

**Matched-Controlled Pilot-Study:
Influence of Osteopathic Treatment
(Diagnostic Touch Technique) on Fatigue in
a Working Population**

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Contents

1. Introduction and Aims	3
2. Underlying Principles	5
2.1. Fatigue	5
2.1.1. Definition of Terms	5
2.1.2. Causes of Fatigue	6
2.1.3. Assessing Fatigue	8
2.1.4. Fatigue in Osteopathy	9
2.2. Diagnostic-Touch according to Rollin E. Becker	10
2.2.1. Basic Concept of Diagnostic-Touch.....	10
2.2.2. Conduct of the Diagnostic-Touch Technique.....	11
2.3. The Effect of the Diagnostic-Touch Technique on Fatigue– Attempt at an Explanation.....	14
3. Methodology	16
3.1. The Questionnaire MFI-20	16
3.2. Basic Principals of the Investigation.....	17
3.2.1. Preparations for the Investigation.....	17
3.2.2. The Participants.....	19
3.2.2.1. The Participants of the DT Group	19
3.2.2.2. The Participants in the Control Group.....	20
3.2.2.3. Comparison between the Study Group and the Control Group	21
3.2.3. The Therapy	22
3.3. Evaluation of the Results	23
3.3.1. Definition of the Variables and Statistical Methods	23
3.3.1.1. Raw Data	23
3.3.1.2. Calculated Data	23

4. Results	25
4.1. Results of the Questionnaires	25
4.1.1. Questionnaire 1.....	25
4.1.2. Questionnaire 2.....	27
4.2. Changes caused by the Treatment	29
4.2.1. Absolute Changes in Fatigue	29
4.2.2. Relative Changes in Fatigue	31
4.2.3. Additional Results	33
5. Discussion	35
5.1. Discussion of the Method.....	35
5.1.1. Limitations Arising from the Therapist.....	35
5.1.2. Limitations Arising from the Participants.....	35
5.1.3. Limitations in the Design of the Study	36
5.2. Discussion of the Results.....	36
5.2.1. Discussion of the Results of MFI-20.....	36
5.2.2. Discussion of Individual Cases	38
5.2.3. Discussion of the Results of the Initial Survey.....	38
5.2.4. Discussion of other Changes Caused by the Therapy.....	39
6. Summary and Evaluation.....	40
7. Bibliography	42
8. Table of Illustrations.....	47

Appendices

Abstract

Questionnaires

Table of Results

1. Introduction and Aims

Following osteopathic treatment my patients frequently report better sleep, improved motivation and reduced fatigue. These reports lead me to examine whether my frequent use of the technique of Diagnostic Touch introduced by Rollin E. Becker is connected with this reduction in fatigue.

In order to be able to measure reports of reduced fatigue and improved motivation, it was necessary to find existing, scientifically valid questionnaires on the subject of fatigue. This process was hindered by the fact that both descriptions of the questionnaires and in particular the questionnaires themselves, are only available to psychotherapists (according to information from the Universities of Vienna and Salzburg).

I obtained an overview of questionnaires and their use through direct contact with Primarius Dr. Reinhold Fartacek, (Leiter des Sonderauftrages Krisenintervention) in the Psychiatric Clinic in Salzburg, who informed me about the work of A.J.Dittner.

In the work of A.J.Dittner (Dittner, 2004) a data base search is used to compare 30 questionnaires, only one of which, the Multidimensional-Fatigue-Inventory MFI-20, was suitable for my study.

I think that at a time when psychological pressure and fatigue due to cut-backs and problems in the work place and in particular Chronic Fatigue Syndroms CFS are increasingly the focus of public concern, preventive measures to reduce these symptoms are worth examining. Osteopathy could, if its effectiveness were confirmed, possibly be used to reduce physical fatigue and increase attention, activity and motivation.

Of interest to me is the investigation of symptoms of fatigue in subjectively healthy people and not the investigation of fatigue as a symptom associated with disease.

The aim of this study is to examine whether and to what extent Diagnostic Touch has an effect on fatigue in a working population as well as on recorded physical symptoms.

Chapter 2 provides an overview of the subjects of „fatigue“ and „Diagnostic Touch“ and explains the use of these terms in this study.

In chapter 3 the questionnaire MFI-20, which was used for the determination of the extent of fatigue, is introduced. In addition, the conduct of the investigations and the group characteristics, which form the foundation of the present study, are described.

In chapter 4 the results of the questionnaires and the results of the treatments are presented.

In chapter 5 the method and the results are discussed.

In chapter 6 a conclusion and a perspective on further aspects of interest are given.

2. Underlying Principles

In this chapter the subjects of „fatigue“ and „Diagnostic Touch“, which form the basis of this study, are defined with reference to relevant literature. An overview is given of the causes of fatigue and the possible scientific methods of evaluating it, and fatigue is described from an osteopathic point of view. The underlying principles and treatment with Diagnostic Touch are described, in particular those positions used for treatment in this study. Based on this, an attempt is made to develop a theory on how this treatment affects fatigue.

2.1. Fatigue

2.1.1. Definition of Terms

Fatigue - the boundary between normal and abnormal fatigue - CFS (Chronic Fatigue Syndrom).

