

The Integration of Clinical Reasoning in Osteopathy

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Introduction

The process of clinical reasoning should be in the center of therapeutic actions (Klemme and Siegmann, 2006, p. 8) and is a method not only applied by osteopaths, but also by manual therapists and physicians (Wallace, 2006; Klemme and Siegmann, 2006; Jones, 2006, Elstein, 2002; Bradley, 1993).

"Clinical Reasoning is the critical and analytical thinking process of making clinical decisions." (<http://www.fysio.ee/dok/01.pdf> [November 20, 2007])

These clinical decisions do not refer to diagnosis alone but are intertwined with the whole therapeutic process. Clinical reasoning guarantees transparency and retraceability of therapy such that students and patients are able to follow and understand the individual treatment steps. For the practitioner, the clinical reasoning process induces discussion and self-reflection; for the patient, clinical reasoning often provides a better explication of his situation. The General Osteopathic Council claims in the Standard 2000 - Standard of Proficiency:

"Osteopathy can no longer operate in isolation from other health care professions and must be able to exchange information with other health care professionals." (http://www.osteopathy.org.uk/about_gosc/standard_2000.pdf, p. 12 [November 20, 2007])

An open demonstration of the individual steps of the therapeutic process - as accompanying the application of clinical reasoning - is beneficial for the exchange with other health care professionals and serves as a possible basis for professional communication. Hence, the application of clinical reasoning enables the participation of colleagues or family in the therapeutic process (Jones, 2006, p. 3) to achieve the objective of providing the best and most efficient treatment method for the patient.

This master thesis describes the present situation of clinical reasoning in manual therapy in opposition to epistemology, philosophy of science, and philosophy of medicine. It illustrates Andrew Taylor Still's clinical patient approach and analyses whether aspects of clinical reasoning are already contained in his conception of the therapeutic process or not. On the one hand, Still postulates the application of simple methods of logical thinking (Still, 2002, p. 297), on the other hand, he works intuitively (Still, in Frymann, 2007, p. 374). Both approaches are discussed in the chapter "Osteopathic Clinical Reasoning versus Intuition" (cf. chapter 6.4).

An integration of clinical reasoning into osteopathic work is discussed, and possibilities of integrating the clinical reasoning process into osteopathic education and training are presented.

For reasons of better readability, the masculine form will be used throughout this thesis; it equally represents the feminine and masculine form. For various reasons, I was not able to refer to the respective official translation of the cited works. Therefore, any citations in German language have been translated by Mag. Claudia Lanschützer. Though aiming to choose the most faithful translations with regard to context and meaning of the citations, it is important to note that content and meaning might have changed during translation.

2 Terms related to Clinical Reasoning and their philosophical Origin

The first question this master thesis elucidates is: what is clinical reasoning? In order to elaborate on this topic, we have to clarify the philosophical origins of the central elements clinical reasoning is based on. The connection between osteopathy and philosophy was also identified by Andrew Taylor Still who states in his compendium:

"Die Osteopathie ist eine Philosophie[...]."

"Osteopathy is a philosophy [...]." (Still, 2002, p. 488)

"Philosophy" is a word of ancient Greek origin and consists of the two words *philos* (love, passion, or interest) and *sophia* (wisdom). According to Snell (Snell, 1924, p. 574), *sophia* was furthermore a commonly used word for knowledge, cognition, skills, and handcraft and represented the concepts of trust, prudenz, and power of judgment.

Assuming with Still that osteopathy is a philosophy and referring to the explanation above, we can conclude that osteopathy is love for prudenz and knowledge, passion for handcraft, interest in cognition.

Referring to a definition of philosophy dating back to the early 20th century, the time when Still lived, Dilthey (1907, p. 753) reasons:

"Philosophie ist das sich entwickelnde Bewusstsein über das, was der Mensch denkend, bildend, und handelnd tut."

"Philosophy is the developing conscience about humans' actions through thinking, forming, and acting."

Thus, osteopathy implies conscience of human thinking and human actions. Clinical reasoning refers to what we think while treating patients and to reflecting what we do.

This chapter elaborates on terms tightly connected with clinical reasoning. These terms are further related to epistemology and philosophy of science. Epistemology is defined as

"[...] die Lehre von der Erkenntnis, wobei Reflexion auf die Erkenntnis vorausgesetzt wird, einschließlich eines entsprechenden Bewusstseins dieser Reflexion".

"[...] the theory of knowledge, whereby the premise is reflection of cognition, including an appropriate conscience of this reflection". (Zedler, 1745, p. 683)

According to Laudan (1968, p. 974), philosophy of science studies

"[...] im allgemeinsten Sinne [um] Benennungen für die theoretische Reflexion auf Grundlagen, Methoden und Zielsetzungen."

"[...] in the most general sense the denominations for theoretical reflection of basic models, methods, and objectives".

In the following section of this thesis, the key words *clinical reasoning*, *logical judgment*, *hypotheses*, *cause and effect*, *diagnosis and decision*, as well as *prognosis* will be described and explained by means of a stage model.

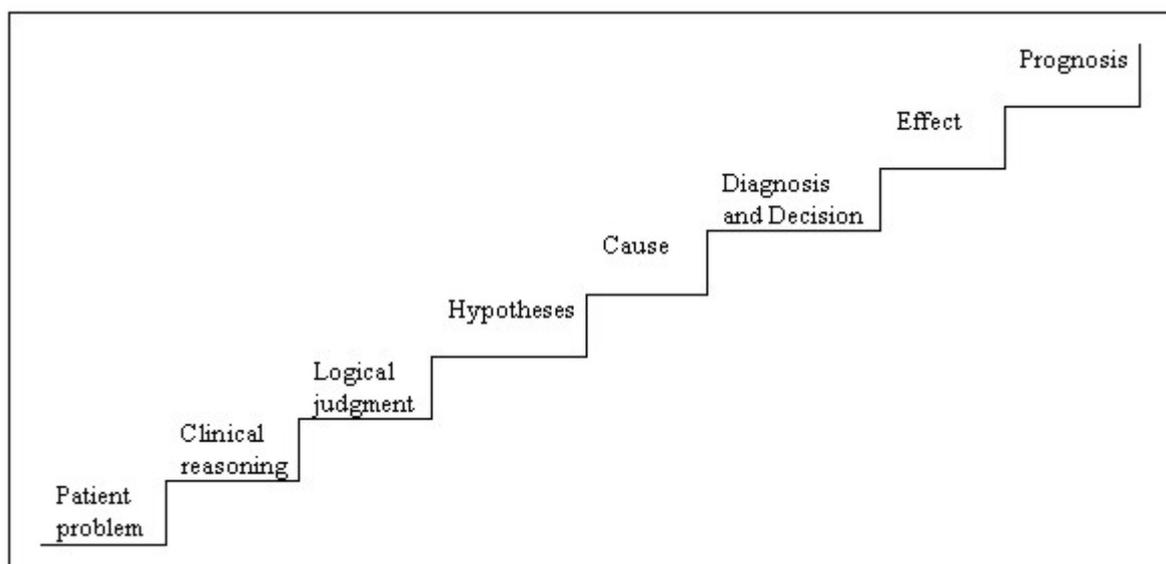


Figure 1: Stage model of the therapeutic process

Following the 8-stage model displayed in Figure 1, the individual sections of this chapter will illustrate the successive character of a treatment and provide further discussion on this procedure.

The therapeutic process begins when the patient consults the osteopath, therapist, or doctor when confronted with a certain health problem. Once the practitioner (this term will be used as generic term to summarize the three professional groups mentioned above) has established the anamnesis, he is supposed to logically reason about the patient's problem and to come to a judgment. Hypotheses about the cause(s) of the problem are formed, examinations are performed, and as a consequence a certain diagnosis is pronounced. In turn, diagnosis induces a certain treatment the effect of which is observed. Only after the stages of diagnosis and treatment, the practitioner might be able to predict a prognosis.

2.1 Clinical reasoning

When examining the two parts of the word "clinical reasoning", we will find the following explanations: "clinical" means "*referring to a physical examination of patients by a doctor*" (Pons Medical Dictionary - Fachwörterbuch Medizin, 1992, p. 78), or "*concerning the clinical disease pattern, clinical*" (Reuter, 2001, p. 1014). *Reasoning* can generally be described as "*logical thinking, argumentation*" (Breitsprecher, 1986, p. 921). Hence, clinical reasoning can be defined as logical clinical thinking.

Wikipedia, the free encyclopedia, offers the following definition for the term *thinking*: "Thought or thinking is a mental process which allows beings to model the world and so to deal with it effectively according to their goals, plans, ends and desires." (<http://en.wikipedia.org/wiki/Thought> [February 26, 2007]). *Thinking* is a very broad concept and is therefore described further in more detail.

"Denken ist ein Grundwort aus der Umgangssprache, das schon in ihr in vielfachem Sinn gebraucht wird. Wie die deutschen Wörterbücher verzeichnen, bedeutet Denken nicht nur: Vorstellungen mit Bewusstsein haben, sondern sich auch erinnern, nachdenken, Begriffe bilden, urteilen."

"Thinking is a basic word of common language, used in multiple senses. As the German dictionaries note, thinking does not only mean to have certain views and conscience but also to recollect, ponder, define terms, judge." (Adelung, 1774, p. 62)

Immanuel Kant states:

"Der Mensch indem er sich seiner bewusst (ihm selbst Objekt) ist, denkt."

"By being conscious of themselves (being objects to themselves), humans think". (1763, p. 62)

Furthermore, he assumes:

"Alles Denken geschieht durch Begriffe, Urteile und Schlüsse."

"All thinking is determined by terms, judgments, and conclusions." (ibid)

According to Kant, we draw conclusions and make judgments when we think, and this is precisely what clinical reasoning implies.

This type of thinking is applied in osteopathy, manual therapy, and medicine to form preliminary hypotheses after anamnesis and physical examination of the patient and to subsequently pronounce a diagnosis. Thus, the practitioner can choose the appropriate form of treatment which confirms or disproves the previously established hypotheses, depending on the effect the treatment has on the patient. Therapeutic thinking aims to solve certain problems by achieving a shift from an actual state (e.g. headache) into a target state (freedom of symptoms). Thinking of possible activation factors induces specific actions in the form of therapeutic treatment approaches.

Clinical reasoning aims to make therapeutic thinking audible, i.e. it requires practitioners to think aloud by answering specific questions in a written form, for instance by application of the self-reflection worksheet (Jones, 2004, Appendix 2).

This allows others (colleagues, students, related professional groups, as well as the patients and their relatives) to participate in the thinking process of the therapist.

The treatment thus gains transparency for all persons involved. From this thinking, certain conclusions and judgments are drawn. A conclusion can be defined as

"[...] a final proposition, which is arrived at after the consideration of evidence, arguments or premises". (<http://en.wikipedia.org/wiki/Conclusion> [February 26, 2007])

In clinical reasoning, conclusions are defined as follows:

"[Es ist] die Anwendung eines geregelten Verfahrens, von bestimmten Aussagen, den Prämissen eines Schlusses, auf eine weitere Aussage, die Konklusion des Schlusses, zu schließen d.h. von den Prämissen zur Konklusion nach der Regel des Verfahrens, der Schlussregel, überzugehen."

"[It is] the application of a regulated procedure to conclude from certain statements, the premises of a conclusion, to another statement, i.e. to pass from the premises to the conclusion by following the rules of the procedure, the conclusion mode". (Frege, 1967, p. 1303)

The different conclusion methods are explained in detail in chapter 2.3.

2.2 Logical judgment

2.2.1 Power of judgment

After reflecting the patient's problem, the practitioner forms a judgment, based on hypotheses and on the cause for the problem. For a practitioner, power of judgment is an essential tool during anamnesis and physical examination since it permits assessing and analyzing a series of valuable impressions and results. Judgment may be defined as the "correct" assessment of situations or circumstances, providing us with a suitable basis for the actions following in the therapeutic process. Professional competence and experience are the two main assets required to form an appropriate judgment.

Competence may be defined as

"[...] a standardized requirement for an individual to properly perform a specific job. It encompasses a combination of knowledge, skills and behaviour utilised [sic] to improve performance. More generally, competence is the state or quality of being adequately or well qualified, having the ability to perform a specific role." (http://en.wikipedia.org/wiki/Competence_%28human_resources%29 [February 26, 2007])

In other words, comprehension of technical problems in specific contexts and target-oriented problem-solving skills are vital to any profession. Osteopaths, for example, are expected to possess the professional competence to understand the patients and their problems as a whole. However, the question arises whether it is really feasible to recognize all aspects of the patient's problems like his family situation or professional situation etc., or whether practitioners don't ask too much of themselves by following this holistic approach.

"Urteilstkraft und Urteilsvermögen bezeichnen ausschließlich die Fähigkeit zu urteilen...."

"Power of judgment denotes exclusively the ability to judge." (Krug, 1832-1838, p. 479)

Immanuel Kant considers the power of judgment as a valuable talent which cannot be taught but requires training. This statement is confirmed by Wieland (1975, p. 96):

"Urteilstkraft kann in der Praxis immer nur an Beispielen geübt werden."

"In practice, the power of judgment can only be trained with reference to examples."

These citations emphasize the importance of gathering experiences. Experiences gained over the years develop from a series of sensual perceptions and cognitive processes, enabling the individual to encounter and explore the environment.

Experience certainly facilitates the process of forming hypotheses. Manual therapy accounts for this fact with the term *pattern recognition*; in medicine, the term *illness scripts* is used. Both describe the same: faster and more efficient recognition of existing patterns and organization of the treatment. For further comments on experience, please refer to chapter 3.4.

2.2.2 The importance of logic in a clinical context

The term *logic* is mainly encountered in close connection with mathematics and philosophy; it is, however, also present in manual therapy and osteopathy. On the one hand, the term *clinical reasoning* is employed in manual therapy; on the other hand, Still postulates that

"[e]r [der Osteopath] muss logisch überlegen".

"[h]e [the osteopath] has to think logically". (Still, 2002, p. 306)

"Die Logik ist unter anderem ein grundlegender Teil der Lehre vom richtigen Argumentieren. Und Philosophie unterscheidet sich von anderen Arten der Weltdeutung gerade dadurch, dass sie versucht, begründete Antworten auf die von ihr behandelten Fragen zu geben, d.h. durch gute Argumente gestützte Antworten."

"Among other things, logic is a fundamental part of sound argumentation and philosophy differs from other worldviews particularly insofar as it attempts to give reasonably founded answers to the arising questions, i.e. answers founded on sound arguments". (Beckermann, 2003, p. 1)

In the field of clinical reasoning, the practitioner aims to answer specific questions with regard to the respective patient and to justify his answer by sound arguments. Here is a simple example: the therapist has chosen a certain treatment since contraindications have been detected for any other form of treatment. Here, the "sound" argument is the recognition of contraindications in the case of application of certain treatment techniques. Beckermann (2003, p. 2) reasons that we master the art of argumentation without having studied philosophy. Logic aims to express explicitly what has already been more or less mastered implicitly (ibid). Thus, clinical reasoning shall enable the following:

- Improvement of argumentation skills: particularly difficult cases are hard to solve when solely referring to intuition.
- Teachability of argumentation skills.
- Acquirement of the ability to reflect the principles and criteria of argumentation with the help of logic.

These are exactly the basic thoughts reflected by clinical reasoning in manual therapy: the aim is to improve the thinking processes and to support the therapeutic actions with sound arguments which may also be used for training purposes since they provide students with the opportunity of understanding the applied examination and treatment methods. Furthermore, reflection of individual decisions is facilitated.

The main subject of logic is the deductive validity of arguments, i.e. the logical relation between premises followed by the conclusion of an argument (Beckermann, 2003, p. 34). In his *Historic Dictionary*, Ritter cites Arnauld (1980, p. 361) who reasons that logic is an art, or school, of thinking because its focus are the intellectual options of understanding, judgment and conclusion, and methodological categorization.

Clinical reasoning also aims to structure and categorize the practitioner's thinking process. The art in this case consists in the effective adaptation of the thinking process to each patient and his problem.

2.3 Hypotheses

After the comprehensive evaluation of the patient's situation, the next step in the therapeutic process consists in forming hypotheses for his problem in order to find the underlying reason. In the *Historic Dictionary of Philosophy*, hypotheses are described as follows:

"Hypothesen haben daher den Status einer Annahme".

"Therefore, hypotheses have the status of a presumption". (Sigwart, 1879, p. 1266)

Some hypotheses can be verified by experiments or experience; disproved or falsified hypotheses must be rejected or modified. Sir Karl Popper, major philosopher of the 20th century, asserts that falsifiability is a required characteristic for scientific theories (ibid).

In order to verify (= confirm) or falsify (= disprove) a hypothesis, three different techniques of logical reasoning are applied: induction, deduction, and abduction.

These methods of logical thinking are recognized methods of reasoning in the field of philosophy of science.

"Von Hypothesen wird hauptsächlich Gebrauch gemacht beim hypothetisch-deduktiven Modell der Theorienbildung in den exakten Naturwissenschaften. Hier verwendet man eine Hypothese auf die Daten einer konkreten Situation an, zieht die deduktiven Konsequenzen der Hypothese und vergleicht die Ergebnisse mit dem tatsächlich beobachteten Lauf der Ereignisse. Lassen sich die angegebenen Konsequenzen beobachten, so gilt die Hypothese als bis zu einem gewissen Grad bewährt oder bestätigt, sonst als nicht bestätigt."

"Hypotheses are mainly referenced for theory construction in the exact natural sciences when utilizing the hypothetico-deductive model. In this case, a hypothesis is applied to the data of a concrete situation, the deductive consequence of the hypothesis is drawn, and the results of the hypothesis are compared with the actually observed results. If the previously assumed consequences can be observed, the hypothesis is, to a certain degree, proved or confirmed, otherwise it is disproved." (Sigwart, 1879, p. 1266)

Clinical reasoning in manual therapy embraces the concept of the hypothetico-deductive model (cf. 3.2.2). In the following section, deductive reasoning and the two other methods of logical thinking will be discussed.

"Unter Deduktion versteht man die Ableitung einer Aussage (These) aus anderen Aussagen (Hypothesen) mit Hilfe der Regeln des logischen Schließens."

"Deduction is defined as the derivation of a sentence (thesis) from other sentences (hypotheses) with the help of the rules of logical conclusions." (Curry, 1950, p. 27)

"Conclusion" means a deduction performed according to implicit rules. In formal logic, the conclusion may also be referred to as "proof".

In order to come to a conclusion, three declarative sentences are required: major premise (rule), minor premise (case), and the result (conclusion). These three sentences can be grouped differently, thus leading to different results.

The American philosopher Charles S. Peirce (1839-1914) illustrates deductive reasoning with the example of a bag of beans lying on a table and a hand full of beans, lying loosely around the bag (Peirce 1969, p. 2623).

Following this example, we will briefly discuss the methods of deduction, induction, and abduction while at the same time relating the examples to clinical case studies with practical relevance.

Deduction is the conclusion of a result from a rule and a case.

1. Peirce's example:

Premise (rule): All the beans in the bag are white.

Premise (case): These beans are from this bag.

Conclusion (result): These beans are white.

2. Clinical case study:

Premise (rule): All persons have a cranial rhythm.

Premise (case): Some persons are from Hamburg.

Result (conclusion): All persons from Hamburg have a cranial rhythm.

(cf. Sommerfeld, 2008)

If the premises are true, the conclusion will also be true in the case of deductive reasoning. This method of reasoning is mentioned in manual therapy, even though it has to be questioned whether all premises can be assumed to be true in clinical reasoning and if this really is the method of reasoning applied. This will be subject to further discussion in chapter 3.2.2.

Induction is an inversion of deduction: conclusion is obtained from a certain result in a special case, subsequently determining the rule.

