiently the receptors of these reflexes are stimulated.

Success depends on the appropriateness of the technique and the intensity with which the targeted receptors are accessed.

Somatic Effects of Massage: Vestibular Apparatus and Cerebellum

The vestibular apparatus is a complex system of sensors that enables visuospatial orientation and movement.

Locations of vestibular sensors:

Inner ear

Eyes

Upper neck

Motion sickness is one example of disruption of the vestibular apparatus. When the parts of the system are receiving conflicting information, motion sickness can result.

For example, when you are reading a book while riding in a car, your inner ear and the skin receptors in your upper neck detect the car's movement. Your eyes, however, are focused on the unmoving pages of the book, and you might get "car sick."

Vestibular sensors send signals that stimulate the cerebellum.

The cerebellum responds by signaling the motor cortex, brainstem, and hypothalamus.

The techniques that most strongly affect these systems are those that produce rhythmic rocking during the application of massage. Rocking produces movement at the neck and head that influences the sense of equilibrium. It also stimulates the balance mechanisms of the inner ear to keep the head level. Pressure on the sides of the body may stimulate the body-righting reflex

Somatic Effects of Massage: Hyperstimulation Analgesia

Hyperstimulation analgesia reduces pain through stimulation of the PNS.

It also induces neurophysiologic and neurohormonal inhibitory effects at the spinal gating mechanism

Pain impulses pass through a spinal cord “gate” to reach the lateral spinothalamic system. Painful impulses are transmitted by large-diameter and small-diameter nerve fibers. Stimulation of the large-diameter fibers prevents small-diameter fibers from transmitting signals; therefore, stimulation of large-diameter fibers inhibits the sensation of pain.

To achieve hyperstimulation analgesia, massage should stimulate specific points at a sufficient intensity to activate the large-diameter fibers and stimulate the gating mechanism.

Somatic Effects of Massage:

Counterirritation

Massage can produce counterirritation—a controlled superficial irritation intended to relieve pain in deeper structures. Examples include:

- Inhibition of central sensory pathways by rubbing or shaking an area

- Stimulation of the skin over an area of pain

Any massage method (such as compression or movement) that introduces a controlled sensory stimulation intense enough to be interpreted by the client as a “good pain” signal works to create counterirritation.

Somatic Effects of Massage:

Trigger Points

Myofascial trigger points are areas of local nerve facilitation in muscle or associated connective tissue that create a small point of tension.

Muscles with myofascial trigger points feel tense and have a reduced range of motion.

The effects of massage on myofascial trigger points are a result of stimulation of proprioceptive nerve endings, changes in sarcomere length, release of enkephalin, stretching of musculotendinous structures that initiate reflex muscle relaxation through the Golgi tendon organ and spindle receptors, and increased circulation.

Somatic Effects of Massage: Nerve Impingement

Nerve impingement (“pinched nerve”) is caused by two different dysfunctions:

Entrapment—soft tissue exerts inappropriate pressure on nerves

Compression—hard tissue exerts inappropriate pressure on nerves

Massage reduces pressure on nerves in several ways:

It reflexively changes the tension pattern and lengthens the muscles.

It mechanically stretches and softens connective tissue.

It interrupts the pain-spasm-pain cycle caused by protective muscle spasms that occur in response to pain.

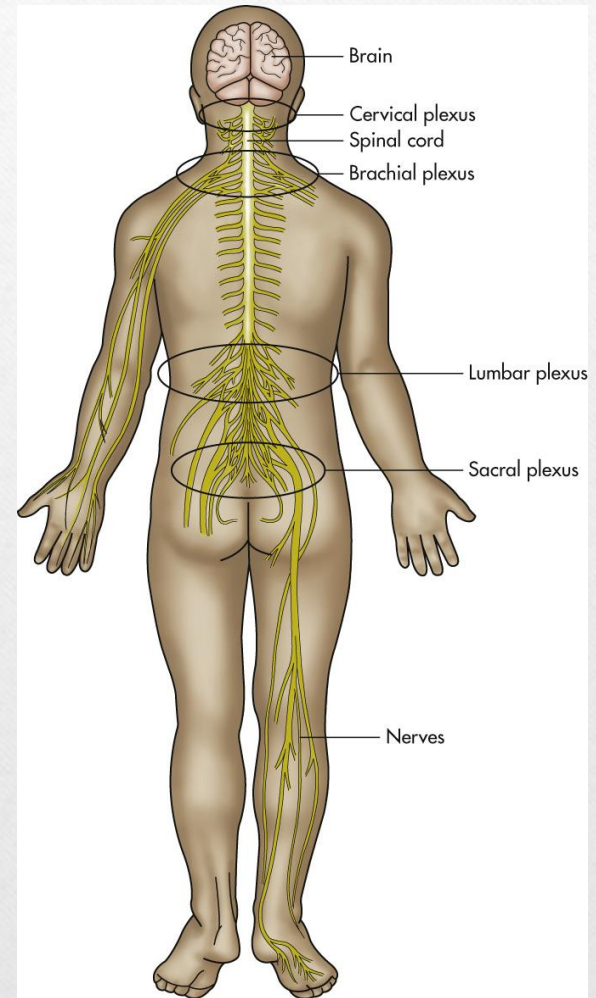
Impingement often occurs at major nerve plexuses.