Fatigue is a prevalent symptom in the general population and therefore of great clinical and investigational importance (Watt, 2000).

In general population studies fatigue is often reported (Loge, 1998).

Fatigue is commonly associated with both acute and chronic illness, but also seen in healthy individuals (Jorgensen, 2006).

In common use the word “fatigue” is used to describe a whole range of afflictions. These range from a burning sensation in painfully fatigued muscles to a general state of lethargy. In a physiological sense the term “fatigue” is used to describe the inability to continue to function on a normal level. There are seen to be two types of fatigue: one manifests itself locally as a muscle-specific inability to perform the functions of a muscle, the other manifests itself as a general physical and/or psychological feeling of lack of energy (Gandevia et al., 1996).

Fatigue is believed to be activated in the reticular activating system of the lower brain. However, the brain did not evolve merely to register representations of the world; rather it evolved for adaptive action and behaviour. Musculoskeletal structures co-evolved with appropriate brain

structures so that the whole functions together in a constructive and adaptive fashion (Kelso, 1995).

The definition of Chronic Fatigue Syndrom (CFS) in 1988 included disabling fatigue of unknown cause of at least six months´ duration (Shafran, 1991).

This clinically defined condition is characterized not only by severe disabling fatigue but also by a combination of symptoms that features selfreported impairments in concentration and short-term memory, sleep disturbances, and musculo-skeletal pain. The diagnosis of CFS can be made only after exclusion of other medical and psychiatric causes of chronic fatigue (Holmes, 1988; Lloyd, 1990; Sharpe, 1991).

There is still a lack of standardized criteria for defining CFS (Reeves, 2005).

In this work the term fatigue is defined as „the state of weariness following a period of exertion, both mental or physical, characterised by a decreased capacity for work and reduced efficiency to respond to stimuli.”

The questionnaire MFI-20, used for this study, is not only used for the assessment of CFS, but also of common fatigue (Watt, 2000).

The five dimensions which are used in this questionnaire are based on the ways in which fatigue can be expressed. General Fatigue refers to general remarks like “I feel tired”, Physical Fatigue refers to physical sensations of feeling tired, Mental Fatigue refers to difficulties in concentration, Reduced Motivation refers to the description of fatigue as having a lack of motivation to start any activity, and Reduced Activity refers to exactly this reduction in activity (Smets et al., 1995).

2.1.2. Causes of Fatigue

As far as characteristics of fatigue symptoms are concerned two perspectives are proposed from which the causes for fatigue can be derived: central and peripheral (Kent-Braun, 1999; Gandevia, 1996; Biagini, 2006).

Peripheral fatigue is generally the most common cause of the physical symptoms of fatigue. This causes contractile dysfunction, which is manifested in the reduction

or lack of ability of a single muscle or local group of muscles to function properly. The sub-optimal aerobic metabolism generally results in the accumulation of lactic acid in the muscle, causing the stereotypical burning sensation of local muscle fatigue (Kent-Brown, 1999; Westerblad, 2002).

Central Fatigue – The central component of fatigue is generally described in terms of a reduction in the neural drive or nerve-based motor command to working muscles which results in a decline in the force output (Gandevia, 2001; Kent-Braun, 1999).

The central model of fatigue is an integrated mechanism, which works to preserve the integrity and function of the whole system by initiating fatigue through muscle derecruitment, based on collective feedback from the periphery, before cellular or organ failure occurs. The exact mechanisms of central fatigue are unknown, although there has been a great deal of interest in the role of serotonergic pathways (Davis, 1995; Yamamoto, 2000).

It is also possible to distinguish between organic and non-organic fatigue. Non-organic fatigue occurs when the body needs, but does not get, sleep. This can be caused by lack of sleep, physical and/or mental effort and relieved by sufficient sleep. Prolonged fatigue with no immediately recognisable cause is one of the most difficult problems in everyday medicine (Hausotter, 2001; Velasco, 2006).

Organic diseases can lead to rapid tiredness, so that it is possible to be fit in the morning or after a break, but tire quickly when carrying out normal activities. This tendency to tire rapidly is a common symptom of anaemia, infections, and diseases of the heart and lungs. Permanent fatigue, when the patient never really feels rested, is often caused by physical dysfunction, hormone imbalance (e.g. increased levels of melatonin) as well as chronic illness such as cancer, dust mite allergy, histamine intolerance, hay fever, serious lung disease and Sleep Apnoea-Syndrome. Chronic alcohol abuse or liver diseases (high gamma-GT values) can be a cause of permanent fatigue (Jorgensen, 2006).

The symptoms of CFS (chronic fatigue syndrome) are constant exhaustion over a period of at least six months and a further four from a whole group of symptoms - possible causes being considered are viral infections and genetic defects. Since CFS-patients report more psychological symptoms and often more infections by

contrast with fatigue patients who seem to have more of an emotional, burn-out-like component, we may consider the existence of different pathogenetic backgrounds (Evengard, 2003).

Postulated mechanisms relating to fatigue so far involve abnormalities of the neuroendocrine system and cytokine regulation. The relationship between the hypothalamo-pituitary-adrenal (HPA) axis and fatigue is being discussed (Gottschalk, 2005; Del Monte, 2006).