1. Peirce's example:

Premise (result): These beans are taken from this bag.

Premise (case): These beans are white.

Conclusion (rule): All the beans in the bag are white.

2. Clinical case study:

Premise/result (observation): There are persons who sit a lot at work.

Premise/case (random sample): Some of them suffer from back pain.

Conclusion (rule): All persons who sit a lot at work suffer from back pain.

(cf. Sommerfeld, 2008)

This conclusion aims to detect a generality such that Aristotle already described. However, we have to take into account that there are always exceptions to a rule - e.g. definitely, not all persons who predominantly sit at work suffer from back pain.

Peirce underpins that

"[f]olglich kann die Induktion nicht den geringsten Grund für die Annahme liefern, dass ein Gesetz ohne Ausnahme ist".

"[c]onsequently, induction can not provide the slightest reason to assume that there is a single rule without exception". (Pierce, 2002, p. 191)

For Peirce, only induction and abduction are suitable methods for the production of new knowledge. Abduction, also referred to as retrodution, was introduced by Peirce as logical conclusion. It is the conclusion of a case from an available result and a possible rule.

1. Peirce's example:

Premise (result): These beans are white.

Premise (rule): All the beans in the bag are white.

Conclusion (case): These beans are from this bag.

2. Clinical case study:

Result (medical findings): Karl has a positive anterior drawer sign.

Rule (empirical value): A positive anterior drawer sign indicates an anterior instability.

Case (diagnosis): Karl has an anterior instability.

(cf. Sommerfeld, 2008)

In such cases, abduction is a possible conclusion to provide a diagnosis and is applied in the field of medicine. Epistemologically speaking, it is an assumption which can be proven wrong; it would not be prudent to consider this a definitive diagnosis or even speak of medical evidence. We can thus summarize with Peirce:

"Die Deduktive Konklusion ist immer mit einer eindeutigen Wahrscheinlichkeit verknüpft, weil der Schlussmodus notwendig ist. [...] Mit der Induktiven Konklusion ist keine eindeutige Wahrscheinlichkeit wie die zur Deduktiven Konklusion gehörige verknüpft. Aber wir können berechnen, wie oft Induktionen einer gegebenen Struktur einen gegebenen Grad an Präzision erreichen."

"Deductive conclusions are always linked to an explicit probability because the conclusion mode is required. [...] In contrast, such an explicit probability is not connected with inductive conclusions. But we can calculate how frequently inductions of a given structure achieve a certain degree of precision." (Pierce, 2002, S. 194)

With regard to abduction, Peirce concludes as follows:

"Bei ihr gibt es keine eindeutige Wahrscheinlichkeit. Sie ist eine bloße Annahme, von der wir versuchsweise ausgehen".

"In this case, explicit probability is inexistent. It [probability] is a sheer assumption which we tentatively consider to be the origin of our reasoning". (ibid)

In this context, there is no hypothesis which is unambiguously true, but we have to preliminarily form a hypothesis for the single purpose of proving it wrong, which is precisely corresponding to the requirements of clinical reasoning. Peirce considers this method of reasoning to be, in the long term, the fastest one in order to find a solution.

On the other hand, Popper, in his later philosophical studies, rather emphasizes the concept of critical rationalism than the concept of falsifiability (Alt, 1995, p. 14).

It is vital to consequently criticize and discuss perceptions, solutions for problems, and convictions to become aware of our faults and weaknesses at an early stage and to be able correct them. Critical rationalism considers the disposition for criticism and self-criticism as a general way of living. Clinical reasoning, too, shall serve as a medium for self-criticism.

2.4 Cause and effect

The search for definitions of the terms *cause* and *effect* does not provide us with satisfying and unambiguous results (Wieland, 1975; Bradley, 1993; Ritter, 2001; Still, 2002).

Platon asserts that

"[d]er Begriff Ursache kann zur Erklärung und Begründung von etwas angeführt werden, und er setzt die Wirkung und Werdendes gleich und vertritt das Prinzip, dass jedes Werdende eine Ursache habe".

"[t]he term cause can be referred to for the explanation and justification of things, and it equates the effect and things to be, representing the principle that everything that is to be shall have a cause". (Platon, in Ritter, 2001, p. 378)

Over the centuries and into the 20th century, philosophy and philosophy of science have been - and will probably continue to be - engaged in discussions about these two terms.

"Die Auffassungen über die Begriffe Ursache und Wirkung vor allem darüber, wie sie angemessen zu definieren oder zumindest zu explizieren sind und ob es überhaupt sinnvoll und unverzichtbar ist, von kausalen Beziehungen zu reden, gehen nach wie vor weit auseinander, und ein Konsens ist nicht in Sicht."

"Interpretations of the terms cause and effect, particularly of how to suitably define or at least explain them, and of the general sense and importance of speaking of causal relations, still differ significantly, and consensus is not yet possible." (Posch, 1981, p. 402)

As a consequence of the extensive discussions, Russel proposes to eliminate the term *effect* from the philosophical vocabulary and underpins this proposal with arguments from the field of physics:

"The reason why physics has ceased to look for causes is that, in fact, there are no such things". (Tietze, 1981, p. 403)

In medicine, the terms *cause* and *effect* developed as early as in the 5th century BC (Vegetti, 1999, p. 377). Contemporaries of Hippocrates already elaborated on the cause of a disease (Hippocrates, in Ritter, 2001, p. 377). Some referred to various, empirically verifiable causes whereas others assumed that a disease had one or even less causes (ibid).

Independently of the number of causes to be determined for a disease,

"[e]s ist ein Gemeinplatz, dass die Therapie immer die Ursache einer Erkrankung auszuschalten hat".

"[i]t is a commonplace that therapy always has to eliminate the cause of a disease".
(Wieland, 1975, p. 142)

The therapist investigates the cause of the patient's problem and selects a suitable therapeutic treatment the effect and afterwards aims to determine its effects. However, we can assume that in most cases we will not only be confronted with *the* cause, but with a causal chain of multiple causes.

Osteopaths particularly engage in the concept of causal chains. During my osteopathic education and training, causal chains have frequently been discussed, e.g. when a patient had suffered an injury in the knee and subsequently started to limp, thus provoking lumbar vertebrae pain. Figure 2 illustrates such a causal chain with a practical example.

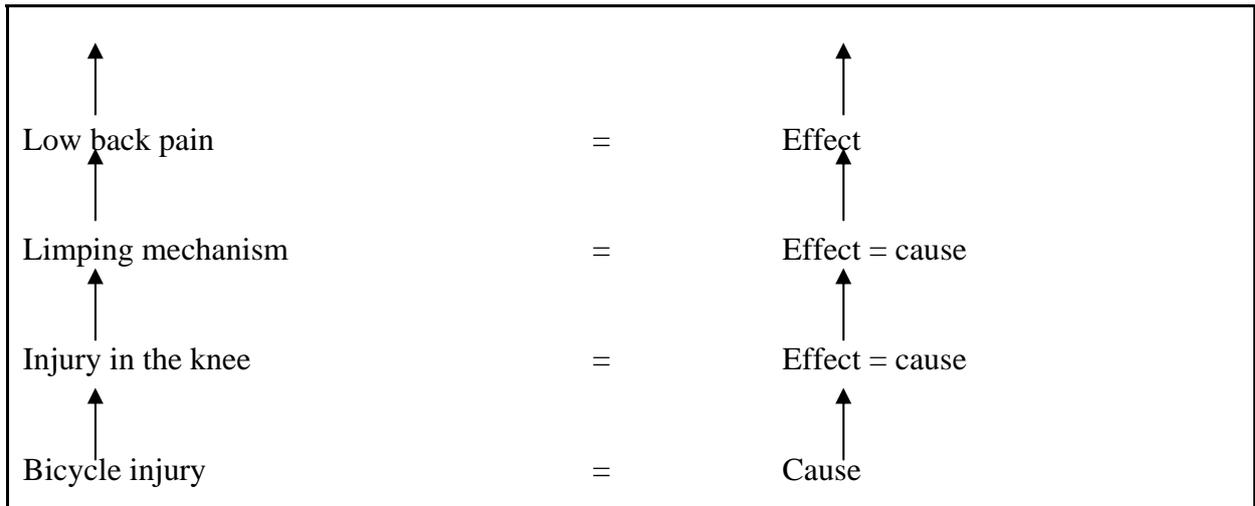


Figure 2: Causal chain, example 1

We can continue this example *ad libitum*: the bicycle injury is the direct cause for the injury in the knee which, in turn, is the cause for the limping mechanism, and this may lead to low back pain etc. The figure illustrates that each cause can be considered to be the effect of another cause which at first sight might not be obvious and directly related to the original cause. However, this is a simplified model which does not claim that every bicycle accident induces an injury or a cause for limping.

A second practical example has been chosen in order to illustrate the complexity of causal chains:

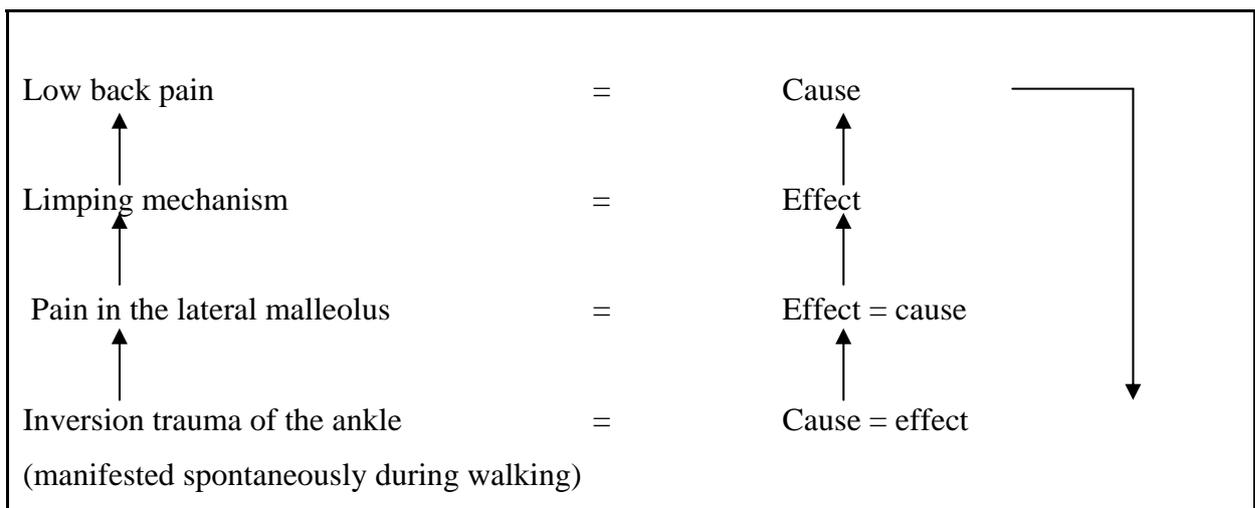


Figure 3: Causal chain, example 2

The problem described in Figure 3 is similar to the example illustrated in Figure 2. The important difference is, however, that we hypothesize that the cause for the patient's problem originates from the lumbar vertebrae pain. Physical troubles in the lumbar vertebrae region over years, in combination with pain irradiating into the leg, are susceptible to induce muscular hypotonia and a lack of neuromuscular control. This increases the probability of experiencing an inversion trauma, the cause of which might not be the twisting of the ankle itself but the symptoms in the lumbar vertebrae region.

The causal chains mentioned above illustrate that chain reactions can take various directions. The therapist has to recognize the individual directions by interpretation of the different pieces of information obtained from the patient as well as from the subjective and objective examination.

"Somit kommt man zu einer Kausalkette, die auch eine Form der Idealisierung ist."

"Hence, we identify a causal chain, also being a form of idealization." (Wieland, 1975, p. 143)

This idealization can serve as a helpful tool in order to organize and structure the causality process. In manual therapy, the cause of the cause is also sought: the cause of the main problem has to be identified in order to determine where this cause originates from.

With reference to the above discussion of terms, I would rather speak of a probable causal relation.

It is important to be aware of the individuality of each patient; simple models such as described in Figures 2 and 3 are hardly to be encountered in a patient, *"but the idea of cause and effect has been and remains important to our understanding of the everyday world as seen at the practical level"*. (Bradley, 1993, p. 47)

2.5 Decision and diagnosis

After identification of the individual components of the patient's problem, the practitioner decides on a diagnosis. Any practitioner's activities are based on making decisions, i.e. which questions to ask during anamnesis, which diagnosis to pronounce, and which treatment to choose.

The term *decision* is best explained by referring to a general model:

"Ein Individuum, der Entscheidende, befindet sich in einer Situation, in der ihm gewisse Handlungsweisen zur Wahl offen stehen, von denen er genau eine ergreifen muss und aus der sich eine von mehreren möglichen Folgen ergibt.

Der Entscheidende besitzt im allgemeinen keine vollständige Kontrolle über die Faktoren, die die Folgen, das Ergebnis, bestimmen."

"An individual, the person who decides, encounters a situation in which he can choose one of several options for action. He has to choose precisely one of these options, and this option implies one of more possible consequences. In general, the person who decides does not have total control of the factors determining the consequences, the result." (Schneeweiss, 1966, p. 543)

The person who decides is obliged to decide for a certain action and is not aware of its exact consequences. Before deciding, we consider the goals of our actions and establish plans for measures to be taken afterwards in order to evaluate the consequences of the decision.

For instance, a patient sees his therapist because he suffers from paresthesia in the right hand. The therapist finds a cranial rib and decides to caudalize it. This decision aims to achieve freedom of symptoms in the right hand; however, it is possible that the symptoms remain the same and that no improvement is achieved. Taking into account the definition mentioned above, this means that the therapist has to make a certain decision with regard to diagnosis and health management. Then he evaluates the result obtained, which can be positive or negative and draws conclusions for future decisions. The therapist aims to recognize all possible components relevant to the patient's problem but is unable to control all the factors contributing to a successful treatment (e.g. the patient's behavior at work).

Diagnosis is another fundamental step in the therapeutic process. It is essential for the patient, who might already feel a release of symptoms because a diagnosis has been pronounced; on the other hand, diagnosis is crucial not only for introducing suitable examination and treatment methods but also for pronouncing a prognosis. Furthermore, diagnosis is important for the patient's health assurance company and can be considered the basis of the communication system the patient is involved in.

The term *therapeutic action* is tightly linked to diagnosis (Wieland, 1975, p. 45). Diagnosis is a precise statement claiming truth. However, similar to every precise statement, the probability of not fulfilling the claim must also be taken into account (Wieland, 1975, p. 48). In order to further approach truth, diagnosis by exclusion can be applied. This method aims to exclude certain medical conditions to detect the corresponding disease pattern. In the field of clinical reasoning in manual therapy and osteopathy, this method is applied by carrying out specific tests which allow to rule out certain body regions.

Moreover, I would like to stress that the concept of truth with regard to diagnosis is

"...[um einen] Grenzwert handelt, dem man sich wohl annähern kann".

"...a critical value which can indeed be approached". (Wieland, 1975, p. 48)

"Diese Tatsache begründet die Notwendigkeit ständiger Selbstkritik, die für die wissenschaftliche wie auch für die ärztliche Haltung verbindlich ist."

"This fact constitutes the necessity of constant self-criticism which is binding for scientific as well as medical attitudes." (ibid)

Self-reflection and self-criticism of the individual treatment sessions are central elements of clinical reasoning in manual therapy. Since patients are different from each other diagnosis must be tailored to the individual whose problem(s) must be detected and treated. The concept of individuality must not be neglected. Still, it is mandatory for the practitioner to follow and consider the latest scientific findings as it is done in evidence-based medicine. The concept of evidence-based medicine will be described in detail in chapter 4.4.

In order to pronounce a diagnosis, different methods of reasoning (cf. chapter 2.3) are applied. Application of the deductive method is only feasible if the disease is fully developed, i.e. if symptoms and signs unambiguously characterizing the disease pattern can be diagnosed. Encountering such a case is, however, very rare in practice. The art of diagnosis therefore lies in the therapist's ability to pronounce a reliable diagnosis and to evaluate the disease pattern even in the absence of all typical characteristics.

Most frequently, the inductive method is applied to establish a diagnosis. This method implies a relatively high degree of probability and is applied in order to pronounce a rule which is intended to generalize. By using this method, the treatment can be adjusted to the symptoms of the corresponding disease pattern and to the diagnosis. Efforts of generalization are mainly pursued for didactic reasons but are also highly interesting for administrative purposes for health assurance companies.

The following two citations have been chosen to conclude this chapter. They are taken from the book "Wege zur Diagnose - Successful diagnosis" (Hennhöfer, 1992, p. 4) published by the *Kassenärztliche Vereinigung Westfalen-Lippe*, an association of German health insurances.

"Zur endgültigen Diagnose kommt man immer nur durch ständiges Rückfragen und Untersuchen."

"A final diagnosis can only be achieved by constant inquiring and examination." (Hennhöfer, 1992, p. 4)

This citation underpins the importance of permanently questioning the patient and oneself. Furthermore, it is vital that the practitioner consults the most effective and most efficient methods of examination.

"Aber es muss auch festgehalten werden, dass die Diagnose nicht immer auf Anhieb gelingt, auch trotz aller Bemühungen um eine schlüssige Antwort."

"But we have to stress that a diagnosis cannot always be achieved immediately, independent of the various efforts for a conclusive answer." (ibid)

For the patient, the prognosis is at least as crucial as the diagnosis, and the two terms are directly linked with each other; in how far will be discussed in the following chapter.

The prognosis is on no account the last step in the stage model of the therapeutic process introduced in chapter 2. It can be confirmed or proven wrong in the course of disease and of therapy. The final step of the stage model is reached once the patient is liberated from his sufferings and symptoms. Depending on the nature of the problem, this might not always be achievable.

2.6 Prognosis

During our osteopathic education and training, we were expected to provide the patient with a prognosis. (Ligner, 2002) The patient wanted to have details on the frequency and length of the treatment and on the time interval until the relief of symptoms.

"Natürlich ist der Patient an der Diagnose nicht um ihrer selbst Willen interessiert, von ungleich höherem Interesse ist für ihn die Prognose."

"Naturally, the patient is not interested in diagnosis per se; prognosis is of much higher interest." (Wieland, 1975, p. 23)

Once a diagnosis has been established, the practitioner can pronounce a prognosis, since it is directly linked with diagnosis.

"Doch kein Weg führt jedoch unmittelbar von den Beschwerden zur Prognose."

"But there is no path leading straight from symptoms to prognosis." (ibid)

The basis for prognosis consists of factors such as the duration of disturbances, the patient's compliance, structural changes, and others. These factors have to be considered before pronouncing a prediction for future with a certain probability. In modern medicine, valid methods and standards are sought and explored in order to obtain a higher probability rate for diagnosis and prognosis (Bradley, 1993, p. 92).

Long term studies to investigate the effect of therapeutic processes over a longer period of time are of higher significance for establishing a prognosis. Finally, the experience of the respective doctor or therapist plays a vital role for prognosis and for higher success rates of prognosis (cf. chapter 3.4.).

"Der Patient erwartet vom Arzt nicht nur die objektive Beseitigung seiner Beschwerden, sondern zugleich eine Stellungnahme zu seinen Hoffnungen und Befürchtungen."

"From his doctor, the patient expects not only the objective elimination of his symptoms, but at the same time a comment on his hopes and fears." (Wieland, 1975, p. 24)

Clinical reasoning in manual therapy aims to integrate the wishes and needs of the patients with the help of the patient-centered model which is matter of discussion in the next chapter.