Conditions involving impingement:

Thoracic outlet syndrome

Sciatica

Carpal tunnel syndrome



There are many types of thoracic outlet syndrome (TOS), which is impingement of the nerves of the brachial plexus.

Sciatica is impingement of the sciatic nerve, which is the longest in the body. The disorder is secondary to another condition, such as a herniated disk, which puts pressure on the nerve.

Carpal tunnel syndrome—impingement of the nerves that pass through the narrow tunnels in the wrist—can be caused by a variety of inflammatory conditions, such as rheumatoid arthritis and diabetes, in addition to repetitive use injuries.

Circulation: Effects of Massage

Massage increases five types of circulation:

Arterial flow by using direct compression

Venous return flow by using passive/active joint movement

Movement of lymph by using passive/active joint movement

Respiration by using all approaches

Cerebrospinal fluid (all approaches)

Increased blood flow on a local level is achieved by compression of tissues, which empties venous beds, lowers venous pressure, and increases capillary blood flow. Massage also stimulates the release of vasodilators such as histamines. It also increases blood flow through autonomic vascular reflexes that have a body wide effect

Breathing Pattern Disorder

Massage therapists should watch for:

- Generalized body tension

- Chronic inability to relax

Effects of massage:

- Approaches that restore mobility to thorax and muscles of respiration affect ability to breathe

- Can restore normal function of soft tissue involved with breathing

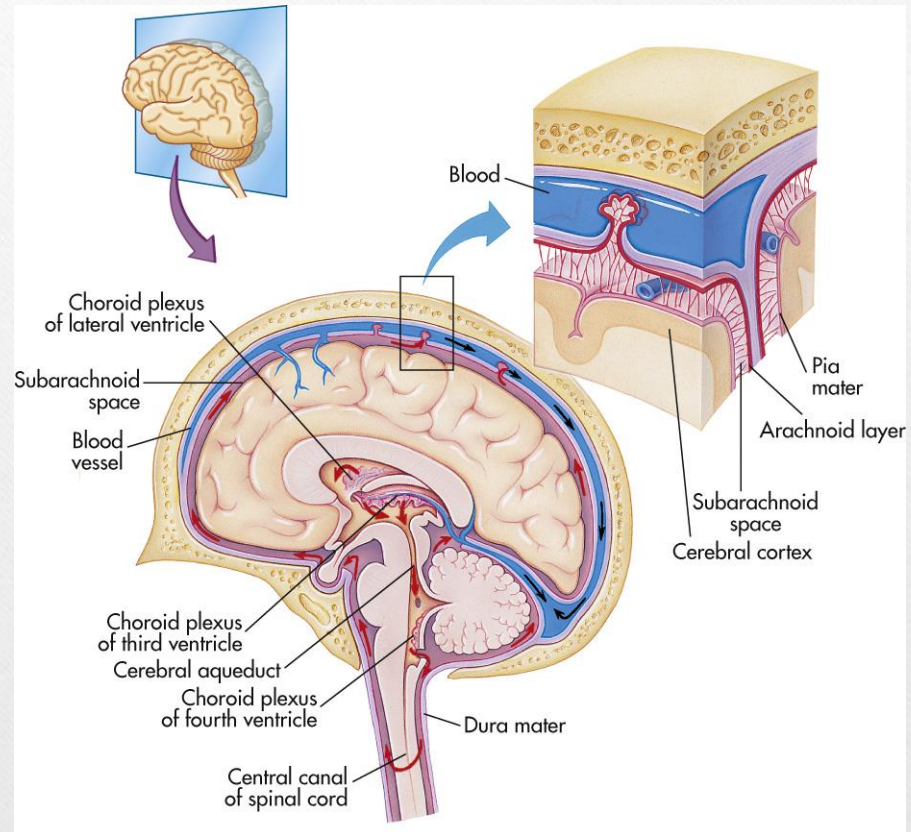
- Enables breathing retraining to become effective

Breathing pattern disorder is a complex set of behaviors that leads to overbreathing despite the absence of a pathologic condition.

Craniosacral therapy techniques specifically target CSF circulation

Massage stimulates the release of vasodilators, especially histamine.