2.1.3. Assessing Fatigue

Fatigue is essentially a subjective experience and there is no standard way to assess it. Dittner et al. (Dittner et al., 2004) report about 30 published scales and their use in published studies.

Instruments available to assess fatigue are either one-dimensional as for example the Visual Analogue Scale (VAS) used by Krupp et al. (Krupp, 1988), the Tiredness Scale (Montgomery, 1983), the Fatigue Severity Scale, FSS (Krupp, 1989) or multidimensional checklists such as the Fatigue Symptom Checklist FSCL (Kogi et al., 1970), the Piper Fatigue Selfreport Scale PFS (Piper et al. 1989) or the Multidimensional Fatigue Inventory MFI (Smets et al., 1995).

Research studies in the last few years often only make reference to a few validated self-report questionnaires measuring fatigue: the Chalder Fatigue Scale, the Multidimensional Fatigue Inventory, the Fatigue Severity Scale (Wagner, 2005; Gottschalk, 2005)

Multidimensional scales provide a detailed qualitative and quantitative assessment of fatigue. Fatigue in the normal population has symptoms relating to physical and cognitive function. Of interest to me is the investigation of symptoms of fatigue in subjectively healthy people and not the investigation of fatigue as a symptom associated with illness. The Multidimensional Fatigue Inventory was used to assess fatigue in a working population (Dittner, 2004).

In the Multidimensional Fatigue Inventory (MFI) five dimensions are assessed: General Fatigue, Physical Fatigue, Mental Fatigue, Reduced Motivation and

Reduced Activity. These five dimensions correspond to most symptoms reported and are assessed by most checklists of fatigue (Smets et al., 1995).

2.1.4. Fatigue in Osteopathy

In osteopathic literature the term „fatigue“ is used in a variety of different contexts.

Fatigue is named in combination with tissue tension and different kinds of strain which are related to the upright posture of man. 30 percent of 1000 cases of backpain are attributed to chronic fatigue. Influences which affect the skeletal tissues directly, such as trauma, postural strain, overexertion of muscles, chilling, and fatigue are pointed out as principal causes of neuralgia, myofascial disease, and joint pains, while at the same time recognizing their functional nature, and the usual absence of histologic change (McBain, 2001).

Continuing contraction of muscles which is needed to stabilize the severely out-of-balance body in any given somatic dysfunction means actively maintaining the shortened position and will begin to produce products of fatigue that also activate the nociceptors. This process will tend to recruit additional reinforcement of the abnormal position (Mountcastle, 1980).

Fatigue is named in a list of sensations that can be felt from the functioning and dysfunctioning within the body. And the capability to feel fatigue in the tissues, either in the patient as a whole or in specific areas of trauma or disease is said to be a most important factor in therapy (Becker 1997, 166ff).

Variations in the sensory impulses reaching the spinal centers may be due to variations in the severity of visceral disorders, but also to fatigue of the sensory end organs in the affected tissues, or to fatigue of the sensory nerve cells of the spinal ganglia. Within the spinal cord the association neurons may suffer fatigue, or the motor neurons of the first order may be fatigued and thus fail to carry nerve impulses to the muscles concerned, or the motor end organs in the muscles themselves may become fatigued (Burns, 2001).

In some readings fatigue is believed to be secondary to somatic dysfunctions, which increases metabolic demands and therefore decreases the efficiency of musculoskeletal function (Stiles, 2001).

Osteopathic lesion, the concept of the chain of function and of chains of lesions, the principle that „everything is connected with everything“, Korr's facilitated segment, facilitation running into other segments in the spinal cord, the lowering of the stimulation threshold and the heightened tissue tone connected with it – all these observations are a sign of increased energy consumption in the body, which the osteopath can feel when treating patients as (kinetic) energy stored in the pattern of lesions (Korr, 1963; Becker, 2001).

2.2. Diagnostic-Touch according to Rollin E. Becker

I learnt Diagnostic Touch as a functional cranio-sacral technique from Nick Woodhead, D.O. at the WSO. Today descriptions of the technique are also found under names such as the Fulcrum-Point-Technique, Total Rhythmic Balanced Interchange or Modified Rhythmic-Balanced-Interchange-Technique (Liem, 2006) which however all relate to the technique described by Becker (2001).

As mentioned in the introduction, following osteopathic treatments and especially following the use of the Diagnostic Touch technique, my patients often report a reduction in fatigue. In this study I therefore concentrate on the use and the effects of this technique.

2.2.1. Basic Concept of Diagnostic-Touch

Diagnostic Touch is a constant alternation of diagnosis and therapy. The diagnosis itself constantly alternates between diagnosis as a science with a variety of tests to establish the condition of the patient as objectively as possible, and diagnosis as the art of the osteopath to let himself be lead subjectively and intuitively to a result. Prerequisites for this interpretative ability are knowledge, experience and an open mind.

Furthermore there are three factors to consider when treating a patient: the patient's opinion of his or her problem, the osteopath's concept and the knowing tissues of the patient's body. The patient is guessing at a diagnosis; the osteopath

is making a scientifically informed diagnosis, while the patient's body knows the problem and is manifesting it in the tissues (Becker, 1997).