3 Clinical Reasoning in Manual Therapy

For an introduction to this chapter, I want to underpin the complexity of this topic by referring to reputable authors and by discussing their different definitions of clinical reasoning. On the one hand, they aim to find a general scheme for the process of clinical reasoning; on the other hand, considerations of the patient's individuality play an inherent role in these definitions. After a brief discussion of the different definitions, I will present three models applied in clinical reasoning. Furthermore, the vital concepts of pattern recognition and reflection will be introduced in this chapter. In this context, experience must not be neglected. Experience helps the therapist to recognize patterns and is gained by application of clinical reasoning. To conclude this chapter, I will link theory to a practice-relevant case study to better illustrate the individual steps involved in the process of clinical reasoning.

3.1 Definitions of clinical reasoning

Two significant persons are frequently cited with regard to clinical reasoning in manual therapy and osteopathy: Mark Jones and Joy Higgs. They define clinical reasoning as follows:

"Clinical reasoning has been defined as a process which the therapist, interacting with the patient and significant others (e.g. family and other health-care team members), structures meaning, goals and health management strategies based on clinical data, client choices and professional judgment and knowledge." (Jones, 2004, p. 3)

The concepts of thought and of decision applied in clinical reasoning, combined with practical experience, enable the therapist to supervise each patient according to his best discretion, which can be assumed to be the central objective of every practitioner.

Other authors describe clinical reasoning as follows: Cervero and Harris (1988, 1993, in Jones, 2006, p.3) define clinical reasoning as method of inducing "prudent" actions. The importance of "prudent" in this context will be subject to further discussion in chapter 5.1.

Mattingly and Fleming (1994, in Klemme und Siegmann, 2006, p.8) stress the impossibility of describing clinical reasoning in a few sentences because therapists apply different strategies in practice. These strategies are closely interrelated with factors such as education and training of the therapist, type of patients, definition of aims, etc.

Klemme and Siegmann (2006, p.8) conclude that clinical reasoning is not only remarkably comprehensive and complex but is also positioned in the center of each therapeutic action: therapeutic actions are hence based on clinical reasoning.

According to the glossary "European Physiotherapy Benchmark Statement" of the World Confederation for Physical Therapy, clinical reasoning is

"[t]he critical and analytical thinking process of making clinical decisions". (<http://www.fysio.ee/dok/01.pdf>[March 25, 2007]),

To summarize, clinical reasoning is interpreted in many different ways by different authors. However, their definitions have several aspects in common: they all claim that clinical reasoning makes major contributions to clinical decision-making and to the determination of therapeutic actions. By applying the concept of clinical reasoning, most therapists aim to provide their patients with the best and most effective form of treatment. Differences lie in the field of standardized structures within the process of clinical reasoning: Jones provides a self-reflection worksheet in his work "Clinical Reasoning for Manual Therapists" (2004, Appendix 2) in order to facilitate the reflection process, whereas Mattingly and Fleming postulate the impossibility of illustrating different thinking strategies with one single scheme.

We can conclude that clinical reasoning is applied in order to make clinical decisions with reference to and the help of critical and analytical thinking processes. These processes are illustrated in the context of different models, aiming to support the practitioner with regard to structuring the therapeutic treatment steps as well as evaluating and managing the patient's problem.

3.2 Models in the context of clinical reasoning

Several models are applied in the context of clinical reasoning. In the following section, the patient-centered model, the hypothetico-deductive model, and the model of hypothesis categories will be presented.

The central elements of clinical reasoning - cognition, knowledge, and metacognition - are important factors underlying all of these models. Cognition is described as

"[...] die Gesamtheit der Prozesse, die mit der Aufnahme von Informationen, ihrer Verarbeitung und Speicherung einhergehen".

"[...] the totality of processes involved in the uptake, processing, and capture of information".
(Seel, 2000, in Klemme and Siegmann, 2006, p. 15)

In the context of clinical reasoning, cognition aids the processes of data analysis and data synthesis: the therapist is enabled to pronounce a diagnosis and subsequently plans and agrees upon further treatment steps with his patient. Cognition in this case depends on the comprehensive knowledge of the therapist and *vice versa*. Knowledge in the context of clinical reasoning not only refers to medical and clinical knowledge but furthermore emphasizes the therapist's personal knowledge.

"Diese Form des Wissens [persönliches Wissen] ist nach Higgs und Titchen für das Clinical Reasoning besonders wichtig, da den Angehörigen der Gesundheitsberufe immer das Wohlergehen der ganzen Person am Herzen liegen muss."

"This form of knowledge [personal knowledge] is according to Higgs and Titchen of utter importance for clinical reasoning because health professionals must always be concerned with the well-being of the person as a whole." (Klemme and Siegmann, 2006, p. 21)

"Die Metakognition lässt sich kurz gefasst als das Denken über das Denken bezeichnen".

"Briefly speaking, metacognition can be defined as thinking about thinking." (Klemme and Siegmann, 2006, p. 22)

Thus, the therapist must aim to thoroughly perceive and consciously reflect his own thoughts.

Figure 4 illustrates the close interaction between the central elements of clinical reasoning.

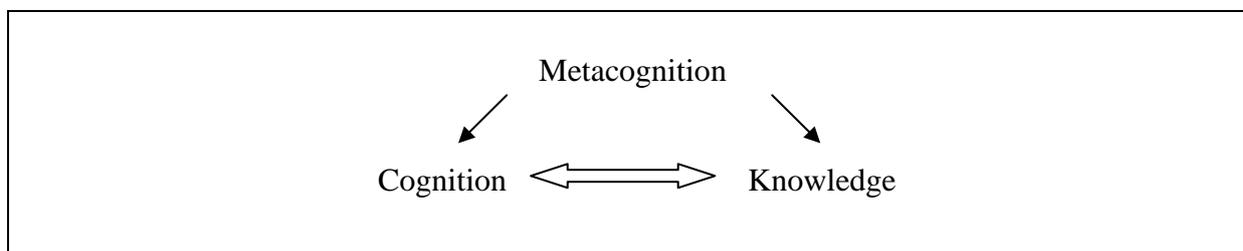


Figure 4: Relation between the central elements of clinical reasoning ¹

"Entsprechend kann die Metakognition als ein der Kognition und dem Wissen übergeordnetes Element eingestuft werden."

"Accordingly, metacognition can be classified as superordinate to cognition and knowledge."

(Klemme and Siegmann, 2006, p. 22)

Metacognition does not only refer to individual thinking but - most importantly - reflects an individual's knowledge itself. In the patient-centered model, the steps in the therapeutic process are illustrated; this model emphasizes the importance of close interaction between therapist and patient. The model of hypothetico-deductive reasoning describes the process of establishing a diagnosis in the context of clinical reasoning. The model of hypothesis categories takes components into account which are considered crucial for the patient's problem. This involves not only pain mechanisms and contraindications but also the patient's reaction to his problem and the limitations with regard to abilities and activities he experiences as a result of the problem.

¹ Taken and adapted from Klemme and Siegmann (2006, p. 22).

3.2.1 The patient-centered model

In their patient-centered model of clinical reasoning, Edwards and Jones (2006) aim to graphically illustrate the complexity of the individual components of clinical reasoning (see Figure 5).

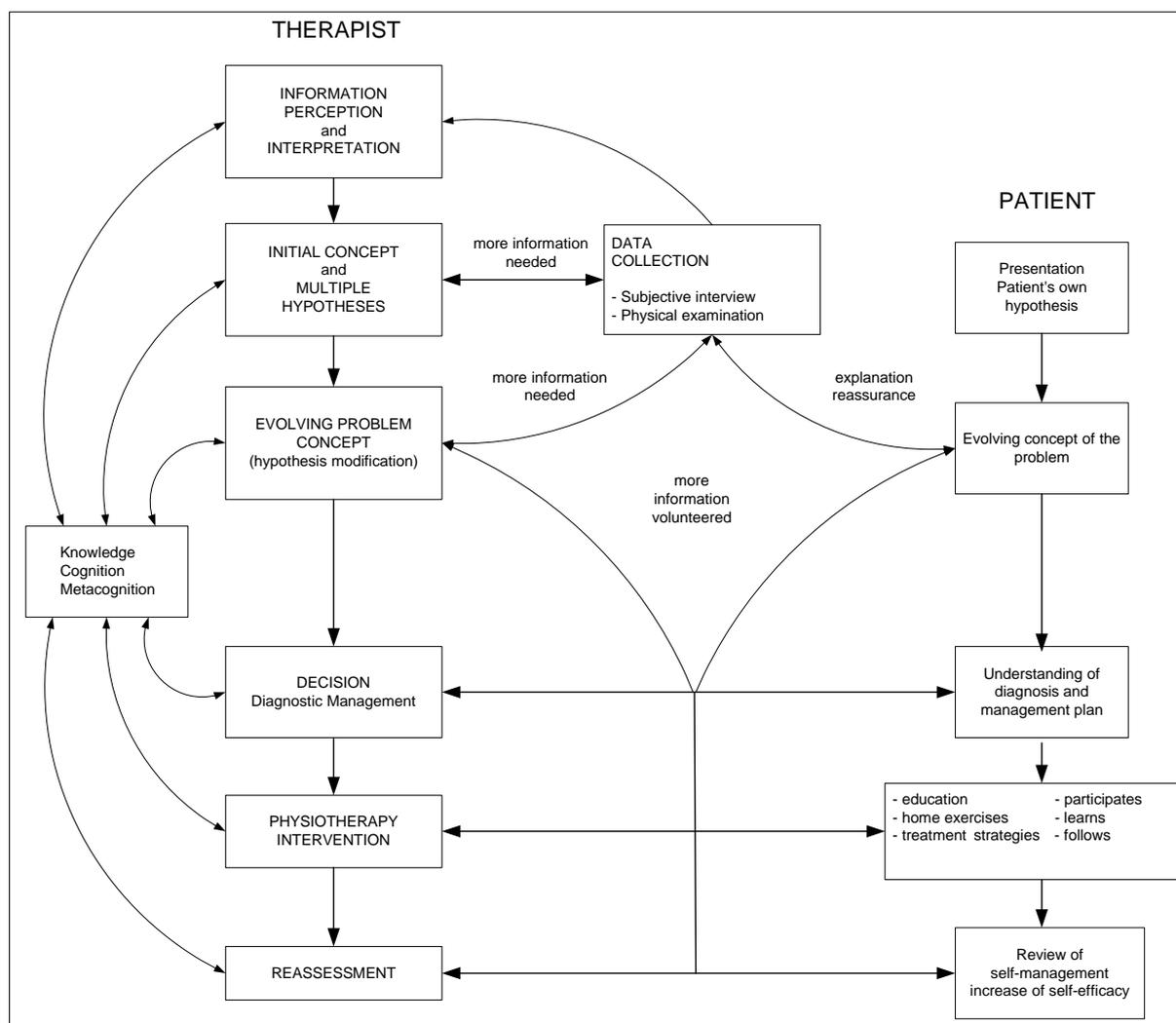


Figure 5: The patient-centered model after Edwards and Jones².

In the processes described above, both the therapist and the patient play a crucial role. From the moment the therapist meets the patient, he collects and perceives multiple pieces of information and interprets them (e.g. social or psychological aspects) before engaging in the processes of establishing hypotheses and interpreting data.

² Taken and adapted from Jones and Rivett (2004, p.4).

After the anamnesis and an initial assessment of the patient's problem resulting from a subjective interview, the therapist amends and modifies his initial hypotheses and compares them with those of the patient.

A vital element to this model is *narrative reasoning*. In this process, taking place during the subjective interview, the therapist aims to gain insights into the patient's thinking and interpretations while the patient aims to describe and interpret his problem. In narrative reasoning, the therapist is demanded to possess excellent communication skills and thorough biopsychosocial knowledge.

Since personal interpretation or individual interview methods may easily affect the information the patient gives, the therapist has to subject himself to a high degree of self-reflection.

In this context, I want to stress with Mezirow (1991, in Jones, 2006, p. 6) that

"[w]eniger, das was Menschen widerfährt, als wie sie es interpretieren und erklären, bestimmt ihre Handlungen, ihre Hoffnungen, ihre Zufriedenheit, ihre emotionale Befindlichkeit und was sie im Leben zustande bringen".

"[l]ess what people experience but rather how they interpret and explain it determines their actions, hopes, contentment, being, and achievements in life".

Each individual develops his own ways of thinking and interpreting, deriving them from personal, societal, and cultural experiences. Seizing them during the process of narrative reasoning is essential for the therapist. Hence, continued reflection and joint interpretation of the data collected during the subjective interview and the physical examination, as illustrated in the center of Figure 5, is vital for a successful anamnesis and treatment. A permanent flow of communication between therapist and patient avoids diverging concepts and expectations of the treatment.

After the anamnesis and the physical examination, the therapist pronounces the diagnosis and starts with the first steps of manual therapeutic treatment in agreement with the patient.

Hypothesis-oriented thinking is a most helpful tool for the diagnosis decision process: the therapist aims to verify or falsify the previously established hypotheses by examining certain aspects (e.g. pain description, changes of active movements), performed in the course of reassessment. The therapist aims to actively integrate the patient into this process.

Suitable methods to do so are explanations and the assessment of the problem as well as integration of the patient's interpretation. For Jones (1997, p.7) the process of clinical reasoning extends to the overall treatment and treatment progress.

3.2.2 The hypothetico-deductive model

The hypothetico-deductive model is an established model in the context of clinical reasoning in manual therapy and in medicine. Elstein und Schwartz (2002, p.729) describe that hypothetico-deductive reasoning is based on the formation of hypotheses, generated from medical data and medical knowledge. The available information is then to be verified or disproved in further examinations.

This model is referred to as deductive since hypotheses are at the origin of the further process of data collection: any further decisions are derived from the first hypotheses.

However, the use of the term *deductive* might be misleading in this context. Premises in deduction are assumed to be true, whereas hypotheses are not susceptible to meet this claim since they are assumptions and not facts. Hence, speaking of a hypothetico-deductive model is not correct in the context of clinical reasoning. Considering that the translation of Latin *deductio* means *leading on or leading away* (Stowasser, 1998, p. 142), it is probable that this term has been introduced to describe that possible causes are derived from hypotheses. With this interpretation, the term *hypothetico-deductive model* can be considered appropriate, since the therapist is stimulated to continue or derive hypotheses in the process of clinical reasoning.

The concept of hypothesis categories, in turn, is appropriate for a better understanding of the patient's problem and for choosing a suitable therapeutic treatment.

3.2.3 The model of hypothesis categories

Applying this model, the therapist aims to assign categories to the patient, whereas each category induces a certain therapeutic approach. These categories comprise multiple components, e.g. the effects of the disease with regard to the daily life of the patient, effects to his environment, the presence of contraindications for examination and treatment methods, etc. Hence, the therapist aims to integrate into his reasoning not only the anatomic and physiological factors for the patient's problem, but also his personal environment.

Jones and Rivett (2006, p. 17) divide their model into the following categories:

- Category of skills: diminution of possible activities and skills necessary to participate in daily life. The therapist has to be well aware of the patient's skills in order to integrate them into the treatment.
- Category of experience: the patient's experiences with his problem and personal attitude towards it. This category comprises the patient's psychological, psychosocial, and mental status.
- Category of pathobiological disposition: involves data on tissue and pain mechanisms of the patient, enabling the therapist to better understand the exact origin and continuation of the symptoms in the nervous system.
- Category of physical impairment and associated causes in structures and tissues: the therapist should be capable of detecting potentially relevant impairments and to subsequently pronounce a hypothesis for the cause.
- Category of (psychosocial, behavioral, or biomechanical) factors relevant for the development or continuation of the problem.
- Category of preventive measures and contraindications against physical examination and treatment: it is essential for the therapist to recognize which therapeutic interventions do not impair the patient's health.
- Category of patient management and treatment: this involves hypotheses for the achievement of a significant improvement of the patient's health and considerations for the application of suitable treatment forms.
- Category of prognosis: in the context of predictive reasoning, the therapist evaluates and considers the patient's reactions and the results of the treatment.

With the help of this categorization, the therapist can choose the best therapeutic approach for each patient.

In the therapeutic process, the three models are applied simultaneously. The patient-centered model integrates the interaction between therapist and patient into the treatment; the hypothetico-deductive model provides the theoretical background; and the model of hypothesis categories aims to develop a better understanding of the patient's problem by considering further factors which previously have not been taken into account.

3.3 Clinical reasoning and pattern recognition

"Eine Verknüpfung von biomedizinischem und klinischem Wissen bildet die Basis für eine optimale Patientenversorgung."

"A link between biomedical and clinical knowledge is the basis for an optimal medical care of patients." (Jones, 1997, in Klemme and Siegmann, 2006, p. 21)

However, social, psychological, communicative and ethical knowledge and skills are equally important. Particularly personal knowledge, referring to the individual conscience, is essential for the development of thorough understanding of other people and of patients (Klemme and Siegmann, 2006, p. 21).

Knowledge is captured in bundles or patterns which facilitates communication and thinking processes. Pattern recognition is a typical feature of developed and sophisticated thinking (Schön, 1983, in Jones, 2006, p.9).

In the clinical field, we will not only encounter patterns of clinical symptoms relevant for the diagnosis decision process but also patterns deriving from the physical, psychological, social, or cultural field. Frequently, similar patterns are determined with regard to the professional situation. Moreover production rules as described by Jones in 1997 are captured in our brains. Production rules are also referred to as *if-then rules*, in our case determining the therapeutic actions.

"Die Produktionsregeln besagen, wenn bestimmte Merkmale oder Zustände vorliegen, dann werden bestimmte klinische Muster und Behandlungsstrategien ins Gedächtnis gerufen."

"The production rules indicate that certain characteristics or conditions conjure certain clinical patterns and treatment strategies." (Jones, 1997, p. 7)

Comprehensive knowledge about clinical patterns, developed and derived from long experience, is crucial for the formation of hypotheses. Once a hypothesis is confirmed, the corresponding pattern is scrutinized carefully to validate its applicability. Patterns can also be relevant for the deduction and acquisition of new patterns.

In contrast to their younger colleagues, experienced therapists use the method of pattern recognition more frequently.

Pattern recognition is susceptible to errors if applied unquestioned; if applied too routinely, it might result in the loss of flexible and innovative thinking. Still, it can represent a fast and efficient method for resolving clinical problems.

In the next chapter, I will take up the above-mentioned concept of experience to discuss the terms clinical experience and expertise.

3.4 Clinical experience and expertise

Experience plays a vital role within the therapeutic process in the literature, referring both to manual therapy (Jones, 2006; Klemme and Siegmann, 2006) as well as to medicine (Bradley, 1993; Elstein 2002; Dhaliwal, 2006).

Again, a philosophical excursus has been chosen to provide an introduction to this chapter. Aristotle used the term *experience* in the context of craftsmanship and connection with pre-comprehension, focused on human's acquired skills, and training in or familiarity with certain things (Aristotle, in Ritter, 1972, p. 609).

Experienced therapists are better skilled in and more familiar with certain forms of treatment and thus can apply them more precisely and more efficiently. Furthermore, they are well-versed in patient management, faster in assigning the corresponding patterns to their patients and thus have better problem-solving skills. They master the art of diagnosis and of treatment in all aspects.

However, during the treatment of my own patients, I have become aware on a few occasions that the therapist is susceptible to neglect and overlook simple things because of the complexity of the subject.

"Neuerlich steht Erfahrung hier sehr pauschal für die Ergebnisse von Experimenten oder Erhebungen."

"Again, experience generalizes the results of experiments and studies." (Popper, 1935, p. 616)

Previously obtained results from experiments and studies permit the accumulation of experience. Experience already made can be confirmed by other results from studies, or new perspectives can be obtained.

Experience is definitely essential for becoming an expert. Simon (1980, in Jones, 2006, p. 454) assumes that it takes a minimum experience of ten years before obtaining the status of an expert in any specialized field. In his reasoning, Andrew T. Still even enlarges the period of collecting experiences:

"Nach 50 Jahren Studium der Anatomie und Physiologie, verstehe ich die Anatomie."