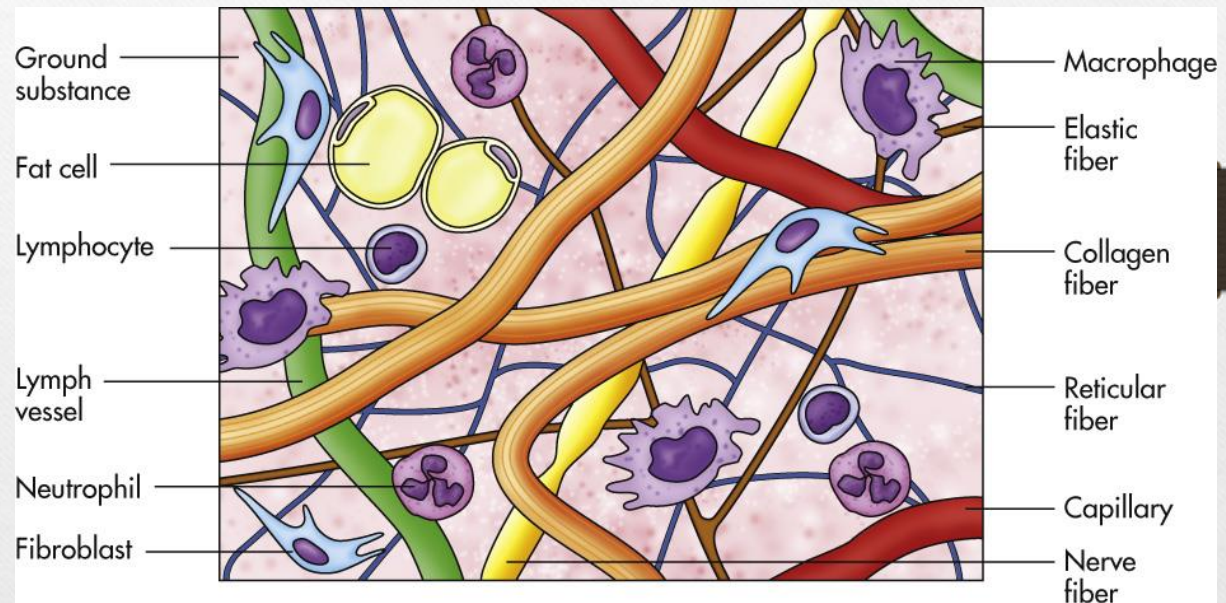
Massage and other forms of bodywork mimic and assist the pumping action of the muscles and respiratory pump, influencing breathing and possibly the movement of CSF.



Connective Tissue: Effects of Massage

Connective tissue is the most abundant body tissue

Connective tissue is made up of various fibers and cells in a gelatinous ground substance.



The combination of the fibers and the cells that produce the fibers and the ground substance is called the connective tissue matrix.

Massage methods most often affect the superficial and deep fascial sheaths, the ligaments, and the tendons.

Three basic approaches are used:

- Methods that address the ground substance

 - Slow, sustained pressure and agitation

 - Soften the ground substance

Fibrotic tissue responds well to the specific approaches of connective tissue massage.

Studies indicate that massage may reduce the formation of adhesions and the scarring that often results from soft tissue injury.

Approaches

Methods that address the fibers within the ground substance

Elongate fibers past the elastic range into plastic range

Create controlled, inflammatory response

Methods that influence fascial tone through direct stimulus of muscle bundles in the fascia and indirectly through influence of the nervous system

Stimulates smooth muscle bundles and skin to organ reflexes

Produces body-wide reactions to connective tissue massage

Helps normalize circulation

Locally improves blood supply of surface tissues

Energy Systems' (Biofield)

Effects of Massage

Body energy research might reveal the reason for correlation of the ANS and traditional energy centers, like chakras.

Electrocardiography (ECG) and electroencephalography (EEG) are clinical tools that measure the flow of currents through tissue.

Biofield energy therapies seek to affect more subtle levels of the body's energy to stimulate healing.

Research is still being conducted, but all bioenergy therapies seem to work by entraining the body's biomagnetism.

Amplification

The building of stronger and more coherent biomagnetic fields

Connective tissue fabric

Semiconducting communication network that can carry bioelectronic signals between every part of the body

Bodywork, including massage and other repetitive practices (e.g., yoga, Qigong, tai chi, meditation, and therapeutic touch), may gradually lead to more structural coherence (crystallinity) in the tissues, facilitating both the detection and radiation of energy fields.

Nervous system

Energy system in the body

Source of some biomagnetic fields in and around an organism

Regulates all muscular movements

Perineural system

Regulates wound healing and tissue repair

Electrical stimulation with direct current can promote healing in bone and other tissue

The nervous system is one of the keys to the conversion of thoughts into energetic actions.

Anticipatory fields

Pulses of electrical and magnetic energy

Begin in brain before any movement occurs

Healing energies

Qi (pronounced “chee”)

Periodic entrainments of brain waves, whole body biomagnetic emissions, and resonances in the earth's atmosphere

Anticipatory fields are an important phenomenon, and they are being investigated for their application in training for athletic events, dance, theater, music, and so on.

Many therapeutic schools emphasize the importance of anticipatory fields, but call it intention; that is, the practitioner decides in advance the goals he or she wants to attain for a particular client.

The debate over whether such a thing as a healing energy or a life force exists is being replaced by study of the ways biologic energy fields, structures, and functions interact.

The generalized therapeutic approach of massage seems to have a normalizing effect on the body's energetic processes.

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