Through the sense of touch – and again knowledge, practice and an open mind, the necessary abilities of the osteopath – he can feel function or dysfunction within the tissues. To get this “feeling touch” the osteopath has to recognise the potency in the tissue tension, that can be assumed to be kinetic energy in the intrinsic forces within human physiology in health as well as in disease. To recognise this potency the osteopath establishes a fulcrum with his elbows (or with any other part mainly from his or her upper extremity) which becomes the still-point of the lever from which at its far end his feeling fingers touch the patient. The osteopath can control the feeling touch by holding the fulcrum free enough to allow it to shift like examining a hyperactive child. The amount of pressure at the fulcrum corresponds to the depth of palpatory touch with the fingers. *There is no limit to the application [...] for practically every type of complaint that comes to our attention* (Becker, 2001;p.89).

So the principles of this technique are to get in contact with the biokinetic intrinsic energies in the strained tissues through a still-point created through a shiftable fulcrum and observe and be guided through all corrective processes that take place within this energy field. *All anatomical-physiological units express and utilize kinetic energy in manifesting their functioning in health, disease, and trauma. The art of learning to use these kinetic energies, with their centering potencies, is diagnostic touch* (Becker, 2001;p.83).

Allow the physiological function within to manifest its own unerring potency rather than use blind force from without (Becker, 1997;p.156).

2.2.2. Conduct of the Diagnostic-Touch Technique

In the clinical application I put my hands under a chosen part of the patient's body and establish an automatic-shifting-suspension-fulcrum point for each hand by dropping my elbows down on to the couch. The hand contact is soft all the time while I vary the pressure with my elbow on the table to follow the biodynamic intrinsic force through the different layers of tissue. This means

that I allow tissue functioning and dysfunctioning to come through my hands and fulcrum points. Each organ or tissue has its own natural tendency to move when the forces within it have an opportunity to express themselves. I have to position myself and my hand contacts and establish my fulcrum points and apply such gentle pressure so that the forces within the body structures can express themselves. Therefore, I have to know and respect the anatomy and physiology under my hands.

I have chosen different positions for treatment on each patient in this study in order to reach different areas from different points of access and thereby enable the Diagnostic Touch technique to be applied to almost the whole body.

In this study I used four differently positioned handholds on the patient lying supine on the couch and I name them in order of application and according to the area of my hand in contact with the patient. Each position is described in terms of the osteopath's handhold, the fulcrum points, and the examined and treated regions.

Position 1 – Occiput : The hands are positioned under the occipital area of the head of the patient with the fingers resting on both sides of the cervical area. The fulcrum points are the forearms resting on the table (Illustration 1). Through this position the cervical area as a whole, the basilar area and at least all structures of the posterior skull, the reciprocal tension membrane and the fluctuation of the cerebrospinal fluid can be examined and treated.



Illustration 1: Position 1 – Occiput.

Position 2 – Scapulae : The hand contact is bilateral, with one hand under each scapula. The fulcrum points are the elbows positioned on the table (Illustration 2). This position allows to examine and treat the upper thoracic area as well as the lower thoracic area, the cervical area, the shoulders and the upper extremities.



Illustration 2: Position 2 – Scapulae.

Position 3 – Feet: The hands are positioned bilaterally on the dorsal foot so that the thumb is in contact with the medial aspect of the ankle on the tibia and the fingers spread around the lateral aspect establishing contact with the fibula. The fulcrum is built between the upper arm and the lateral thorax. Additional fulcrum points are the osteopath's thighs against the table (Illustration 3). This position allows the examination and treatment of the whole lower extremity, its joints, its nerve and blood supply, the interosseous membrane between tibia and fibula and the connection to the pelvis via the area of the hip and also the correlation to the lumbar area.



Illustration 3: Position 3 – Feet.

Position 4 – Sacrum : The right hand is positioned under the sacrum in such a way that the fingertips can reach the lower lumbar spinous processes. The fulcrum point is at the right elbow on the table. The knees of the patient are flexed. The left hand is clasped around the opposite iliac anterior superior spine while the left arm rests on the ipsilateral anterior superior spine of the ilium. The osteopath can use each ilium alternately as a fulcrum point to examine the opposite ilium and its connections (Illustration 4).

This position allows examination and treatment of the whole pelvic area, the iliosacral joints, the correlation to the lower thoracic area as well as the correlation to the shoulder girdle, the reciprocal tension membrane, and the fluctuation of the cerebrospinal fluid.



Illustration 4: Position 4 – Sacrum.

2.3. The Effect of the Diagnostic-Touch Technique on

Fatigue – Attempt at an Explanation

According to Irvin Korr (1963) we have to keep in mind that any segmentally related structure which sends afferents to the spinal cord may influence not only segmental osteopathic lesions or dysfunctions but may also exert some influence through the network of interneurons at any level of the spinal cord. Psychic stress, emotional imbalance and strains influence motor activity, increase muscular tone and have dysbalancing effects resulting in fatigue, hyperreflexia and other symptoms. Korr also points out that the stretch and tension end-organs – the proprioceptors in the muscles and tendons are the most important source of

afferent impulses which may produce the changes in the spinal cord that are associated with the osteopathic lesion (Korr,1963).

Nowadays we know that there are many proprioceptors in the connective tissue – especially in the myofascial tissue – which also have great afferent influence on the spinal cord (Gandevia 2001).