"After having studied anatomy and physiology for 50 years, I understand anatomy." (Still, 2002, p. 234)

Undoubtedly, not only the factor time determines this process of understanding, but also the intensity of engaging with a certain topic. Practical and patient-centered work is essential in order to collect clinical experiences. In this context, an expansion of knowledge can only be achieved by practicing: learning objectives are achieved more easily when linked to case studies of practical relevance.

Glaser and Chi (1988) defined features of expertise, summarizing results from different fields, e.g. physics, mathematics, medicine, chess (in Jones, 2006, p. 453). According to their findings, they concluded the following aspects of general expertise:

- Experts excel in their specific fields.
- They are able to recognize vast and meaningful patterns in their respective fields.
- They perform skills characteristic for their fields faster than young professionals. At the same time, experts are able to solve their problems more efficiently and with less effort.
- They have an excellent short-term as well as long-term memory.
- They perceive and represent a professional problem more in depth than their younger counterparts and rather as a question of principle compared with young professionals (typically, the latter provide a rather superficial illustration of a problem).
- They spend a lot of time on the qualitative analysis of a problem.
- They are capable of self-reflection; their clinical reasoning takes place at a high metacognitive level.

- Experts have the affective prerequisites (e.g. curiosity, self-consciousness, open-mindedness, flexibility, honesty, accuracy, empathy, and modesty) to reflect their experiences and learn from them.

Some of these characteristics are also frequently encountered in clinical reasoning: the recognition of patterns; quick and precise problem-solving skills; analytical troubleshooting; self-reflection and metacognition; the learning effect; in-depth knowledge. Experts have on many occasions treated the same symptoms and have accumulated comprehensive knowledge by reading and referring to literature.

Hence, we can conclude that the application of clinical reasoning is a most helpful tool to become an expert. Jones (2006, p. 452) comes to the same conclusion:

"Was den Experten von anderen Klinikern unterscheidet dürfte die Kognition oder das Clinical Reasoning sein."

"What distinguishes the expert from other clinicians might be cognition or clinical reasoning."

Higgs and Jones (2000, in Jones, 2006, p. 453) amend the above-mentioned features of experts by the following characteristics considered vital to experts in the field of manual therapy:

- They acknowledge the importance of knowledge from other fields and apply it critically for their own thinking.
- Their expertise is made accessible, helping others improve their own expertise.
- Experts are able to communicate their thoughts objectively and comprehensively to their audience.
- By applying clinical reasoning and communicating it, they prove their cultural competence.
- They think in multiple approaches in order to establish new hypotheses and are able to restructure the treatment concept if progress proves to be insufficient.
- They are patient-centered, understand the patient's experiences, perceptions, and expectations and react accordingly.

- They appreciate the participation of others (patients, their relatives, other health professionals) in the decision process.

The enumeration of these characteristics focuses on two aspects: pedagogic value on the one hand, and the individual person on the other hand.

Due to its transparency, the application of clinical reasoning is well-suited for pedagogic purposes: first because the expert can illustrate a structured therapeutic process, second because the novice is guided through the clinical reasoning process and learns to reflect his actions.

The person, as patient as well as individual, is in the center of each therapeutic process, either by communicating his wishes and feelings or by actively contributing to convalescence within the process of patient self-management.

In most cases, the patient's expectations of the expert are high: he demands outstanding clinical performance with regard to precision in the diagnosis decision process and treatment. We can assume that experts excel because they are aware of their limits and permanently aim to expand their knowledge which is achieved by repeated studies of relevant literature, by continuous training, and by working with the patient in a self-reflective and self-critical manner.

I want to point out that experience and expertise do not protect against cognitive errors. Dhaliwal (2006, p. 27) comes to the same conclusion and recommends posing the same question again and again: "*What else could this be?*", and furthermore affirms:

"This type of mindful practice (metacognition, or thinking about thinking) may ultimately help to guard against diagnostic pitfalls." (Dhaliwal, 2006, p. 27)

3.5 Clinical reasoning as reflection process

Cognitive self-consciousness and self-criticism are crucial for competent clinical reasoning:

"Wer reflektiert, ist skeptisch, hinterfragt stets, wie zuverlässig, valide und insgesamt relevant Befunde und Interpretationen sind."

"Whoever reflects is skeptical and always questions the reliability, validity, and overall relevance of diagnoses and interpretations." (Jones, 2006, p. 11)

The process of clinical reasoning is performed implicitly, i.e. on an unconscious basis and not directly verbalized, or explicitly, i.e. conscious, depending on the respective situation and type of reflection. The therapist must question not only medical statements and interpretations, but also his own actions in order to further develop his clinical experiences. This type of reflection is a useful source of learning and permits a better understanding of the obtained clinical results and, if required, their optimization. However, speaking from my own experience, the reflection process can be supported by partners or colleagues who can add new interpretations and other possible therapy approaches.

Hengeveld (1998, p. 48) describes the importance of reflection as follows:

"Der Reichtum an Gedanken und Gefühlen während einer therapeutischen Begegnung wird nicht enthüllt, wenn keine Reflexion während und nach der therapeutischen Handlung stattfindet."

"The wealth of thoughts and feelings during a therapeutic encounter is not unveiled unless reflection takes place during and after the therapeutic actions."

However, self-reflection is not always easy since it requires honesty and willingness to confront one's own mistakes and weaknesses. Still, it is vital for the collection and amplification of experience.

3.6 A case study: summary and reflection

For a better illustration of the practical applicability of the clinical reasoning process, one of the 23 chapters of "Clinical Reasoning for Manual Therapists" (Jones, 2004, p. 60- 421) is discussed in this chapter. The chapter "Chronic low back and coccygeal pain" (Paul Hodges, 2004, p. 103-121) is summarized and reflected with regard to the organization and practicability of clinical reasoning. The selection of this chapter is justified insofar as osteopaths frequently encounter these problems in their practical lives. Present tense has deliberately been selected for the description of this process since it can serve as prototype for clinical reasoning in practice at any time.

Primarily, the patient defines his main problem and the objective of the therapy. During anamnesis, the therapist tries to detect subjective parameters which he questions again within the reassessment process. After the subjective interview, preliminary hypotheses related to the cause of the symptoms and the present pain mechanisms are established. These hypotheses determine the patient management. Furthermore, the therapist considers psychosocial factors, i.e. if the patient's private life is affected, if he suffers from restrictions with regard to hobbies or quality of life, and the patient's own interpretation of the problem. From the beginning, hypotheses are reflected in different categories (cf. chapter 3.2.3).

The next step consists in the clinical examination. Personal, professional, and propositional knowledge play an important role in the understanding of clinical problems and in their successful treatment. Subsequently, the hypotheses which have been formed at the beginning and confirmed or rejected within this process are reflected again. Moreover, the therapist reassesses all relevant components and any information obtained during the interview and examination, thus considering less obvious hypotheses and critically reflecting his thinking.

It is essential not to strictly stick to technically specific explanations but also to highlight alternative explanation approaches, such as biopsychosocial components. Biopsychosocial refers to the biopsychosocial model, denominating a multi-dimensional approach going beyond the tissue- and pain-oriented concepts. Hence, this approach not only considers pain, but also integrates the patient's social and professional environment, his self-management during therapy, and his personal convictions and perceptions (Gifford, 2002, p. 198). Afterwards, a suitable therapy is chosen and started with in agreement with the patient who together with the therapist reassumes therapy after an adequate interval of treatment.

The most striking aspect of this case study is that each selected method of treatment is questioned and that every further treatment session is determined by reflection. Appropriate studies are referred to in order to justify and underpin the selected treatment method, and good therapists recognize easily which study is suitable for the individual case and the respective patient (cf. chapter 4.4). We can thus conclude that scientifically founded interventions and approaches based on experience should be evaluated and reflected.

Further reflection is performed after each treatment session and after the termination of the treatment cycle. This reflection is based on the effects of the treatment, on the interval of treatment, and on the patient's self-management.

An essential factor for the success of the therapy process is active participation of the patient and the respect and integration of his expectations, fears, and feelings.

Paul Hodges described his case study in-depth and justified the individual examination and treatment steps by strictly answering the questions of Mark Jones. The reader can follow the example and Hodges' thoughts well, and his case description seems to be of high pedagogic relevance, enabling the student to better understand the therapy process by applying the method of clinical reasoning: the learning progress achieved by sole observation of a treatment is very probably lower for students. In Appendix 2 of his book, Jones illustrates a worksheet for self-reflection, answering specific questions for an independent performance of the clinical reasoning process. Paul Hodges' case study described above as well as Jones' worksheet for clinical reasoning are both attached in the Appendix (cf. 11.2) to this master thesis.

4 Clinical Reasoning from a Medical Point of View

The following chapter describes the clinical reasoning process from a medical point of view and underpins its parallels to manual therapy. Further aspects of the clinical reasoning process and their application in the medical field are elaborated.

Above all other aspects, clinical reasoning plays a crucial role in the field of medical education and training. Reputed authors such as Arthur S. Elstein (professor at the Department of Medical Education in Chicago, USA) or Ed Peile (professor of medical education at the University of Warwick, UK) are engaged in medical education.

4.1 Pattern recognition and hypothetico-deductive reasoning

Ed Peile (2004, p. 946) defines the process of clinical reasoning as follows:

"What is clinical reasoning: the process by which doctors funnel their thinking towards probable diagnosis is classically thought of as a mixture of pattern recognition and hypothetico-deductive reasoning",

thus proving that the corner stones of clinical reasoning, i.e. pattern recognition and the hypothetic-deductive model as described in chapters 3.3 and 3.2.2, are also well represented in the medical field.

Physicians are daily confronted with the diagnosis decision process followed by decision for a certain therapy. Patients contact their doctor because they expect him to solve their problem.

"Problem solving is a skill all physicians must learn and that some clearly perform better than others, yet few can articulate how they do it." (Dhaliwal, 2006, p. 19)

Clinical reasoning seems a suitable method to render the process of problem-solving more transparent. The diagnosis decision process in medicine is similar to the process described in chapter 3: diagnosis is preceded by a detailed anamnesis and physical examination.

The aim of this process is the identification of signs and symptoms of the health impairment, followed by pattern recognition and finding an adequate solution. According to Dhaliwal (2006, p. 19) pattern recognition allows fast, efficient, and simple treatment. On the other hand, the danger of assigning the same pattern to each patient is inherent to this method.

Once the patient cases become more complex and can no longer be fitted into a pattern, the physician is forced to apply analytical reasoning. This type of reasoning links the patient's problem with pathophysiological mechanisms, allowing to seek different problem-solving approaches. Depending on the field in which experience and medical knowledge have been collected, either pattern recognition or analytical reasoning is applied: a clinician, for instance, who has worked in the field of emergency medicine in a hospital, assumes office for a general practitioner. Their approaches and hypotheses with regard to the patient's problem will differ significantly (Dhaliwal, 2006, p. 20). We can assume that the experienced clinician can refer to already encountered patterns to advance the therapy decision process.

In medicine, the hypothetico-deductive model (cf. chapter 3.2.2) is also a well-known concept in the processes of diagnosis and analytical reasoning whereby hypotheses are proposed, tested and verified, or rejected (Dhaliwal, 2006, p. 20). The following two citations of Bradley (1993) underpin the importance of establishing hypotheses:

"It is the generation of hypotheses which is the real key to success. Some people have regarded this as an unscientific act, but it is a fundamental part of scientific process."
(Bradley, 1993, p.23)

"The generation of a hypothesis, although intuitive, is at the heart of the scientific method."
(Bradley, 1993, p. 32)

For further details on *intuition*, please refer to chapter 6.4.

According to Dhaliwal (2006, p. 20), two to five diagnostic hypotheses are formed within the first 30 to 120 seconds after encountering the patient. Subsequently, these hypotheses are reassessed by collecting further information (physical examination, laboratory tests, imaging techniques) and by reflecting the cause-and-effect relationship. Once these subsequent tests have excluded certain diagnoses, a relatively secure diagnosis can be pronounced.

The detection of the corresponding pivotal findings, also referred to as *key features* or *good cues*, is essential to this process. The pivotal findings are obtained from anamnesis, physical examination, or lab tests. Another important aspect for interpretation of test results is to avoid over-interpretation of positive test results when a negative finding may contain just as much information (Bradley, 1993, p. 55).

"A negative test should have the converse effect of making the diagnosis less likely, and yet the clinician often ignores the evidence." (ibid)

4.2 Illness scripts as instrument of knowledge organization

The degree of efficiency, reliability, and rapidity of establishing a diagnosis depends not only on experience, but to a high degree on the capture of knowledge and experience in the physician's memory. Illness scripts allow the storage of clinical findings and clinical data which can differ from those of textbooks or other physicians.

"For precise and efficient diagnosis to occur, illness scripts must be accurate and accessible to the physician in real time." (Dhaliwal, 2006, p. 24)

Experienced physicians are able to detect characteristic features already within the process of anamnesis, to compare them with the pre-defined illness scripts, and to eventually solve the patient's problem. Care has to be taken insofar as prematurely pronouncing a diagnosis without sufficient evidence or carefully considering contradictory information is a common source of cognitive errors.

4.3 Quantitative medical decision-making

Besides clinical reasoning, another method of decision for diagnosis is applied: quantitative medical decision-making.

Bayesian analysis is a decision support tool within the diagnostic process.

This method graphically illustrates the factors of the patient's problem with the help of a decision tree, thus listing all possible differential diagnoses and assigning to all of them a certain probability (in %) of being the cause of the problem. A mathematical model is applied to calculate the diagnosis with the highest probability.

"Quantitative medical decision making is the mathematics behind the practice of evidence-based medicine, which is the process of identifying, evaluating, and applying the highest-quality medical evidence." (Bent, 2006, p. 1)

A more detailed description of application of this method is beyond the scope of this thesis and remains open to further research. Consequent research for systematic reviews in current literature, i.e. further reflection of the patient's problem, is the most important prerequisite for this approach of diagnostic decision-making.

Bradley (1993, p.60) suggests grouping the respective diagnoses into a pyramid, whereby the most probable diagnosis forms the basis. This approach is similar to the Bayesian analysis, in literature also referred to as *Bayes` theorem*. However, Bradley critically notes that in practice, the physician does not establish a systematic list of possible hypotheses but assumes the most obvious diagnosis by application of intuition and pattern recognition.

Intuition in connection with clinical decisions is equally important in the medical field as in the field of manual therapy (Bradley, 1993; Dhaliwal, 2006; Elstein, 2002; Jones, 2006) and is hence matter of further discussion in chapter 6.4.

4.4 Evidence-based medicine

Authors in the fields of manual therapy (Jones, 2006) and medicine (Bent, 2006; Bradley, 1993; Dhaliwal, 2006) frequently refer to the application of evidence-based medicine. Therefore, importance and objectives of evidence-based medicine (EBM) are briefly discussed in the following section.

The philosophical origins of EBM can be traced back to the mid-19th century.

"Evidence-based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients." (Sackett et al, 1996, p. 1)

Combination of individual experience with the best external clinical evidence from systematic research is vital to this concept (ibid). Only then, the treatment can be adjusted to a certain case to guarantee efficient and individual therapy for the patients.

External clinical evidence in this case means integration of studies of clinical relevance, whereby the studies are previously verified. Long-term studies, clinically monitoring the effect of therapy, are referred to for selecting adequate treatments as well as for forming prognoses.

It is important not to perceive EBM as "cookbook medicine" but to adapt it individually to each patient (Sackett et al, 1996, p. 1).

EBM mainly serves the consolidation of propositional knowledge and integration of innovative ideas into therapy. Generally, EBM is an important and most helpful tool in the process of therapeutic decision-making. EBM is of particular interest for the pedagogic field: it is to be avoided that students learn "only" from their teacher's practical experience without being provided with a sound scientific basis.

5 Clinical Reasoning connected with Andrew Taylor Still's Thoughts

This chapter discusses the thinking process selected by Andrew Taylor Still for approaching the patient's problem and compares it with the processes relevant for manual therapy and medicine. My main source of information thereby was the first German edition of the Still compendium; therefore we have to be aware that the context might have been affected by translation. When mentioning the "practitioner", Still refers to the osteopath.

Furthermore, this chapter provides the reader with the relevant historic context to render the thoughts of Still more comprehensive.

Basically, Still defines three pillars for osteopathic treatment: free and independent thinking, acting, and treating; searching the cause of the disease; and proving claims by actions.

5.1 Free and independent thinking, acting, and treating

"Ein Student jeglicher Philosophie wird durch Anwendung der einfachen Methoden des logischen Denkens und der Schlussfolgerung am erfolgreichsten sein."

"A student of each philosophy will be most successful by application of the simple methods of logical reasoning and concluding." (Still, 2002, p. 297)

In the Still compendium, the methods of logical thinking (cf. chapter 2.3) and reasoning are not described; however, logical thinking - according to Still, subsequently leading to success - is mentioned.

Still studied the works of E. Swedenborg in-depth and made himself familiar with the different concepts and types of reasoning. E. Swedenborg (1688-1772) was a polymath of his time, studying the to-date most important fields of science such as chemistry, physics, astronomy, anatomy, physiology, philosophy, and psychology (Hartmann, 2007).

Still was also influenced by his father, a Methodist, and Methodists of the time were philosophers, pastors, and doctors in one person (Hartmann, 2007).

"Dieses Werk [das Still Kompendium] wurde für den Studenten der Osteopathie geschrieben um ihm zu helfen, vor dem Handeln zu denken, den Auslöser bzw. die Ursache der Fälle zu ergründen und sie herauszufinden, bevor er mit seiner Behandlung beginnt."

"This work [the Still compendium] was written for the student of osteopathy to enable him to think before acting, to comprehend and detect the trigger or cause of the cases before starting the treatment." (Still, 2002, p. 298)

The thinking process accompanying each case is the most crucial element for treatment. The osteopath is expected to reason about possible causes and to confirm or disprove his own interpretations by referring to examination and treatment. Still's reasoning was intended to serve as basis for osteopathic treatment. In the chapter "Forschung und Praxis - Research and Practice" (Still, 2002, p. 473-661), Still describes different disease patterns, always according to the following scheme: he notes the definition of the disease by citing the doctors Dunglison or Dorland, continues by mentioning etiology before describing the suitable form of treatment. Thereby he listed certain disease patterns to help the osteopath recognize the disease and treat the patient in correspondence with the osteopathic criteria. In this case, we can draw parallels to pattern recognition and its application in clinical reasoning of manual therapy.

With the help of pattern recognition, the diagnosis decision process becomes faster since characteristic symptoms and signs are recognized and assigned to a typical pattern inherent to a certain disease (Dhaliwal, 2006, p. 19).

"Es [Wissen] wird weiter bewiesen durch seine Fähigkeit, Fakten zu sammeln und zu verbinden und dadurch kluge Schlüsse zu ziehen. Er muss logisch überlegen, da ihm das absolute Wissen fehlt."

"It [knowledge] is further proven by his [the osteopath's] ability to gather facts, to intertwine them, and then draw prudent conclusions. He is obliged to think logically, since he lacks absolute knowledge." (Still, 2002, p. 306)

Osteopaths and their students are in research of *good cues* or *key features* (cf. chapter 4.1) which help recognize certain patterns.

In the citation mentioned above, Still describes this process with "gather facts and intertwine them"; likewise, clinical reasoning, too, searches key terms and characteristic features permitting conclusions about the cause of the patient's problem.

According to Still, the osteopath lacks "absolute" knowledge, in the possession of which is only God who plays a vital role throughout Still's life (Hartmann, 2007). He mentions "prudent conclusions", in the way Cervero and Harris speak of prudent actions in their definition of clinical reasoning. Furthermore, Still describes "prudent" logical thinking, in contrast to Cervero and Harris (cf. chapter 3.1) who describe "prudent" actions preceded by "prudent" thoughts. A description of "wisdom" or "prudenz" affirms that

"Klugheit zwischen Einsicht (Verständigkeit, Wissen um das Richtige und Zweckmäßige) und Weisheit steht".

"[p]rudenz stands between insight (comprehension, knowledge about the right and convenient) and wisdom". (Walch, 1727, p. 857)

Morality is closely linked with the concept of prudence:

"Die Klugheit bedarf immer noch [...] ihrer Rückbindung an die Sittlichkeit."

"Prudence requires still [...] reference to morality." (Pieper, 1960, p. 862)

Wise conclusions hence imply correct and convenient logical reasoning under consideration of morality; prudent actions attempt to be adequate, appropriate for the individual case, and convenient by taking into account relevant factors and moral insights, based on the therapist's knowledge.

Clinical reasoning and its objective corresponds precisely with this definition: the therapist aims to act appropriately for the patient under consideration of the patient's expectations and other individually relevant factors. By "appropriate", Still means to integrate not only the patient's anatomical structures and problems, but also other criteria such as social environment, or professional aspects, into therapy. This concept shows similarity to manual therapy and Jones' model of hypothesis categories.

With the help of hypothesis categories, the therapist aims to comprehend further components of the patient's problem, such as the biopsychosocial component, the patient's abilities, or in how far the problem affects his professional life. By categorizing the patient according to hypothesis categories, the practitioner is able to obtain a more comprehensive picture of his patient.

Still advises:

"Lernt Anatomie und benützt euren Menschenverstand."

"Learn anatomy and use your common sense." (Hartmann, 2007)

Still defines reasoning as follows:

"Der Verstand, von dem wir eine Antwort erwarten ist eine Folge von geistiger Aktivität. Seine Antwort ist der Beweis des Lebens, das seine Attribute benützt, um zu denken, Schlüsse zu ziehen."

"Reason of which we expect an answer is the result of intellectual activity. Its answer is the proof of life, using its attributes to think, draw conclusion." (Still, 2002, p. 660)

He assumes that reasoning permits us logical thinking and concluding.

However, not only thought and action should be independent and free, but also reason:

"Der Erforscher der Wahrheit muss zunächst seine Unabhängigkeit von allen Verpflichtungen oder irgendwie gearteten Bruderschaften erklären. Sein Denken und sein Verstand müssen frei sein."

"The investigator of truth must at first state his independence of all obligations or other alliances. His thought and reason must be free." (Still, 2002. p. 365)

Still requests the osteopath to liberate his thinking from all prejudices. Since Still was actively involved in the anti-slavery movement of his time, we can assume that he underpins the insignificance of color of skin or other factors. For an osteopath summoned to his patient, it did not have to be of interest whether the patient was black or white.

None of these prejudices was to influence the osteopath and his reasoning, his spirit should be free to think and act accordingly (Hartmann, 2007).

At that time, freedom of thought and action - and freedom of therapy selection - were important concepts. The American president Andrew Jackson (1767-1845) had already implemented the individuals' freedom to choose their profession. Every person was supposed to have the right to move, think, and act independently and freely (Hartmann, 2007). We can assume that this new climate of openness and tolerance was not only favorable to the development of new inventions and machines, but also to the development of osteopathy.

Still states that

"[d]ie Wahl der Methode obliegt dem Einzelnen".

"[t]he choice of method is to be decided by the individual" (Still, 2002, p. 503),

thus permitting the free choice of examination and treatment methods, i.e. individual selection of treatment depending on the osteopaths and the patient's needs and requirements. This concept must be highly appreciated because osteopaths differ from each other with regard to education in treatment techniques, potential of physical conditions (with regard to muscle power etc.), and personal preferences of treatment methods.

"Und jeder sollte seine eigene Methode entwickeln."

"And everyone should develop his own method." (Still, 2002, p. 503)

Also, the osteopath is accorded freedom with regard to adaptation and development of examination and treatment methods. For Still, it is important

"[...] dass das Ziel der Sache im Auge behalten werden sollte- die Regulierung der Knochen".

"[...] to keep track of the objective of the cause - the regulation of the bones". (Still, 2002, p. 483)

He encourages and requests the osteopath to study further and to apply innovative methods:

"Es gibt viele Arten eine Maschine zu reparieren und so verlässt sich ein Osteopath nicht nur auf eine Methode um einen Knochen zu reparieren."

"There are many ways to repair a machine, and likely, the osteopath does not rely onto one single method to repair bones." (Still, 2002, p. 483)

To summarize, treatment methods are multiple but they pursue one single goal:

"[...] den menschlichen Körper aus der anomalen Kondition - der Krankheit - in die normale - die Gesundheit - zu führen".

"[...] to lead the human body from the abnormal condition - the disease - into the normal - health". (Still, 2002, p. 661)

5.2 The importance of cause and effect in osteopathic treatment

When working with patients, A.T. Still permanently investigates the cause of their diseases. He assumes that the causes might be of anatomic nature, thus building the basis for each osteopathic treatment.

"Wollen sie [Osteopathen] diese Symptome erfolgreich behandeln, müssen sie die Ursache der Störung finden und wie ein Mechaniker vorgehen."

"If they [osteopaths] want to successfully treat these symptoms, they have to find the cause for the defect and proceed like a mechanic." (Still, 2002, p. 497)

In the Still compendium, we find no explicit definition or concept of the term *cause*. However, Still illustrates a method of detecting the cause for a patient's condition: he divides the body into three regions. The osteopath then examines the individual regions and excludes certain areas of the body. The first group of areas includes head, cervical spine, chest, abdomen, and hip; the second group integrates head, cervical spine, arm and fore arm, and hand; finally, the third group contains feet, legs, thigh, pelvis, and sacrum.

To confirm the hypothesis that the cause of the disease lies in a certain area, Still demands actions; actions in the form of treatment intended to ease or eliminate symptoms or the disease (Still, 2002, p. 561).

In the citation mentioned above, Still compares osteopaths with mechanics, thus indicating that osteopaths are craftsmen, too, and expected to manually work with their patients instead of giving them medicines such as morphine, whiskey, etc. (Hartmann, 2007). He compares the human being with an engine and the osteopath with a mechanic. He might have chosen this comparison due to the fact that a lot of inventions and discoveries date back to Still's time, such as the invention of electricity, steam boats, etc., and it can be assumed that he was inspired by the spirit of his age. A possible proof for this assumption may be provided by the following citation:

"Ich sage 'Ja' und behandle den menschlichen Körper, wie auch eine Maschine behandelt werden sollte."

"I say 'Yes' and treat the human body such as an engine should be treated." (Still, 2002, p. 491)

This aspect of comparing the human body with an engine is not to be judged negatively. Still rather requests the osteopath to thoroughly study and internalize anatomy and its fundamental principles. He considers learning and understanding physiology as an appropriate means of understanding the function of the "human machine".

"Still hat die Hand in die Medizin gebracht."

"Still brought hand into medicine." (Hartmann, 2007)

Until that date, doctors treated patients surgically or with the help of treatments such as bloodletting. Still aims to find an alternative, gentle method of treatment. To improve his palpation skills, he used to carry bones in his bags and attempted to capture their shape, thus describing and introducing the first form of palpation (Hartmann, 2007).

Comparing Still's treatments of patients with clinical reasoning applied in manual therapy, we notice that Still also structures his treatments: in osteopathy, structure is attempted by anatomic categorization of body regions, in manual therapy by categorization into hypothesis categories. Both types aim to structure the treatment and to find the cause for the patient's problem; hypothesis categories, however, do not exclusively consider anatomic aspects.

For Still, in-depth knowledge in the field of anatomy is the basis for each osteopathic treatment. He accumulated comprehensive knowledge in this field after extensive studies of anatomy and physiology. The main focus within the search for the cause of a disease is the arterial and neural supply of the affected body regions, i.e. he focuses on heart and lung, but also on brain and vertebral column.

"Denn die Lungen und das Herz sind für einen kerngesunden Körper verantwortlich. Jedes erkrankte Organ ist von diesen beiden Körperteilen abhängig."

"Because lung and heart are essential for a body healthy to the core. Each sick organ depends on these two organs." (Still, 2002, p. 496)

Summarizing, Still assigns a main part of causal research to the examination and treatment of heart and lung because he reasons that this might improve the arterial supply.

"Gegenstand meiner osteopathischen Behandlung ist es, das arterielle Blut seiner Bestimmung zuzuführen, damit es all seinen physiologischen Pflichten nachkommen kann."

"Subject of my osteopathic treatment is to guarantee that arterial blood reaches its destination so that it can fulfill its physiologic duties." (Still, 2002, p. 561)

As possible cause for the patient's problem, Still suggests restrictions of neural and arterial provision and subsequently selects a treatment approach involving lung and heart. According to Still, the vertebral column, responsible for the neural supply of extremities and organs, should always be examined and, if required, treated. In the chapter "Forschung und Praxis - Research and Practice" (Still, 2002, p. 473-661), the vertebral column is always integrated into treatment, in the case of a disease (i.e. tuberculosis) as well as in the case of, for instance, ischialgia.

Contrary to osteopathy, manual therapy exclusively treats symptoms affecting the musculoskeletal system and does not include the treatment of diseases. Dahl and Rößler (1999, p. 10) define manual therapy as follows:

"Die Manuelle Therapie (oder auch Manualtherapie) ist das Herausfinden und Behandeln von reversiblen Störungen am Bewegungssystem."

"Manual therapy is the detection and treatment of reversible defects of the musculoskeletal system."

Still was already acquainted with the principle of cause and effect:

"Der Behandler arbeitet mit Ursache und Wirkung. Er darf nicht auf die niedrige Ebene des Verstandes zurückfallen."

"The practitioner applies [the principle of] cause and effect. He must not fall back to the lower level of reason." (Still, 2002, p. 313)

We can assume that the "lower level of reason" referred to in this citation is theory, thinking about a certain therapeutic problem which shall serve as the basis for any elimination of the cause. The cause is treated with a certain method the effect of which is observed. Ideally, this involves constant reflection of the osteopath's own thoughts (i.e. hypotheses) and actions with regard to a certain case. Similar to manual therapy, the osteopath aims to verify or reject his hypotheses; treatment is thus guided by effects obtained similar to the hypothetico-deductive model which proposes, tests, verifies, or rejects hypotheses (Dhaliwal, 2006, p. 20).

"Jede Änderung einer Ursache führt zu einer neuen Auswirkung."

"Each change of a cause leads to a new effect." (Still, 2002, p. 493)

As already discussed in chapter 2.4, cause and effect are reciprocal. In osteopathy, changes after individual treatment steps are thoroughly observed, and new causes may be found in the course of therapy.

Talking from personal experience, the probability of finding several causes for the patient's problem during treatment is high; some of them become obvious after only a few treatment sessions. It is vital to integrate any possible causes, even if they seem not directly related to the origin of symptoms.

Moreover, manifestation of local symptoms can be misleading, but

"[e]s kommt darauf an, die Ursache hinter den Wirkungen zu finden. Die Beschwerde ist lediglich die Wirkung".

"[i]t is essential to find the cause behind the effects. The symptom is only the manifestation of the effect". (Still, in Frymann, 2007, p. 420)

5.2.1 Reflection in osteopathy

Reflection plays an important role in Still's works:

"Wenn wir über Ursachen nachdenken, müssen wir mit Tatsachen beginnen und sie uns immer wieder vor Augen führen."

"When thinking about the causes, we have to start with facts and permanently take them into account." (Still, 2002, p. 419)

This means that the practitioner is requested to find these facts. Facts can refer to key terms of anamnesis or certain test results obtained in the physical examination and are comparable with the good cues and the positive or negative findings applied in the field of medicine. These facts help observe changes occurring with regard to the patient's problem. I assume that Still chose "take into account" in the citation mentioned above to describe the continuous process of reflection of the treatment steps and their results. Page 370 of the Still compendium (2002) notes that Still counts among the few researchers and scientists excelling through honesty, including honesty towards themselves. In my opinion, honesty towards oneself requires a high degree of self-criticism. To summarize, Still also applies the concepts of reflection during treatment and self-criticism but does not use explicitly these terms.

5.3 Proving claims by actions

"Der erfolgreiche Mann verfolgt nicht nur die Theorie. Sein Motto heißt beweisen."

"The successful man not only pursues theory. He wants to prove." (Still, 2002, p. 524)

Still requests osteopathy to excel with actions and results and, above all at his time, withstand comparisons with traditional medicine. Osteopathy as a new form of treatment had to face many opponents and successful treatment results were the best way to convince the opponents and to become an appreciated treatment method.

As theory, Still defines the precise knowledge of anatomy and physiology as well as the function of the human body, all being the basis for treatment. However, successful treatment results demand proof and demonstration. *Proof* in this context can be defined as the results achieved by osteopathic treatment, i.e. passage of gall stones, disappearance of a goiter (Still, 2002, p. 549).

The remark *"[d]iese Beweisführung bestätigt die Wahrheit der osteopathischen Philosophie"*.

"[t]his demonstration proves the truth of osteopathic philosophy", (Still, 2002, p. 561)

emphasizes this argument: for Still, the treatment results obtained prove the truth of the philosophy of osteopathy. His concept of theory might also refer to the theoretically established hypotheses which have to be subject of demonstration; however, it is important to note that in his compendium, the term *hypothesis* and the synonym *assumption* are not explicitly stated at any point.

In manual therapy, practitioners aim to verify or reject the established hypotheses by reassessment of treatment parameters after the individual treatment steps, as illustrated in the patient-centered model discussed in chapter 3.2.1. Hence, parallels between manual therapy and osteopathy with regard to demonstration and proof can be drawn.

Still frequently used the adjective *successful* in his works (cf. citation p. 50 and 54). He might have stood under extreme pressure to succeed with regard to patients, family, and colleagues from the field of medicine.

At the time, osteopathy was a new invention requiring examination and critical evaluation and could thus only excel by referring to successes achieved (Hartmann, 2007).

Still called for research combined with practice:

"Die Zeit für den praktischen Menschen ist gekommen. Er muss all unbeweisbaren Theorien beiseite legen und seine Behauptungen durch Taten beweisen."

"The time for the practical human being has come. He has to put aside all unprovable theories and prove his claims by action." (Still, 2002, p. 661)

At the time, the osteopath had to demonstrate the theoretical model and the philosophy of osteopathy with his actions in each individual case. Action in this case refers to the osteopathic treatment preceded by logical thinking.

The above-mentioned citation, however, does not lose validity when being transferred into the 21st century. Then it might represent an invitation for the osteopath to actively participate in scientific dialogue and studies. Demonstration of the effectiveness of osteopathy in a scientific context can be performed with the help of studies.

The transcript of the General Osteopathic Council on the Standard 2000 of Proficiency postulates:

"The osteopath should be able to demonstrate evidence of problem solving and thinking skills to a level that informs and guides the interpretation of clinical data and contributes to effective clinical reasoning and decision-making." (<http://www.osteopathy.org.uk> [November 10, 2006])

Integration of evidence-based osteopathy could be a possible approach for meeting this requirement of the Osteopathic Council. When applying clinical reasoning in manual therapy, the therapist is advised to provide his patients with the best evidence. For that purpose he researches in databases.

Evidence-based osteopathy is a very recent approach and it might still be inexistent in practice since I did not find any corresponding entries in Google (internet query at <http://www.google.at>, [September 3, 2007]) and in PubMed database (<http://www.ncbi.nlm.nih.gov>, [November, 3, 2007])

The Vienna School of Osteopathy (Wiener Schule für Osteopathie, WSO) aims to provide free access to current studies, master theses and diploma theses in this field via the osteopathic research forum (<http://www.osteopathicresearch.com>). Until establishment of a suitable method in the field of evidence-based osteopathy, evidence-based medicine will have to be referred by osteopaths (cf. chapter 4.4). Electronic media (internet) enable discussions with regard to evidence-based medicine. Evidence-based medicine and evidence-based physiotherapy are taught and applied at Universities of Applied Sciences (i.e. Graz, Salchinger, 2007, personal communication), and at hospitals (i.e. University Hospital Graz, Uhl, 2007, personal communication). Evidence-based medicine and Evidence-based osteopathy should also be integrated into osteopathic education.

Still postulates:

"[u]nd seien Sie immer imstande zu beweisen, was sie behaupten".

"[a]nd make sure you are always able to demonstrate what you claim" (Still, 2002, p. 661),

thus requesting osteopaths to pursue research which can in turn serve as a basis for the development of evidence-based osteopathy. Still attempted to demonstrate his treatments and results and keep them transparent, such as evidence-based medicine might require as well, and surrendered himself to criticism: he treated his patients on a market square, observed by an audience (Hartmann, 2007). Still emphasizes transparency and openness of treatment to enable students to learn from it and to permit patients and other health care professionals to participate in the process and its results, hence formulating the basis for osteopathic research.

5.4 Summary: aspects of clinical reasoning in Andrew Taylor Still's work

This chapter illustrates the aspects of clinical reasoning Still takes up in his work. It will also elaborate which components Still did not integrate.

Table 1 lists the aspects of clinical reasoning represented in osteopathy. For better comprehension, Still's terminology will be used.

<u>Aspects of clinical reasoning in osteopathy</u>
Simple methods of logical thinking and conclusion
Action preceded by thought; considerations with regard to cause
Recognition of typical disease patterns
Gathering of facts
Drawing prudent conclusions
Categorization of body regions
Putting aside unprovable theories
Reflection of treatment
Proving claims by actions

Table 1: Aspects of clinical reasoning in osteopathy

Still mentions simple methods of logical thinking referred to in order to think about the cause of the patient's problem. After recognition of typical disease patterns, collection of facts and drawing prudent conclusions, a diagnosis is established, and treatment is derived of it. For better structuring the examination process, Still suggests to divide the body into three different regions to exclude certain regions.

Reflection also plays an important role in Still's works: he requests to abandon unprovable theories and suggests making claims only if they can be proved by actions. By demonstrating claims by actions, formed hypotheses shall be questioned, rejected, or confirmed. This can be considered a reference with regard to osteopathic research.

The model of hypothesis categories is not referred to, not even in an adapted form. For Still, the patient's experience, pain mechanisms, prognosis, and psychosocial factors do not have any impact on treatment; the same applies for patient education and the patient's conscience of the problem. Furthermore, the relevant literature (Still, 2002; Frymann, 2007) does not contain any references to quantitative medical decision-making.

To summarize, Still already integrated some aspects of clinical reasoning into his work.

6 Discussion

6.1 Clinical reasoning vs. manual therapy, medicine, and osteopathy

This chapter discusses common as well as differing aspects of the respective clinical reasoning processes in manual therapy, medicine, and osteopathy. Key aspects of clinical reasoning of the three disciplines are illustrated in the table below, aiming to illustrate common aspects and differences between the three approaches.

I want to add that the term *clinical reasoning* is used to denominate the process of reasoning in manual therapy (also referenced in the field of medicine); however, the term *problem-solving* is equally employed. The Still compendium provides the basis for the listing of key factors relevant for osteopathy.