If traumas are stored in the body tissues in the form of biokinetic energy in so-called strain-patterns, it can be assumed that the body will constantly be lacking in energy for health. If such strain-patterns can be at least partially released through Diagnostic Touch treatment and the biodynamic energy made available in greater quantity to the organism, we may have a plausible explanation for the reduction in ever present fatigue and an increase in resilience and subjective well-being. *There is no limit to the application [...] for practically every type of complaint that comes to our attention* (Becker 2001,p.89).

3. Methodology

To begin with, in this chapter the questionnaire MFI-20 which was used for the determination of the extent of fatigue will be introduced. In addition, the conduct of the investigations and the group characteristics will be described as the foundation of the study.

3.1. The Questionnaire MFI-20

The questionnaire „Multidimensional Fatigue Inventory“ (MFI-20) consists of five assessment rubrics, each containing four questions concerning fatigue.

The 20 questions are statements like “I tire easily” or “I feel active” and the participants have to answer to what extent these statements apply to them.

Since several different versions of this questionnaire, differing from the original design (SMETS et al., 1995) can be found in the literature, the design of Watt (WATT et al., 2000) was used with slight changes (cf Appendix 2b). In the original questionnaire a five level scale was used, in this study only four points (highly/rather/hardly/not at all) were presented in order to avoid ambiguous/undecided answers (i.e. middle values).

The statements are worded positively and negatively on to prevent tendencies towards certain responses. As fatigue is a state sensitive to temporal changes the instruction refers to “the last four weeks”.

From the 20 items five scales according to the five rubrics are generated by summation of their four items: “General Fatigue” (GE), “Physical Fatigue” (PH), “Mental Fatigue” (ME), “Reduced Activity” (AC) and “Reduced Motivation” (MO).

According to Watt und coauthors (WATT et al., 2000), missing items (8) were substituted by the mean or the non-missing items, if at least half of the items were not missing. The resulting scores were transformed linearly to a range of 0-100, zero indicating absence of fatigue, 100 the maximum extent of fatigue.

3.2. Basic Principals of the Investigation

3.2.1. Preparations for the Investigation

In order to recruit participants, contacts with company physicians of two companies were established who introduced this study in the company networks.

After that, pre-questionnaires were distributed containing condensed questions of the MFI-20 (cf. Appendix 2a). The formulation of the questions covered the issues “general fatigue”, “reduced activity”, “reduced motivation” and “mental fatigue”, which had to be rated on a 4-point scale (highly/rather/hardly/not at all).

According to Watt (Watt et al., 2000), the answers were collated and numerical values were substituted for the descriptive answers. Depending on the formulation of the statement (positive or negative) the following values were used ensuring that more severe symptoms of fatigue are described by higher values (cf. Table 1).

	Highly	Rather	hardly	not at all
positive (+)	100	66.7	33.3	0
negative (-)	0	33.3	66.7	100

Table 1: Numerical substitutes for the answers.

The sums of the four numerical results were sorted in descending order and the 60 participants with the highest fatigue values were selected for the study. Those 60 participants all worked for the same firm, which had the advantage of a homogenous test group, since all the participants had similar tasks to perform and a similar working environment.

Diagnosed consuming diseases, thyroid diseases, depression, preceding sick-leaves or holidays and pregnancy were laid down as exclusion criteria.

Due to these restrictions 9 possible participants could not be considered.

The participants were divided in two groups by throwing a coin.

The participants of the first group were treated with DT (“DT group”, “study group”). The participants of the second group served as control group for the registration of possible seasonal loads (seasonal hormonal fluctuations, seasonal working peak loads). In this group no therapy was performed.

The participants in the study group were invited to two treatment sessions, taking place at an interval of 14 days and treated with DT, as described above.

The indicators for fatigue were collected by means of the complete MFI-20 questionnaire in both groups (The complete questionnaire with the additional questions is given in appendix 2, the time-table is shown in Fig. 1).

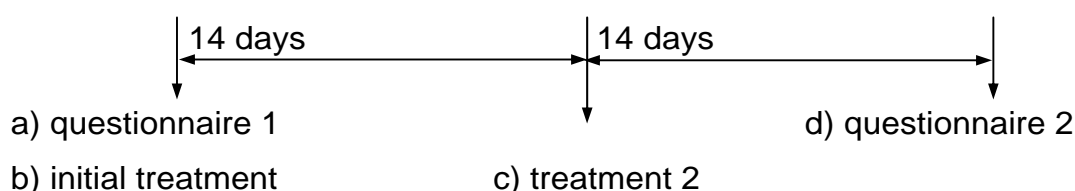


Fig. 1: Time-table of the study

Due to holidays and sick-leaves (exclusion criteria) the data of another six persons had to be eliminated from the dataset after the end of the investigation. Therefore a final sample of 23 participants in the DT group and 22 in the control group forms the basis for the following evaluation.

The answers were collected with a computer programme (MS Access 97) and numerical values were substituted for the descriptive answers of the MFI-20; these values are given in appendix 3, identical to the processing of the pre-questionnaire data. Depending on the wording of the statement (positive or negative) the values (+/-) used relate higher numerical values to a higher extent of fatigue.