Manual therapy	Medicine	Osteopathy
<u>Therapy procedure:</u> anamnesis objective examination diagnosis patient management	<u>Therapy procedure:</u> anamnesis objective examination (incl. apparative examination) diagnosis patient management	<u>Therapy procedure:</u> anamnesis objective examination (incl. examination of viscera, craniosacral system, fascia system) diagnosis patient management
<u>Diagnosis decision:</u> hypothetico-deductive model not available	<u>Diagnosis decision:</u> hypothetico-deductive model quantitative medical decision making	<u>Diagnosis decision:</u> model of categorization of body regions not available
model of hypothesis categorization	not available	not available

pattern recognition	pattern recognition and illness scripts	pattern recognition; constant integration of vertebral column, heart, and lung
reflection process	reflection process	reflection process
<u>Basis for treatment:</u> expertise	<u>Basis for treatment:</u> expertise	<u>Basis for treatment:</u> expertise with emphasis on anatomy and physiology

Table 2: Clinical Reasoning vs. manual therapy (Jones, 2006), medicine (Elstein, 2002; Bradley, 1993; Dhaliwal, 2006), and osteopathy (Still, 2002)

With regard to the therapy procedure, similarities between the three disciplines prevail; however, there are also differences: in medicine, for instance, it is possible to integrate laboratory tests, imaging techniques, etc. into the objective examination. In osteopathy, the therapist attempts to detect disorders with his hands; disorders which, in contrast to manual therapy, do not exclusively impair the musculoskeletal system.

While manual therapy and medicine refer to the hypothetico-deductive model to establish a diagnosis, osteopaths refer to the concept of dividing the human body into certain regions which are subsequently examined.

The model of hypothesis categories is referenced in manual therapy. Medicine seeks to determine pathophysiological mechanisms, whereas in osteopathy, the patient is examined and treated in accordance with anatomic and physiological aspects. At the same time, the therapist must constantly be aware of the close interaction between structure and function of the human body.

Pattern recognition is a central issue to all three approaches, in most cases guaranteeing a faster and more effective achievement of therapeutic success. In medicine, illness scripts are applied in addition to pattern recognition, whereas Still always focuses on the vertebral column as well as on the heart and the lungs in his examinations and, if required, in his treatments.

In all disciplines, the therapeutic process is characterized by constant reflection.

Expertise is considered to be the basis in all three areas, whereas Andrew Taylor Still adds that the basis for each osteopathic treatment is anatomy and physiology.

6.2 The patient-centered osteopathic model

Based on the discussion in the previous chapter and on analyses of Still's work, this chapter presents a patient-centered osteopathic model of clinical reasoning developed with regard to the established model in manual therapy.

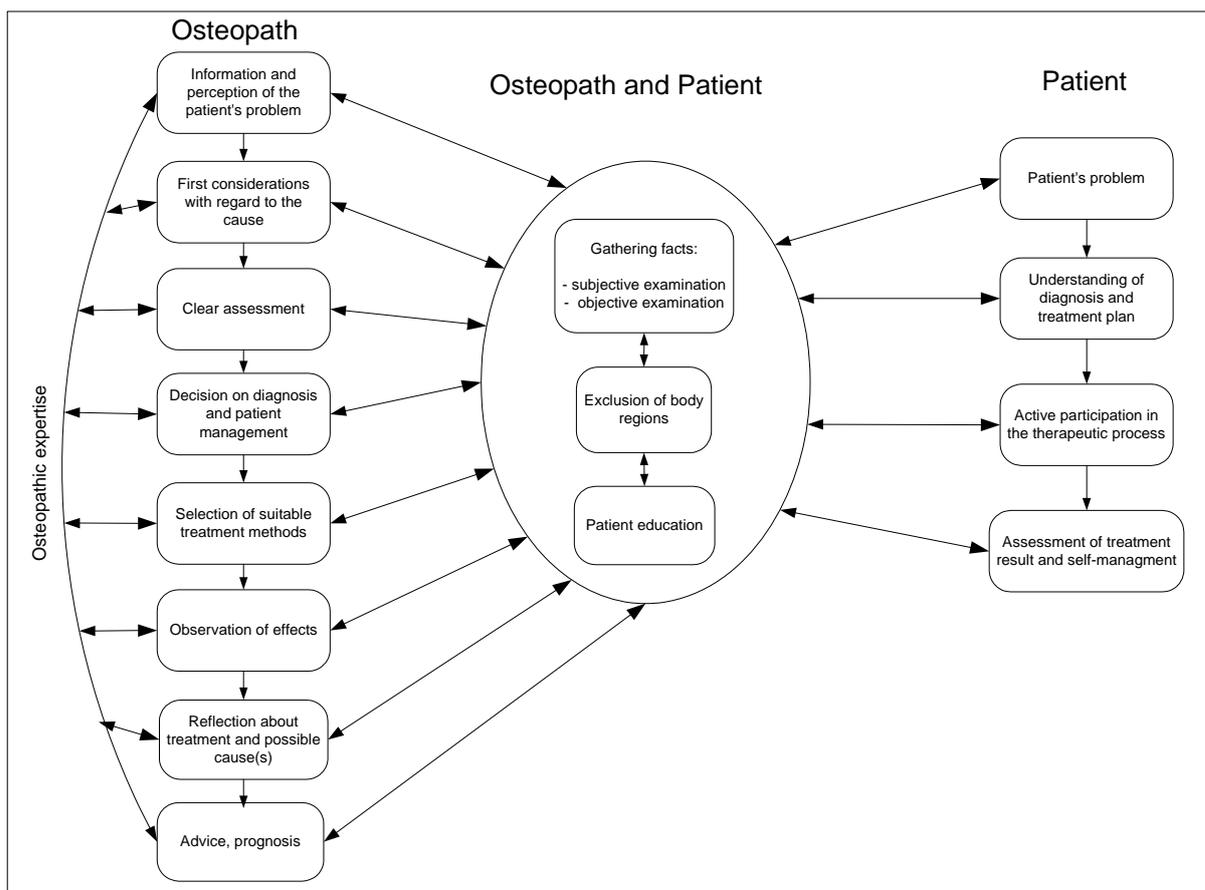


Figure 6: The patient-centered osteopathic model

This model basically consists of three parallel columns: column one describes the osteopath's thinking process; column two in the center of the figure outlines the active cooperation between osteopath and patient; column three illustrates the patient's position.

To the very left, osteopathic knowledge and expertise are noted, underlying any relevant thinking processes.

After having obtained the relevant information on the patient's problem, the osteopath forms first considerations with regard to underlying cause(s) which might determine the following tests and examinations. This gathering of facts facilitates the process of judgment on the patient's problem, and by exclusion of individual body regions, the osteopath is able to quite precisely define the possible cause for the patient's condition. Based on these findings, he decides for one or more body regions to treat and observes the effects of treatment.

The constant process of reflecting subjective and objective examination parameters, into which the patient should be integrated as well, helps achieving the aim of determination of causes and their treatment.

Likewise, the General Osteopathic Council expects of osteopaths:

"The osteopath should be able to demonstrate an effective means of recording the outcome of self-monitoring and reflection on their clinical activities." (<http://www.osteopathy.org.uk> [November 10, 2006])

Continuous education of the patient is vital to this process because it increases his understanding of the problem and permits active participation in the therapeutic process. Giving explanations to the patient supports the osteopath's self-reflection process, and by answering possible questions of the patient, he is induced to reconsider certain aspects and decisions.

The intuitive approach is opposed to the process described above and is difficult to explain. It might lead the patient into a passive relationship of dependency. Intuition will be a subject of further discussion in chapter 6.4.

Since the patient-centered osteopathic model established by myself seems similar to the patient-centered model of Edwards and Jones, the differences shall be emphasized in the following section.

Osteopathy is special insofar as it pragmatically divides the body into different regions to find the cause for the condition whereas manual therapy follows a pain-oriented approach.

After the individual treatment steps, particular emphasis is placed on the actual effect of the undertaken measures, and the cause-related considerations are reflected once again.

On termination of the therapeutic process, the osteopath should be able to provide the patient with useful advice for future and to pronounce a prognosis. These components are stipulated within osteopathic education and training at the Vienna School of Osteopathy (Wiener Schule für Osteopathie, WSO) and are required for the successful termination of a treatment (Bernard Ligner, preparatory course for the clinical exam, 2002).

However, not only the osteopath but also the patient should reflect and evaluate the treatment results because it is essential that the patient himself assumes responsibility for his problem.

Gifford (2002, p. 202) underpins that there is no passive solution for the patient's problem - instead, the patient should be encouraged to more consciousness of his problem.

Also, the patient's reflection can provide the therapist with the patient's evaluation of treatment. Hence, the therapist could integrate this feedback into his own self-reflection process. This interaction between patient and therapist is crucial for successful treatment, particularly from the patient's point of view (Jones, 2006, p. 454).

A further possible method to structure the process of osteopathic clinical reasoning is the application of the model of hypothesis categorization. In my opinion, this model could be integrated in its original form (cf. chapter 3.2.3) into the osteopathic thinking process.

6.3 Advantages, disadvantages, and error sources of clinical reasoning

The Tables 3 to 5 in this chapter illustrate the advantages, disadvantages, and possible error sources within clinical reasoning, based on the works of Jones (2006), Klemme and Siegmann (2006), Bradley (1993), and Elstein (1999).

<u>Advantages</u>
➤ Structures and organizes the thinking and therapeutic process
➤ Self-reflection of the therapeutic process
➤ "Active" collection of experiences
➤ Builds a communication platform
➤ Retraceability for other persons

➤ Pedagogic value
➤ Encourages active participation of the patient
➤ Efficiency with regard to diagnosis and therapy
➤ Recognition of therapeutic limitations

Table 3: Advantages of clinical reasoning

Clinical Reasoning structures and organizes the thinking process as well as the therapy process due to its pivotal questions and its methods of answering these questions. Thus it creates favorable conditions for self-reflection because the therapist is aware of the chosen and confirmed treatment steps. This conscious approach enables the therapist to "actively" gather experiences. The establishment and pronouncement of diagnoses, treatment plans, and prognoses encourages and fosters communication between therapist and patient as well as within the whole team involved in therapy. Hence, clinical reasoning facilitates transparency and retraceability of the therapeutic process.

The high pedagogic value of clinical reasoning is mentioned because this approach is well suited to discuss the theoretical as well as the practical aspects of case studies, thus permitting students to follow the therapist's thinking process and to considerably increase their own learning progress.

The therapist encourages the patient to active participation in the therapeutic progress by explaining the treatment plan and by integrating the patient's wishes, expectations, and concerns. Efficiency with regard to pronouncement of diagnosis, prognosis, and therapy as a whole is guaranteed because the therapist is expected to search various databases to obtain the best evidence for the individual case. Also, by requiring self-reflection and studies of relevant current literature clinical reasoning might help the therapist to recognize his therapeutic limitations.

Naturally, clinical reasoning does not only have advantages; its disadvantages are listed in the next table:

<u>Disadvantages</u>
➤ Reduction of therapeutic freedom and innovation
➤ Possibility to "overlook" the person behind the problem
➤ Hypersensitization of the patient with regard to his problem, possibly involving negative psychological components
➤ Time factor
➤ High concentration of the therapist required

Table 4: Disadvantages of clinical reasoning

The clearly structured procedure required by clinical reasoning might reduce the therapeutic liberty of the therapist with regard to the development of innovative techniques. It is thus susceptible to bring to a halt the integration of alternative ideas for treatment. A possible solution might request the therapist not to be satisfied with a promising approach but to consider other options, too, and to investigate in multiple directions (De Bono, 1993, in Jones, 2006, p. 460).

A further disadvantage of clinical reasoning consists in the likeliness to overlook and neglect the person behind the "patient's case" during the process of analyzing. The patient-centered model tries to consciously integrate the patient into the therapeutic treatment and might therefore offer a solution to this problem (Jones, 2006, p. 4).

Another possible disadvantage is hypersensitization of the patient, such that his thinking exclusively focuses on the problem, consequently deteriorating his condition. Hence it is essential to inform the patient in detail about his problem, of how to deal with it, and how to eventually improve his situation (Gifford, 2002, p. 201).

The time factor is mentioned as disadvantage since I learned from my colleagues that the exact performance of the clinical reasoning process is very time-consuming. Therefore, experienced therapists apply the faster method of pattern recognition for the diagnosis decision process once they have detected characteristic symptoms and indications (Dhaliwal, 2006, p.19).

Likely, Dhaliwal (2006, p. 20) notes:

"When physicians are confronted with a more challenging patient who does not fit a previously recognized pattern, they are forced to employ a more time-consuming and deliberate assessment (analytic reasoning)."

Analytical reasoning, however, demands higher concentration as the "simple" application of pattern recognition:

"Pattern recognition occurs automatically and is rapid, efficient, and easy." (Dhaliwal, 2006, p. 19)

Finally, the next table lists possible error sources of clinical reasoning:

Error Sources
➤ Not finding of good cues
➤ Misinterpretation of facts
➤ Knowledge not adapted to the individual case
➤ Insufficient establishment of hypotheses
➤ Erroneous reassessment and reflection of hypotheses

Table 5: Error sources of clinical reasoning

First, the therapist might not be able to detect the good cues, e.g. because they get lost within abundant patient information or because a wrong image of the patient's problem is derived of them. In this case, the therapist lacks the parameters for reassessment. Misinterpretation of facts is another possible error source: without therapeutic evidence, or after misinterpretation of clinical data, the therapist is unable to form hypotheses, to pronounce a solid diagnosis, and to develop an adequate patient management. Further problems might occur if the therapist does not adapt his knowledge to the respective case, or if he does not extend his knowledge. Equally important is the establishment of any possible hypothesis and to subsequently confirm or reject it.

If hypotheses are not adequately examined, the therapist is more susceptible to accept overhasty hypotheses, and hypotheses of "wishful thinking" might be confirmed. In this case, an evaluation of the hypothesis reflection is required, either through self-reflection or by colleagues. Generally speaking, a helpful tool for recognition of these errors is supervision through a colleague or a mentor (Jones, 2006, p. 464).

6.4 Osteopathic clinical reasoning versus intuition

Still precisely structures his approach to treatment by examining individual body regions to find possible causes for the patient's condition (Still, 2002, p. 180).

On the other hand, intuition plays an equally important role for Still:

"Ich bin, wie Leute sagen etwas inspiriert..., intuitiv."

"I am, as people say, a bit inspired..., intuitively." (Still, in Frymann, 2007, p. 374)

Also, most colleagues affirm in discussions that they frequently apply the intuitive and/or hand-guided approach. These differing patient approaches give reason for discussion, but before the definition of intuition has to be clarified.

6.4.1 Definition of intuition

Albert Einstein states that *"[i]ntuition ist alles"*.

"[i]ntuition is everything". (Zinhofer, 2004, p. 21)

This citation underlines the great number of possible meanings of intuition because *"everything"* permits various interpretations: intuition is a necessity, intuition is freedom, creativity, invention, and a lot more, and maybe Einstein would never have made his fundamental discoveries without it.

To begin with the philosophical aspect of intuition, intuitive and discursive cognition must be differentiated (Bailey, 1926, p. 524).

Philosophers of ancient Greece have already discussed the concept of intuition. Themestius reasoned that we are able to comprehend simple terms by intuition whereas during discursive thinking these terms are further separated or grouped. Intuitive cognition does not deceive, errors occur during the synthesis of individual parts and the analysis of the whole (Themestius, in Ritter, 1976, p. 526). Philoponos also affirms that

"[d]ie Erkenntnis durch den Geist ist dem schlussfolgernden Verfahren überlegen und wie auch Plotin sagt unfehlbar".

"[c]ognition by spirit is superior to the deductive procedure, and as Plotin states, infallible".
(Philoponos, in Ritter, 1976, p. 527)

To summarize, intuition is infallible for ancient philosophers and does not cause errors; however, errors can indeed occur with regard to discursive cognition by dividing into parts the whole, probably referring to analysis. Interestingly, when further discussing the concept of intuition in the 20th century, some definitions state the contrary. According to v. Hartmann, an inherent "danger" of intuition is that it remains intersubjective, incontrollable, indisputable, and incommunicable because it could be based on interests and preferences, i.e. on prejudices (v. Hartmann, 1904, p. 534). Similarly, Schlick affirms that objects can be experienced with intuition. At the same time he is convinced that it is not a suitable tool to comprehend or explain things (Schlick, 1918, p. 537). Albert criticizes intuition as follows:

"Die Intuition ist selbstfabriziert und damit für die Erfahrung der Wirklichkeit wertlos."

"Intuition is self-made and therefore worthless for experiencing reality." (Albert, 1969, p. 537)

If intuition is considered subjective, self-made, not adequate for experiencing and explaining as in the citations mentioned above, it does no longer fulfill the requirement of building a platform for communication and discussion. In my opinion, however, intuitive cognition can indeed be verbalized and thus shared with others.

A further aspect is brought into the discussion by the Italian philosopher Benedetto Croce who notes that intuition is closely linked with creative human thinking. He states that intuition is the expression of an impression and therefore the nature of art *per se* (Croce, 1930, p. 537). Hence, intuition is connected with creativity, innovation, and arts. Considering this variety of possible definitions we can assume that Albert Einstein's citation mentioned in the introduction to this chapter is correct:

"Intuition ist alles."

"Intuition is everything." (Zinthofer, 2004, p. 21)

The high number of citations from different directions shows that the definition of the term *intuition* is highly complex and controversially discussed. The concept of intuition is also intertwined with clinical reasoning and is mentioned in this context in manual therapy (Jones, 2006) as well as in medicine (Medawar, 1969; Bradley, 1993; Croskerry, 2005). Clinical intuition is often referred to in combination with experience.

"Experten sagen manchmal, sie hätten klinische Entscheidungen aus dem Bauch heraus getroffen".

"Sometimes, experts say they have made their clinical decision impulsively" (Jones, 2006, p. 456),

i.e. these decisions are not based on conscious thinking processes but are rather made on the basis of intuition. Jones defines clinical intuition as follows:

"[...] so etwas wie ein starkes Gefühl oder eine Wahrnehmung von einem Patienten oder ein antizipiertes Resultat [...], ohne dass zuvor ein analytischer Denkprozess angelaufen ist. Man kann sich das als eine verfeinerte und subtile Form von professionellem Urteilsvermögen vorstellen. Dieses intuitive Handeln ergibt sich oft aus Erfahrungswerten, die man sich im Laufe der Jahre erarbeitet hat".

"[...] something like a strong feeling or a certain perception of a patient or an anticipated result [...], unpreceded by an analytical thinking process. It can be imagined as a refined and subtle form of professional power of judgment. This intuitive action is derived from experience gained over the years." (Jones, 2006. p. 456)

Hence, we can define clinical intuition as a sentiment guiding the therapist in cognition, decision, and action related to the patient. Experience is tightly connected with intuition: the more experience someone has gathered, the more intuitively he works. An exception are difficult and complex cases - then, the clinical reasoning is applied (Jones, 2006, p. 456). Moreover, Jones (ibid.) describes that intuition can be trained by experience and that experience is what experts refer to:

"Dieses unterschwellige Wissen [Intuition] ist wahrscheinlich mit Erfahrungen mit bestimmten Patientenfällen in ähnlichen Zusammenhängen verknüpft."

"This subliminal knowledge [intuition] is probably intertwined with experiences with certain patients in a similar context." (Jones, 2006, p. 456)

Therefore, intuition is closely linked with previous experiences and can be learned easiest when becoming conscious about experiences related to certain problems. In the next similar case, this knowledge can then be applied.

From a medical point of view, I would like to refer to another citation of Bradley (1993, p. XIV) who points out that

"[t]here is no doubt that intuitive reasoning is one of the highest human reasoning".

To summarize, a common or clear definition of intuition is neither provided by philosophy nor by manual therapy or medicine. Similarly, an explicit definition of intuition is neither provided in the Still compendium (2002) nor in "Die gesammelten Schriften der Viola M. Frymann - The collected writings of Viola M. Frymann" (Frymann, 2007).

6.4.2 Characteristics of intuitive vs. analytical approach in decision-making

Besides the analytical approach of clinical thinking, the intuitive approach is also relevant for the therapeutic process. Table 6 summarizes Croskerry's table of characteristics of the intuitive and analytical approach (2005, p. R1). A brief discussion of the content of the table will also be provided in this chapter.

	Intuitive	Analytical
Cognitive style	Heuristic	Systematic
Cognitive awareness	Low	High
Conscious control	Low	High
Automaticity	High	Low
Rate	Fast	Slow
Reliability	Low	High
Errors	Normative distribution	Few but large
Compliance	High for answer Low for method	Low for answer High for method
Effort	Low	High
Predictive power	Low	High
Emotional valence	High	Low
Detail on judgment process	Low	High
Scientific rigor	Low	High

Table 6: Characteristics of intuitive vs. analytical approach in decision making³

According to this table, important differences can be noted between the intuitive and the analytical approach; the most important of them are explained below.

As illustrated in the figure, these differences are e.g. linked with cognitive style which is heuristic in the intuitive and systematic in the analytical approach.

Moreover, intuitive decisions or actions remain below the conscience awareness level and are therefore subjected to less conscious control. This induces problem areas of the intuitive approach with regard to the development of awareness and formulation of success and failures because these are difficult to explain with reference to intuition.

³ Taken and adapted from Croskerry (2005, R1).

If a patient suffers from increased pain after treatment, the therapist probably cannot explain why, and the same is true if the pain is eased. Without key points, test, and results derived thereof, therapeutic actions cannot be reflected and evaluated.

Furthermore, the tabel shows that - while errors can occur in both approaches - errors obtained within the analytical approach are less likely but more severe than in the intuitive approach.

The intuitive approach is, according to Coskerry, closer linked with emotional valence than the analytical one which might, in my opinion, make it more difficult for the therapist to reflect his thoughts and actions. Likewise, it is difficult to pronounce meaningful prognoses. Scientific rigor is lower in the intuitive approach which is therefore more likely to be subject of contradiction.

Another important aspect is that the intuitive approach is harder to justify: patients, colleagues, and other related health care professionals are not well provided with details on the judgment process, they have less chances to follow and reconstruct the therapy steps undertaken and eventually, the patient's comprehension for his problem might be affected.

Due to a lack of context of justification, the therapeutic process cannot be documented. Therefore it is impossible to form a basis for the development of evidence-based osteopathy.

6.4.3 Conclusion: clinical reasoning versus intuition

There is no clear definition of the complex term *intuition*, a term which sometimes evokes controversy (cf. chapter 6.4.1). A definition of *clinical reasoning* is equally comprehensive (cf. chapter 6.4.1.). Jones (2006), Bradley (1993), and Medawar (1969) do not compare clinical reasoning with intuition nor do they establish a patient-relevant connection between the two approaches.

In contrast, Croskerry (2005, p. R1) detects and compares the characteristics of both approaches, as illustrated in Figure 12. In osteopathy (Still, 2002; Frymann, 2007) both is requested: a logical, well-reasoned approach as well as the necessary intuition.

"Wenn sich jeder Osteopath die Zeit nähme, vom Symptom auf die Ursache zu schließen, indem er die Logik und die Präzision der Wissenschaft der Osteopathie anwendet, würden weit mehr Patienten diese therapeutischen und prophylaktischen Erfahrungen machen können."

"If every osteopath would take the time to conclude from the symptom to the cause by applying logic and the precision of the science of osteopathy, far more patients would be able to make this therapeutic and prophylactic experience." (Frymann, 2007, p. 442)

This citation of Viola Frymann makes clear that a logical and scientific osteopathic approach with regard to the patient's problem is desired. These requirements are met by clinical reasoning, and the scientific approach is guaranteed by application of evidence-based medicine. On the other hand, the intuitive component of treatment must not be neglected; this is confirmed by the following citations:

"Ich bin, wie Leute sagen, etwas inspiriert..., intuitiv."

"I am, as people say, a bit inspired..., intuitively." (Still, in Frymann, 2007, p. 374)

This intuitive component is necessary insofar as the cause for the patient's problem is sought in an emotional as well as a mental manner (Frymann, 2007, p. 434). Viola Frymann requests the osteopath to train his intuition and to approach the patient not in a pure logical way:

"Der zukünftige Osteopath muss seine eigene intuitive Bewusstheit fortschreitend ausbilden."

"The future osteopath has to continuously train his own intuitive conscience." (Frymann, 2007, p. 385)

A combination of both approaches is utterly desirable because it could guarantee a well structured procedure with regard to the patient while at the same time maintaining the required "artistic" liberty. In this context, Croskerry (2005, R1) states:

"The cognitive continuum of decision making runs from informal/intuition at one end to calculation/analytical at the other, and the nature of tasks runs from simple to complex. The trick lies in matching the appropriate cognitive activity to the particular task."

6.5 Integration of clinical reasoning into osteopathic practice

After the individual chapters on the advantages and disadvantages of clinical reasoning and after discussion of clinical reasoning versus intuition, the question arises whether an integration of clinical reasoning into osteopathic practice is desirable and feasible or not.

6.5.1 Arguments for and against an integration of clinical reasoning

"Die Philosophie der Osteopathie stellt einen Aktionsplan für die Lösung menschlicher Probleme zur Verfügung."

"The philosophy of osteopathy provides an action plan for the solution of human problems."

(Frymann, 2007, p. 435)

The model of clinical reasoning is a possible method to formulate a structured action plan of the individual steps within the therapeutic process, aiming to solve the patient's problems in a methodical way. The necessity of an application of clinical reasoning is pointed out with the following citation:

"Dabei darf im gesamten Verlauf [der Therapie] kein Gewebe übersehen werden, dass zur Dysfunktion beitragen könnte."

"Thereby, in the whole process [of therapy], no tissue which might contribute to dysfunction may be overlooked." (Frymann, 2007, p. 440)

The therapist should be aware of any possible hypotheses with regard to the patient's problem, at the same time integrating them into the treatment process. This thorough investigation of the causes for the dysfunction can be obtained by an exact, comprehensive, and structured examination process, and in this context clinical reasoning can be considered a vital tool. Furthermore, self-reflection enables critical assessment of the therapeutic steps and supports multi-dimensional thinking such that any possible ideas and hypotheses with regard to the cause are considered.

Multi-dimensional thinking denominates the ability to restructure old thinking patterns and emphasizes new ideas and concepts to see things from a different angle (De Bono, 1993, in Jones, 2006, p. 460).

These arguments confirm that the application of clinical reasoning is a desirable factor within the work and practice of osteopaths.

The fact that clinical reasoning is taught in the subject "Clinical Osteopathy" (Dr. Erich Mayer-Fally, MSc., D.O.) at the Vienna School of Osteopathy (WSO) and that lessons in clinical reasoning are offered within the master course at the Danube University Krems can be considered further arguments favoring the integration of clinical reasoning into osteopathy.

On the other hand, discussions with colleagues reveal that osteopaths primarily refer to the guidance of their hands and their intuition instead of integrating clinical reasoning into the therapeutic process. In most cases, they indicate the time factor and the high degree of required concentration as reasons. Moreover, some colleagues affirm that the intuitive or hand-guided approach better suits the original osteopathic thought. W.G. Sutherland (2004, p. 190) states:

"Sie [die Studenten] haben mich die besagte Diagnose durchführen sehen, eine Diagnose mittels sehender-fühlender-kluger-wissender Finger - Finger, welche sich bemühen, sich von der Wahrnehmung physischen Empfindens zu entfernen, dorthin, wo es eine Berührung gibt, die weiß. Oft legen sie dann ihre Hände direkt auf die Dysfunktion."

"They [the students] have seen me pronounce the respective diagnosis, a diagnosis guided by seeing-feeling-prudent-knowing fingers - fingers attempting to distance themselves from the perception of physical sensation to direct themselves towards a touch which knows. Often, they then lay their hands directly onto the dysfunction."

This purely intuitive and hand-guided approach also represents an applied form of osteopathy.

The field of psychology might be able to provide an explanation why colleagues prefer to work intuitively: in his model of typology, C. G. Jung distinguishes four typical patterns of human behavior - the thinking, feeling, sensation, and intuition types (Jung, 1921, p. 534). Depending on the type the therapist belongs to, he will rather prefer the intuitive approach or clear thinking structures.

It can be assumed, however, that we do not have only one characteristic behavioral pattern but that combinations are possible; also, the behavior can be adjusted to the respective situation.

Jung characterizes intuition as "*[...] einen in der Hauptsache unbewussten Prozess, der in sich weder rein intellektuell noch rein gefühlsmäßig ist, sondern beides zugleich in ungesonderter Mischung*".

"[...] a mainly unconscious process, being neither purely intellectual nor purely emotional but at the same time a mixture of both in an unseparated manner". (Jung, 1921, p. 534)

Hence, intuition according to Jung is very close to instinct (ibid).

To summarize, there is no clear and commonly defined approach; the clinical reasoning process as well as intuition can be integrated into and applied within the therapeutic process of osteopathy.

6.5.2 Practical implementation of clinical reasoning in osteopathic treatment

A revision of the self-reflection worksheet developed by Mark Jones would be required to start with an implementation of clinical reasoning into osteopathic treatment. This worksheet is attached in the Appendix (11.1) to this master thesis. The worksheet insofar requires revision because it is designed for the needs of manual therapy; some points (such as the behavior of symptoms, the movement diagram) are inexistent in osteopathy. Furthermore, patient-related components such as digestion, alimentation, sleeping patterns and others are not mentioned and have to be integrated.

The adapted worksheet could serve as a basis for the practical life of osteopaths. Only after such an adaptation colleagues can evaluate whether such a form of clinical reasoning is workable or not and which difficulties and problems might occur in this context. And only then it might be possible to find an answer for the question posed at the beginning - whether a practical integration of clinical reasoning in osteopathy is practicable or not.

Further elaboration on the practical implementation would go beyond the scope of this master thesis, but I would gladly see a colleague take up this idea in his own thesis.

However, integration of the self-reflection worksheet is a possible way for the therapist to train his clinical reasoning skills. Further possibilities for osteopathic training will be discussed in the following chapter.

6.5.3 Training of clinical reasoning skills in osteopathic practice

The treatment of each patient represents an indirect training of the therapist's clinical reasoning skills. In this chapter, I will introduce other methods of actively improving these skills.

A method of independent training of clinical reasoning skills is to refer to a specific case study at the end of a working day and to reflect the applied therapeutic process. This training method aims to reconsider the therapist's thinking patterns and to encourage conscious reflection about his work (Jones, 2006, p. 468). It is also possible to integrate colleagues into this process to exchange case studies, interpretations, and ideas and to discuss and reflect them. This training method of clinical reasoning skills requires good social interaction and cooperation (Lave, 1996, in Jones, 2006, p. 463). Another possible method could be supervision among colleagues. Speaking from my own experience, therapists can highly benefit from this kind of training.

In manual therapy, electronic communication media made room for discussion, permitting therapists to get feedback and provide valuable inputs with regard to certain patient problems within an international environment. Also, therapists are enabled to propose their own ideas and present their thoughts regarding the clinical problems of others (Jones, 2006, p. 468).

My research for discussion forums in the field of osteopathy (www.google.at, [November 12, 2007]) proved the existence of only one, rather small German speaking group. However, this group (<http://groups.google.com/group/osteopath/web/ber-osteopathie?hl=de>) does not yet discuss clinical problems but "only" presents the main aspects of osteopathy. More discussion forums could be found for the English speaking public, i.e. <http://groups.google.at/group/Medicine-discussions?Ink-srg>. Maybe this form of exchange and transfer of knowledge will be more frequently used within the next few years. It might be a suitable platform for practitioners aiming to improve their clinical reasoning skills by debating, explaining, and reflecting their case studies in a transparent and comprehensive way.

Summarizing, several training methods can be applied by practicing osteopaths to improve their clinical reasoning skills; however, I think that osteopathic education and training should involve these and similar methods from the very beginning.

6.6 Integration of clinical reasoning into osteopathic education

Speaking from my own 7-year teaching experience at the Academy of Physiotherapy in Graz, a well-structured procedure is highly important in the pedagogic field, since it is hardly possible for students to follow the intuition of their teacher. Teachers should be able to explain and justify the thinking structures of the therapeutic process to render this process transparent for the students. Hence, clinical reasoning and its integration into osteopathic training is subject of discussion in the following chapter.

Clinical reasoning plays an equally central role in the education and training of medical staff and of osteopaths. At the Vienna School of Osteopathy (Wiener Schule für Osteopathie, WSO), clinical reasoning is taught from the fourth year and it is also offered within the master course (one day, respectively) (WSO, 2007, personal communication).

Viola Frymann (2007, p. 442) notes:

"Wenn sich jeder Osteopath die Zeit nähme, vom Symptom auf die Ursache zu schließen, indem er die Logik und die Präzision der Wissenschaft der Osteopathie anwendet, würden weit mehr Patienten diese therapeutische und prophylaktische Erfahrung machen können."

"If every osteopath would take the time to conclude from the symptom to the cause by applying logic and the precision of the science of osteopathy, far more patients would be able to make this therapeutic and prophylactic experience."

With the help of clinical reasoning, the therapist aims to find the cause for the patient's problem by referring to different models (cf. chapter 3.2) as well as the best evidence for the patient.

Referring to the citation mentioned above, we can assume that Frymann speaks of clinical reasoning when referring to logical conclusions with regard to the patient's problem; moreover, it is probable that the *science of osteopathy* she mentions is the application of evidence-based medicine respectively osteopathy. We can thus conclude that she emphasized the application and integration of the clinical reasoning process into osteopathy.

The General Osteopathic Council postulates:

"The osteopath should be able to demonstrate evidence of problem solving and thinking skills to a level that informs and guides the interpretation of clinical data and contributes to effective clinical reasoning and decision-making." (<http://www.osteopathy.org.uk>, [November 10, 2006])

In my opinion, this requirement is best suited by an early integration of clinical reasoning into osteopathic education and training. Obtaining experience and practice related to clinical reasoning during osteopathic education and training are the most suitable tools to achieve a certain ease in the application of this process.

6.6.1 Teaching of thinking strategies for clinical reasoning

This chapter discusses the basic requirements for teacher and learners of clinical reasoning, preceded by an assessment of the current situation. The model of the Vienna School of Osteopathy (WSO) I attended between 1996 and 2002 will be referenced for an assessment of the current conditions for teachers and learners.

Medical doctors, dentists, and physiotherapists are admitted for education at the WSO. Since they have all gone through a different education, teachers are possibly confronted with different conditions. Levels of students might vary with regard to professional experience (the number of years of practical experience is not a criterion for admission) but also regarding the different special fields the students have worked in so far. The latter implies that the basics for clinical reasoning also differ from each other, since clinical reasoning is based on professional knowledge.

However, heterogenic knowledge from several different fields might also be, in my opinion, an advantage for the clinical reasoning process: a greater number of different approaches can be integrated into the process of hypothesis formulation and everyone can benefit from the others' knowledge.

An important challenge involved in teaching clinical reasoning strategies is to encourage every student because different levels of experience and knowledge have to be integrated. In my opinion, the teacher must be aware of these differences and of his own clinical reasoning skills, combining them with the required pedagogic competence.

"Sinnvoll erscheint es zudem, sich in der Vorbereitung von Unterrichtsinhalten, eigene berufliche oder persönliche Erfahrungen zum geplanten Thema zu verdeutlichen, um eine unbewusste Einseitigkeit oder Voreingenommenheit zu vermeiden oder zumindest sich dieser bewusst zu sein."

"Furthermore it seems useful [for teachers] to become aware of their own professional or personal experiences when preparing their lessons to avoid unconscious one-sidedness or prejudices and at least to be conscious of them." (Klemme, 2007, p. 72)

This self-reflection is particularly important within the formulation of hypotheses and in the context of the model of hypothesis categories (Klemme and Siegmann, 2006, p. 72) because these processes require a high degree of openness and diversity.

Just as the clinical reasoning process is to be adapted to the individual case, teaching of clinical reasoning should support the individuality of students in a way that everyone is enabled to find his own problem-solving method for clinical problems. Likewise, Refshauge and Higgs affirm:

"Learners need to develop their own understanding of the clinical reasoning process and how they reason, as well as how to critique their reasoning." (2000, p. 141, in Klemme, 2006, p. 75)

To summarize, teachers as well as learners are challenged within teaching and learning thinking strategies and individual approaches for clinical reasoning.

6.6.2 Teaching methods

In my opinion, the interest of students in class is significantly higher the more practically relevant and the more realistically the subject is taught. Similarly, Jones (2006, p. 463) notes:

"Lernaktivitäten sollten das situative Lernen fördern, d.h.: es sollte in dem Kontext gelernt werden, in dem das Gelernte dann auch anzuwenden ist."

"Learning activities shall encourage situational learning, i.e. it should be taught in the context in which the acquired knowledge is to be applied."

Klemme and Siegmann (2006, p. 77) also affirm:

"Eine praxisnahe Lern-Lehrform ist geeignet, da zur Vermittlung von Clinical Reasoning Fähigkeiten stets die klinische Bedeutung des vermittelten Wissens aufgezeigt werden sollte."

"A practice-related teaching method is appropriate since the clinical relevance of the communicated knowledge should be indicated for the communication of clinical reasoning skills."

Since the osteopath works with a certain individual case in practice, learning should be adapted correspondingly. For teachers, it is vital to present case studies with characteristic features at the beginning of the education; depending on the technical competence and knowledge of the students, more specific examples can also be integrated (Hayes/Adams, in Jones, 2006, p. 463).

Several teaching methods can be considered suitable with regard to clinical reasoning and will be matter of discussion in the next sections.

6.6.2.1 Written and oral presentation of case reports

The discussion of a case report in written and oral form is a possible teaching method. The case report can be a patient-related example taken from the teacher's practice, or the teacher refers to case reports mentioned in the literature (such as "Clinical Reasoning for manual therapists ", Jones, 2006, p. 33-421). Showing pictures and videos of patients might contribute to a better understanding of the patient's problem.

This teaching method enables the student to note his comments and questions after the individual steps of the therapeutic process which are then discussed in group. The advantage of this method is that students are able to recognize without pressure a structured procedure in the thinking process of the teacher; the disadvantage is that they cannot observe the interaction between patient and therapist.

6.6.2.2 Demonstration of a patient's treatment by the teacher

In my own osteopathic education, this teaching method was very popular among students and stimulated their interest.

This interest was particularly focused on the therapist's interaction with the patient, the approach to the patient's problem, and the execution of treatment methods. My own evaluation of this teaching method was shared by the group which developed the Clinical Reasoning Theater (cf. chapter 6.6.2.5.).

"From experience, we know that students are impressed by such 'real-life' presentations because they represent aspects of disease in the context of a patient." (Borleffs, 2003, p. 323)

In this teaching method, the patient is treated by the teacher, under observation of the students. In most cases, the individual treatment steps are reflected within a follow-up session. An immediate analysis during treatment is avoided in order not to disturb the therapy flow. This teaching method corresponds to situational teaching. However, it is to be noted that this therapy situation does not represent a normal situation and is special for the patient as well as the teacher due to the presence of students.

Students are enabled to observe and comprehend the clinical reasoning process applied by their teacher; therefore the follow-up session and a reflection of the treatment are vital. At the WSO, this teaching method is applied in the first and second year, whereas the professor demonstrates a full treatment to small groups of up to 10 students and explains his diagnostic reasoning afterwards (WSO, 2007).

6.6.2.3 Demonstration of treatment by the student

This is the opposite case: the student treats the patient under observation of a teacher or mentor, referred to as supervision in the context of osteopathic training. These supervisions are performed from the 4th year under guidance of a trained supervisor. Speaking from my experience (as a teacher as well as a student of osteopathy myself), this demonstration form is not very popular among students due to its exam character. However, I believe that students can benefit a lot from it since they are able to enlarge their horizon by reflection of their own treatment and by the inputs of the teacher; also they might be able to integrate the hypotheses of others in the determination of causes. Furthermore, supervisors facilitate the evaluation and assessment of the clinical reasoning skills as well as the standard of knowledge of students due to their objectivity.