In a next step, the mean value of the four results of each rubric was calculated (resulting in a scale from 0-100, zero indicating absence of fatigue, 100 maximum fatigue):

General fatigue: $GE = \frac{1}{4} (GE \text{ fit} + GE \text{ tired} + GE \text{ rest} + GE \text{ tire})$

Physical fatigue: $PH = \frac{1}{4} (PH \text{ do little} + PH \text{ lot} + PH \text{ bad c} + PH \text{ exc c})$

Reduced activity: $AC = \frac{1}{4} (AC \text{ act} + AC \text{ lot} + AC \text{ little} + AC \text{ done})$

Reduced motivation: $MO = \frac{1}{4} (MO \text{ all} + MO \text{ dread} + MO \text{ lot} + MO \text{ not})$

Mental fatigue: $ME = \frac{1}{4} (ME \text{ keep} + ME \text{ conc} + ME \text{ effort} + ME \text{ wander})$

Finally, according to Watt (Watt et al., 2000), the total fatigue was calculated from the mean values of the rubrics.

Total fatigue: $FAT = \frac{1}{5} (GE + AC + PH + MO + ME)$

3.2.2. The Participants

The participants were informed about the conduct of the study. They took part of their own free will and received no compensation.

The division of the participants into two groups was performed in a random fashion ahead of the study, as described above.

Since the participants in the control group received no treatment during the study, they all received free treatment once the study was completed.

In the following chapters the participants of both groups will be described by means of descriptive statistical methods by age, sex and symptoms.

3.2.2.1. The Participants of the DT Group

The study group consisted of 23 persons: 10 women and 13 men. The mean age was 40.3 years, the median 38 years. The mean working hours per week were 46.9 hours and varied from 20 to 62 hours (median: 50 h/week). One woman stated that she took the contraceptive pill, one participant used an

asthma spray, one took medicine for anaemia and one medicine for hypertension. In spite of this, the latter was not excluded because the hypertension was medically well controlled. Other diagnosed diseases were not mentioned. The woman with anaemia did not mention it any more in the questionnaire after the treatments. 15 participants stated that they suffered from headaches, 17 from back-ache and 12 from troubled sleep.

In the pre-questionnaire the following information concerning fatigue was collected (cf. Tab. 2):

During the last 4 weeks after a typical working day I was ...		This answer applies to me (N)			
		Highly	rather	Hardly	not at all
(+)	...tired and exhausted	3	14	5	1
(-)	...motivated to undertake something	2	5	15	1
(-)	...able to concentrate	4	11	8	0
(-)	...active	1	3	15	4

Tab.2: Results of the pre-questionnaire of the DT group.

These values will be compared to those of the control group in Chapter 3.2.2.3. (Fig. 2).

3.2.2.2. The Participants in the Control Group

The control group consisted of 9 women and 13 men, the average age was 35, the median 34.5 years. The typical working hours per week was 43 hours ranging between 20 and 62 hours (median: 45 hours). One participant was suffering from anaemia. No other diagnosed diseases were mentioned.

12 participants suffered from headache, 13 from back-ache and 9 from troubled sleep.

In the pre-questionnaire the following information concerning fatigue was collected (cf. Table 3):

During the last 4 weeks after a typical working day I was ...		This answer applies to me (N)			
		highly	rather	Hardly	not at all
(+)	...tired and exhausted	2	16	4	0
(-)	...motivated to undertake something	0	9	12	1
(-)	...able to concentrate	2	15	5	0
(-)	...active	2	6	14	0

Tab.3: Results of the pre-questionnaire of the control group.

These values will be compared to those of the DT group in Chapter 3.2.2.3. (Fig. 2).

3.2.2.3. Comparison between the Study Group and the Control Group

The DT group featured significantly higher values in relation to age (t-test, $p=0.049$).

The differences in the weekly working time turned out to be insignificant on the 5% level.

The mean fatigue in the pre-questionnaires was 55.1 (SD=16.0) in the study group and lower in the control group with an average of 51.9 (SD=13.1). A one-sided u-test shows no significant differences ($p=0.17$).

Therefore, a comparability of the two groups can be assumed.

The levels of fatigue in both groups will be compared in Fig.2.