6.6.2.4 Patient simulation

From the 3rd year, students of WSO "treat" each other under observation of a professor (WSO, 2007). This reciprocal patient simulation encourages feedback related to the behavior and performance of treatment techniques not only from the professor but also from the student who pretends to be the patient. The professor gives further advice and recommendations if required and is able to assess the clinical reasoning process within treatment. A further advantage of this learning method is the possibility to take unlimited "time-outs" to discuss with colleagues and take the time for self-reflection (Jones, 2006, p. 465).

6.6.2.5 Clinical Reasoning Theater

Clinical Reasoning Theater is a new approach in clinical reasoning education and was developed at the School of Medical Science in Utrecht, the Netherlands.

"The goal of Clinical Reasoning Education is not to teach students how to make the correct diagnosis per se but to teach them how to make the right decision in the process of arriving at the diagnosis." (Borleffs, 2003, p. 322)

In my opinion, this method might represent an utterly interesting approach for the education and training of osteopaths. Therefore, I want to present a brief description of this method which has originally been designed for medical doctors but could possibly be applied in the field of osteopathy (ibid.).

There are three actors: the doctor, the patient, and the audience of students. Only the patient and the doctor are on "stage", whereas the students, as audience, actively participate in the play and its development. Two acts are repeatedly performed. The first act of each cycle deals with the history taking, physical examination, additional laboratory and other investigations, final diagnosis, therapy, follow-up, and prognosis. The second act of each cycle is the most important characteristic of the Clinical Reasoning Theater; in this act the doctor explains his reflections and discusses the audience's suggestions for additional questions. Following each discussion with the audience, the doctor returns to the patient's area, asking him questions that have been suggested by the audience.

The Clinical Reasoning Theater is scheduled for one and a half hours and should ideally finish with a discussion of diagnosis, therapy, and prognosis.

This teaching method is special insofar as students can actively participate in the clinical reasoning process in the time-out phase. Questions, recommendations, or doubts can be dealt with immediately. It is important to note that explanation and description of this teaching method have to be provided in detail for the patient who otherwise might feel uncomfortable during the treatment. Comparing Clinical Reasoning Theater with the patient demonstration of the teacher, its main advantage is that the students are integrated into treatment and the related thinking process.

However, clinical reasoning skills should not only be part of education but could also be trained among colleagues as already described in chapter 6.5.3. The total format of clinical reasoning theater is attached in the Appendix (11.3) of this master thesis and is worth a try during osteopathic education and training.

7 Conclusion

Clinical reasoning is the thinking process behind the clinical process of decision finding of manual therapists and physicians and represents the basis of each therapeutic action. The patient whose problem is to be solved is in the center of attention of clinical reasoning. By integration of the patient's impressions and wishes (cf. the patient-centered model of clinical reasoning, chapter 3.2.1), the person behind the medical condition is not neglected.

Already in the Andrew Taylor Still's osteopathic approach, we can detect aspects of clinical reasoning as known from manual therapy and medicine. By categorizing the body into certain regions Still structures the treatment; the characterization of typical features enables the fast and efficient establishment of diagnoses; and by drawing prudent conclusions, the patient can be provided with an individual and adequate treatment.

Furthermore, Still demands to abandon unprovable theories and oppose them to actions, thus giving the impetus for scientific work. A helpful consequence of this claim is the provision of a communication platform among colleagues and other health care professionals. Constant reflection of treatment enables the osteopath to evaluate his therapy method. However, Still does not only integrate the clearly structured patient-related procedure with the help of the clinical reasoning process, but also intuition plays an essential role.

It is important to note that the application of clinical reasoning does not protect against cognitive errors since it contains possible errors sources the therapist has to be aware of in order to avoid them. Meanwhile, clinical reasoning has been integrated into osteopathic education and training with the help of different practice-relevant teaching methods; the application of this thinking process is considered the basis of osteopathic treatment.

Osteopaths, therapists, and physicians must always be aware that errors may occur despite all efforts of reflection and assessment of the treatment.

Furthermore it is noticeable that besides this thinking, structuring, reflecting and assessing, the person must not be overlooked and the individual is to be respected with all his feelings, worries, and wishes.

8 Bibliography

Adelung: Versuch eines vollst. grammatisch-kritisch. WB, 1774, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 62

Albert, H.: Tractat über kritische Vernunft, 1669, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 537

Alt, J.A.: Karl R. Popper, Campus Verlag, Frankfurt/New York, 1995

Aristoteles: Metaphysik 980 und Analytica posteriora, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 609

Arnauld: La. I. ou l'art de penser, 1662, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 5, Schwabe & Co AG Verlag, Basel Stuttgart, 1980, p. 361

Bailey, C.: Epicurus, 1926, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 524

Beckermann, A.: Einführung in die Logik, Walter de Gruyter, Berlin New York, 2003

Bent, S.: Quantitative Medical Decision-Making, In: The new England Journal of Medicine, 2006, p. 1-17

Bochenski, I.M.: Die zeitgenössischen Denkmethode, 10th edition, Francke Verlag, Tübingen und Basel, 1993

Borleffs, J. et al: Clinical Reasoning Theater: A new approach to Clinical Reasoning Education, in Academic Medicine, 2003, p. 322-325

Bradley, G. W.: Disease, Diagnosis and Decisions, John Wiley & Sons, Cichester, 1993

Breitsprecher, R.: PONS-Globalwörterbuch, Österreichischer Bundesverlag, Wien, 1986

Butler, D. S.: Mobilisation des Nervensystems, Springer Verlag, Berlin Heidelberg New York, 1995

Cervero, R.M.: Effective Continuing Education for Professionals, 1988, In: Jones: Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München und Jena, 2006, S.3

Croce, B.C.: Gesammelte Philosophische Schriften, 1930, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 536

Croce, B.C.: Kl. Schrift zur Ästhetik, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 537

Croskerry, P.: The theory and practice of clinical decision making, In: Can. J. Anesth., 2005, Volume 52, pp R1-R8

Curry, H.B.: A theory of formal deducibility, 1950, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 27

Dahl, H., Rößler, A.: Grundlagen der Manuellen Therapie, Georg Thieme Verlag, Stuttgart, 1999

De Bono, E.: Serious Creativity : Using the Power of Lateral Thinking to Create New Ideas, 1993, In: Jones: Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München und Jena, 2006, S. 460

Dhaliwal, G.: Clinical Decision - Making: Understanding How Clinicians Make a Diagnosis, in The new England Journal of Medicine, 2006, p. 19-29

Dilthey: Weltanschauungslexikon, 1907, In: Historisches Wörterbuch der Philosophie, Ritter und Gründer (eds.), Volume 7, Schwabe & Co AG Verlag, Basel Stuttgart, 1989, p. 753

Dölken, M.: Clinical Reasoning- Untersuchen und Behandeln als Prozess, In: Manuelle Medizin 44, 2006, p. 193-198

Elstein, A.: Heuristics and biases: selected errors in clinical reasoning, In: Academic Medicine, 1999, p. 791-794

Elstein, A. Schwartz, A.: Clinical problem solving and diagnostic decision making: selective review of cognitive literature, In: British Medical Journal, 2002, Volume 324, p. 729-732

European Physiotherapy Benchmark: Glossary - Definition of Clinical Reasoning, available at <http://www.fysio.ee/dok/01.pdf> [November 20, 2007]

Frege: Über die Grundlagen der Geometrie, 1967, In: Historisches Wörterbuch der Philosophie, Ritter, J.; Gründer, K. (eds.), Volume 8, Schwabe & Co AG Verlag, Basel Stuttgart, 1992, p. 1303

Frey, Ch.: Zwischen Intuition und Goldener Regel, 1975, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 538

Frymann, V.: Die gesammelten Schriften der Viola M. Frymann, Jolandos Verlag, Pähl, 2007

General Osteopathic Council: Standard 2000 (Standard of Proficiency), London, 1999, <http://www.osteopathy.org.uk>, [November 10, 2006]

Gifford, L.: Perspektiven zum biopsychosozialen Modell, Teil 2: Einkaufskorb-Ansatz, In: Manuelle Therapie 6, 2002, p. 197-206

Google: <http://www.google.at>

Grahame-Smith, D.: Evidence based medicine: Socratic dissent, In: British Medical Journal, 1995, Volume 310, p. 1126-1127

Harris, I.B.: New expectations for professional competence, 1993, In: Jones: Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München und Jena, 2006, S.3

Hartmann, C.: Geschichte der Osteopathie, unpublished manuscript, WSO, Wien, 2007

Hayes, B., Adam, R.: Parallels between clinical reasoning and categorization, 2000, In: Jones: Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München und Jena, 2006, S. 463

Hengeveld, E.: Clinical Reasoning in Manueller Therapie - eine klinische Fallstudie, In: Manuelle Therapie 2, 1998, p. 42-49

Hengeveld, E.: Psychosozial Issues in Physiotherapy in Switzerland: Manual Therapists` Perspectives and Observations, University of East London, Masterthesis, 2000

Hennhöfer, S. (Red.): Wege zur Diagnose, Kassenärztliche Vereinigung Westfalen-Lippe (eds.), Urban & Schwarzenberg, Nördlingen, 1992

Higgs, J., Jones, M.: Clinical Reasoning in the Health Professions, 2000, In: Jones: Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München und Jena, 2006, S. 453

Hippokrates: De flat 1, 4. Oeuvr., Paris 1988, In: Historisches Wörterbuch der Philosophie, Ritter, J.; Gründer, K., Gabriel, G. (eds.), Volume 11, Schwabe & Co AG Verlag, Basel Stuttgart, 2001, p. 377

Hodges, P.: Chronic low back and coccygeal pain, In: Jones, M. A., Rivett D.A.(eds.): Clinical Reasoning for Manual Therapists, Butterworth Heinemann, London New York, 2004, p. 103-121

Jones, M. A., Rivett, D. A. (eds.): Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München and Jena, 2006

Jones, M. A., Rivett D.A.(eds.): Clinical Reasoning for Manual Therapists, Butterworth Heinemann, London New York, 2004

Jones, M.: Clinical Reasoning and Pain, In: Manual Therapy 1, 1995, p. 41-50

Jones, M.: Clinical Reasoning - Fundament der klinischen Praxis und Brücke zwischen den Ansätzen der Manuellen Therapie, Part 1, In: Manuelle Therapie 1,1997, Dez. p. 3-9

Jones, M.: Clinical Reasoning - Fundament der klinischen Praxis und Brücke zwischen den Ansätzen der Manuellen Therapie, Volume 2, In: Manuelle Therapie,1998, März p. 1-7

Kant, I.: Akad-A.3, 191: In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 619

Kant, I.: KrV B 2ff, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 615

Kant, I.: Logik V.Akad.-A.9,33, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 62

Kant, I.: Opus postumum. Akad.-A22, 48, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 62

Kant, I.: Versuch, den Begriff der negativen Größen in die Weltweisheit einzuführen, 1763, In: Historisches Wörterbuch der Philosophie, Ritter, J.; Gründer, K., Gabriel, G. (eds.), Volume 11, Schwabe & Co AG Verlag, Basel Stuttgart, 2001, p. 394

Klemme, B., Siegmann, G.: Clinical Reasoning, Therapeutische Denkprozesse lernen, Georg Thieme Verlag, 2006

Krug: Allgemeines Handwörterbuch der philosophischen Wissenschaften, 1832-1838, In: Historisches Wörterbuch der Philosophie, Ritter, J.; Gründer, K., Gabriel, G. (Eds.), Volume 11, Schwabe & Co AG Verlag, Basel Stuttgart, 2001, S. 479

Laudun: Theories of scient. method from Plato to Mach, 1968, In: Historisches Wörterbuch der Philosophie, Ritter, J., Gründer, K., Gabriel, G. (Eds.), Volume 12, Schwabe & Co AG Verlag, Basel Stuttgart, 2004, p. 974

Lave, J.: Learning Theories: Situated Learning, 1996, In: Jones: Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München und Jena, 2006, S. 463

Ligner, B.: preparatory course for the clinical exam, unpublished manuscript, WSO, Wien, 2002

Mamede, S.: Diagnostic errors and reflective practice in medicine, In: Journal of Evaluation in Clinical Practice 13, 2007, p. 138-145

Mattingly, C., Fleming, M.: Clinical Reasoning. Forms of inquiry in a therapeutic practice, In: Klemme und Siegmann: Clinical Reasoning, Therapeutische Denkprozesse lernen, Georg Thieme Verlag, 2006, S.8

Mayer-Fally, E.: Der Weg zur Diagnose, Donauuniversität Krems, Masterthesis, 2006

Medawar, P.: Induction and Intuition in Scientific Thought, Redwood Press, London, 1969

Nalcadzjan, A.: Intuition im wissenschaftlichen Schöpfertum, Akademie Verlag, Berlin, 1975

Norman, G.: The Epistemology of Clinical Reasoning: Perspectives from Philosophy, Psychology and Neuroscience, In: Academic Medicine, 2000, p. 127-133

Peile, E.: Commentary: Clinical Reasoning, In: British Medical Journal, 2004, Volume 328, p. 946

Peirce, C. S.: Das Denken und die Logik des Universums, Die Vorlesungen der Cambridge Conferences von 1898, Mit einem Anhang unveröffentlichter Manuskripte, Suhrkamp Verlag, Frankfurt am Main, 2002

Peirce, C. S.: Collected Papers Volume 2: Elements of Logic, Hartsthorne and Weiss (eds.), The Belknap Press, Cambridge, 1960

Peirce, C.S.: Collected Papers, Volume 1, Principles of Philosophy, Volume 2, Elements of Logic, Belknap Press, Harvard, 1969

Philoponos: In Anal. post. 48; In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 527

Pieper: Tractat über die Klugheit, 1960, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 862

Platon: In: Historisches Wörterbuch der Philosophie, Ritter, J.; Gründer, K., Gabriel, G. (eds.), Volume 11, Schwabe & Co AG Verlag, Basel Stuttgart, 2001, p. 378

Popper, K.: Logik der Forschung, 1935, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 609

PubMed: available at <http://www.ncbi.nlm.nih.gov>, [November, 3, 2007]

Refshauge, K., Higgs, J.: Teaching clinical reasoning, 2000, In: Klemme, B., Siegmann, G.: Clinical Reasoning, Therapeutische Denkprozesse lernen, Georg Thieme Verlag, 2006, S. 75

Reuter, P.: Springer Großwörterbuch Medizin: English-German, Springer Verlag, Berlin, 2001

Rogers, J.: Clinical Reasoning: The Ethics, Science and Art, In: American Journal of occupational Therapy, 1983, p. 601-616

Sackett et al: Evidence based medicine: what it is and what it isn't, In: British Medical Journal, 1996, Volume 321, p. 71-72

Salamun, K. (eds.): Was ist Philosophie? Neuere Texte zu ihrem Selbstverständnis, 4th edition, Mohr Siebeck Verlag, Tübingen, 2001

Salchinger, B.: e-mail Betreff: Clinical Reasoning in der Ausbildung, November 12, 2007

Schlick, M.: Allgemeine Erkenntnislehre, 1918, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 537

Schneeweiss: Entscheidungskriterien bei Risiko, 1966, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 543

Schön, D. A.: Educating the Reflective Practitioner, San Francisco, 1987

Schön, D.A.: The Reflective Practitioner: How professionals think in action, 1983, In: Jones: Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München und Jena, 2006, S. 9

Schomacher, J.: Clinical Reasoning als Beitrag zur Professionalisierung der Physiotherapie, in Manuelle Therapie 10, 2006, p. 3-12

Sefton, A., et al.: Decisions in problem-based learning: experiences from three Australian medical schools, In: Focus on health professional education: a multi-disciplinary journal, Vol. 1, 1999, p. 1-11

Sigwart: Beiträge zur Lehre vom hypothetischen Urteil, 1879, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 3, Schwabe & Co AG Verlag, Basel Stuttgart, 1974, p.1266

Simon, H.A.: Problem solving and education, 1980, In: Jones: Clinical Reasoning in der Manuellen Therapie, Grundlagen und 23 Fallbeispiele von namhaften Therapeuten, Urban & Fischer Verlag, München und Jena, 2006, S. 454

Snell: Die Ausdrücke für den Begriff des Wissens in der vorplatonischen Philosophie, Philol., 1924, In: Historisches Wörterbuch der Philosophie, Ritter und Gründer (Eds.), Volume 7, Schwabe & Co AG Verlag, Basel Stuttgart, 1989, p. 574

Sommer, A. U.: Die Kunst, selber zu denken, Ein philosophischer Dictionnaire, Eichborn Verlag, Frankfurt am Main, 2003

Sommerfeld, P.: Diagnose der Diagnose. Ansatz einer Strukturanalyse, In: T. Liem, P. Wührl, P. Sommerfeld : Theorien Osteopathischen Denkens und Handelns, Hippokrates Verlag, Stuttgart, 2008 (in press)

Still, A.T.: Das große Stillkompendium, Jolandos, Pähl, 2002

Stowasser, J.M.: Stowasser, lateinisch-deutsches Schulwörterbuch, Hölder-Pichler-Tempsky Verlag, Wien, 1998

Themestius: In de an 30, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 526

Uhl, Ch.: e-mail Betreff: Anwendung des Clinical Reasonings im LKH-Graz, December 4, 2007

Vegetti, M.: Culpability, Responsibility, Cause: Philos., historiogr., and medicine in the 5th century, 1999, In: Historisches Wörterbuch der Philosophie, Ritter, J.; Gründer, K., Gabriel, G. (eds.), Volume 11, Schwabe & Co AG Verlag, Basel Stuttgart, 2001, p. 377

Verdù, A.: Abstraktion und Intuition als Wege zur Wahrheit in Yoga und Zen, Anton Pustet Verlag, München, 1965

v. Hartmann, E.: Philosophie des Unbewussten, 1904, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 534

Walch, J.G.: Einl. in die Philos., 1727, In: Historisches Wörterbuch der Philosophie, Ritter, J. (eds.), Volume 4, Schwabe & Co AG Verlag, Basel Stuttgart, 1976, p. 857

Wallace, S.: Clinical Reasoning, unpublished script, Gars am Kamp, 2006

Wieland, W.: Diagnose, Walter de Gruyter Verlag, Berlin, New York, 1975

Weigel, V.: Erkenne dich selbst, 1635, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 619

Wikipedia: <http://de.wikipedia.org>

WSO: Infoblatt klinischer Nachmittag, Wien, 2007

WSO: Infoblatt Behandlungssupervision für SupervisorInnen, Wien, 2007

WSO: e-mail Betreff: Clinical Reasoning in der Ausbildung, November 13, 2007

Zedler: Universallexikon 43, 1745, In: Historisches Wörterbuch der Philosophie, Ritter (eds.), Volume 2, Schwabe & Co AG Verlag, Basel Stuttgart, 1972, p. 683

Zinterhof, M.: Vertraue der Weisheit in dir, Verlag Ingenium, Styria Medien AG, 2004

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11 Appendix

11.1 Self–reflection worksheet

(Taken from Jones, M. A., Rivett D.A.(eds.): Clinical Reasoning for Manual Therapists, Butterworth Heinemann, London New York, 2004, Appendix 2, p. 421-431)

11.2 Chronic low back and coccygeal pain- a case study

(Taken from: Jones, M. A., Rivett D.A.(eds.): Clinical Reasoning for Manual Therapists, Butterworth Heinemann, London New York, 2004, p. 103-121)

11.3 Format of Clinical Reasoning Theater

(Taken from: Borleffs, J. et al: Clinical Reasoning Theater: A new approach to Clinical Reasoning Education, in Academic Medicine, 2003, p. 322-325)