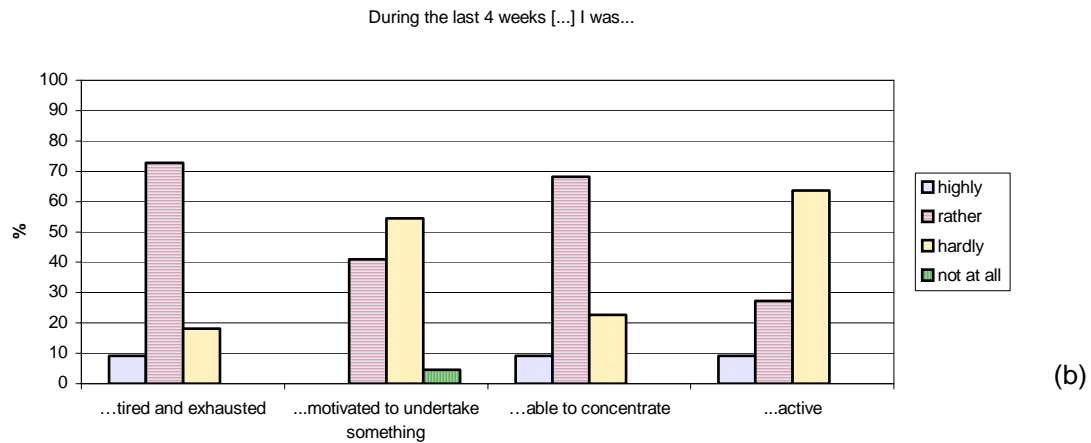
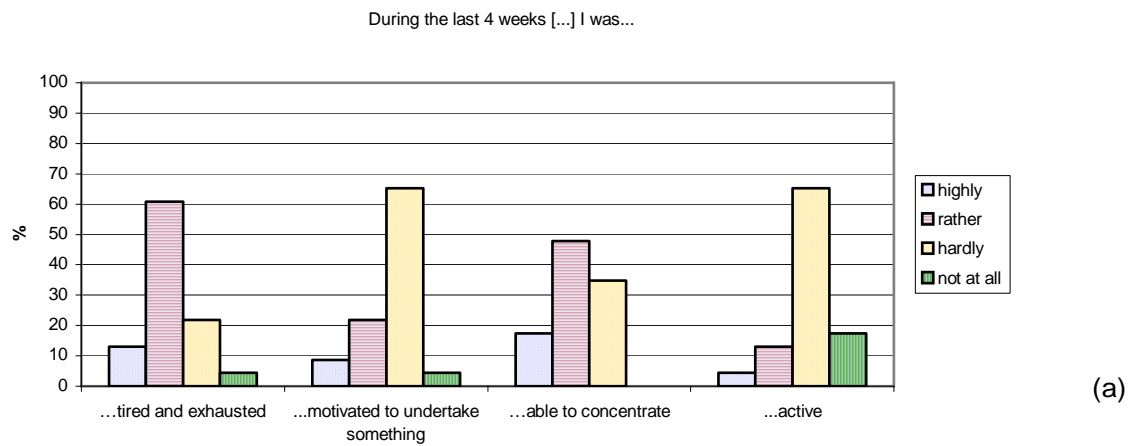


Fig. 2: Comparison of the data of the pre-questionnaires answered by the test- (a) and control group (b).

The physical disorders associated with fatigue (headache, back-ache and troubled sleep) are more frequent in the study group.

3.2.3. The Therapy

The members of the study group were treated according to the explanations in chapter 2.2.2.. Other osteopathic techniques were not applied in order to register purely the influence of the DT treatment on fatigue.

3.3. Evaluation of the Results

3.3.1. Definition of the Variables and Statistical Methods

The following information from the two questionnaires was used for the evaluation:

3.3.1.1. Raw Data

Dependent Variables: Extent of fatigue in the questionnaires (5 subscales GE, ME, MO, AC, PH and total fatigue FAT)

Independent Variable: Group with / without DT treatment

Nil hypothesis: There is no difference between the study and the control group.

Level of significance: $\alpha=0.05$

After both questionnaires the data were analyzed with mean value, standard deviation, median and Cronbach's alpha, in order to gain an overview of the extent of fatigue, it's characteristics and the internal reliability of the answers given by the participants.

Additionally, the dependent variables were tested with regard to normal distribution (Kolmogorov-Smirnov test) and subsequently, the two groups were compared by means of t-tests.

3.3.1.2. Calculated Data

In order to register the changes in fatigue between the two questionnaires two variables were calculated from the raw data. The first variable FAT_{2-1abs} represents the absolute change in fatigue which is calculated from the difference between the extent of fatigue in the second questionnaire (FAT_2) and the extent of fatigue in the first questionnaire (FAT_1):

$$FAT_{2-1abs} = FAT_2 - FAT_1$$

The second calculated value $FAT_{(2-1)/1rel}$ also takes into consideration the starting point by relating the absolute change ($FAT_2 - FAT_1$) to the initial extent of fatigue (FAT_1) as follows:

$$FAT_{(2-1)/1rel} = \frac{(FAT_2 - FAT_1)}{FAT_1} \cdot 100$$

Since higher FAT-values denote higher fatigue, improvements will result in negative values, deterioration in positive values for $FAT_{(2-1)/1rel}$ and FAT_{2-1abs} . The calculated $FAT_{(2-1)/1rel}$ and FAT_{2-1abs} values were tested for normal distribution (Kolmogorov-Smirnov-test). Since the deviation from normal distribution turned out to be too high, a u-test had to be used for the comparison of the two groups by the $FAT_{(2-1)/1rel}$ values; in the case of the FAT_{2-1abs} values a t-test could be performed.

Dependent variable: FAT_{2-1abs} and $FAT_{(2-1)/1rel}$ values

Independent Variable: Group with / without DT treatment

Nil hypothesis: There is no difference between the DT and control group

Alternative hypothesis: The fatigue is reduced in the study group after the DT treatments compared to the control group (one sided)

Level of significance: $\alpha=0.05$

The data are represented by box-and-whisker plots. Due to the small sample used, which can influence the significance of the tests, Cohen's d (COHEN, 1988, 66) was additionally calculated.

4. Results

4.1. Results of the Questionnaires

The raw data represent the basis for the evaluation of the therapeutic effect. In order to investigate the consistency and reliability, this chapter summarizes the test statistics of the results.

4.1.1. Questionnaire 1

Due to the approximate normal distribution of the data, t-tests could be performed, by which the five subscales of the MFI-20 as well as the total of the initial fatigue could be compared. It turned out that the initial fatigue situations (FAT1) of the two groups did not differ significantly ($t=0.2$, $p= .84$). This means that there are even fewer differences between the two groups than could be assumed after the evaluation of the pre-questionnaire. In the subscales the results of the t-test range between $t=1.63$, $p=0.11$ and $t= 0.06$, $p=0.96$ (cf. Table 4).

Therefore, a comparability of the two groups can be assumed.

Item	T	p	* significant difference
General Fatigue	-1,616	0,115	-
Physical Fatigue	-1,052	0,298	-
Reduced Activity	0,055	0,957	-
Reduced Motivation	-0,259	0,797	-
Mental Fatigue	1,638	0,109	-
Total Fatigue	-0,200	0,842	-

Table 4: Results of the t-tests for the fatigue (sub)scales and groups.

The table below shows means, standard deviations (SD), medians and reliability coefficients (Cronbach's alpha) of the (sub)scales (cf. Table 5).

Item	Group	Number of items	Mean	SD	Median	Alpha
General Fatigue	DT	4	52.5	20.3	50.0	0.82
	Control group	4	60.6	12.4	58.3	0.49
Physical Fatigue	DT	4	41.3	19.9	41.7	0.77
	Control group	4	47.7	21.1	45.8	0.85
Reduced Activity	DT	4	34.1	19.0	33.3	0.82
	Control group	4	33.7	23.2	37.5	0.89
Reduced Motivation	DT	4	35.1	23.4	33.3	0.82
	Control group	4	36.7	17.4	33.3	0.54
Mental Fatigue	DT	4	44.9	24.7	41.7	0.88
	control group	4	33.7	21.0	33.3	0.84
Total Fatigue	DT	4	41.6	16.9	46.7	0.84
	control group	4	42.5	13.1	40.8	0.70

Table 5: Mean, median, standard deviation and reliability coefficient of the (sub)scales.

In most cases the internal reliability of the data is higher in the test group compared to the control group. This fact might be attributed to higher motivation of the members of the study group.

The five subscales were used for the calculation of the Cronbach's alpha values for total fatigue in the table above. Higher values result in the inclusion of all ungrouped 20 questions (0.92 in the DT group and 0.86 in the control group). The calculated alpha values correspond to data found in the literature.

Furthermore and corresponding to data in the literature, it can be deduced that in both groups general fatigue contributes most to the total fatigue, whereas reduced activity has the lowest influence.

4.1.2. Questionnaire 2

Also in the second questionnaire the results largely meet the criteria of a normal distribution. Thus t-tests could be performed, which show that the DT group differs significantly in the total fatigue values (FAT2) from the control group ($t = -3.72$, $p = 0.0005$). The average fatigue in the control group is 45.7, whereas in the DT group a mean fatigue of 29.3 can be observed. No significant difference could be found in the subscale “reduced activity” only, in the other subscales significant differences could also be found (cf. Table 6).

Item	T	P	* significant
General Fatigue	-5.100	0.00001	*
Physical Fatigue	-2.546	0.015	*
Reduced Activity	-1.764	0.085	-
Reduced Motivation	-2.355	0.023	*
Mental Fatigue	-2.925	0.005	*
Total Fatigue	-3.719	0.001	*

Table 6: Results of the t-tests for the fatigue (sub)scales and groups.

The table below shows means, standard deviations (SD), medians and reliability coefficients (Cronbach's alpha) of the (sub)scales (cf. Table 7).

Item	Group	Number of items	Mean	SD	Median	Alpha
General Fatigue	DT	4	38.0	18.4	33.3	0.86
	control group	4	62.9	13.8	66.7	0.71
Physical Fatigue	DT	4	31.9	19.6	33.3	0.86
	control group	4	47.7	22.2	50.0	0.90
Reduced Activity	DT	4	23.9	20.3	16.7	0.87
	control group	4	35.2	22.7	41.7	0.90
Reduced Motivation	DT	4	26.1	17.1	25.0	0.77
	control group	4	38.6	18.6	37.5	0.71
Mental Fatigue	DT	4	26.8	18.3	25.0	0.81
	control group	4	43.9	20.9	41.7	0.89
Total Fatigue	DT	4	29.3	15.9	30.0	0.90
	control group	4	45.7	13.3	44.2	0.69

Table 7: Mean, median, standard deviation and reliability coefficient of the (sub)scales.

Also in the second questionnaire the highest values of fatigue were noted with regard to "general fatigue" and the lowest values with respect to "reduced activity" in both groups. The five subscales were used for the calculation of the Cronbach's alpha values for the total fatigue in the table above. Higher values result from the inclusion of all ungrouped 20 questions (0.94 in the DT group and 0.86 in the control group).

4.2. Changes caused by the Treatment

4.2.1. Absolute Changes in Fatigue

As can be observed from the results of the second questionnaire, fatigue in the DT group was diminished to such an extent, in contrast to the control group, that a significant statistical difference between these two groups can be observed in spite of the similar situation at the outset in the first questionnaire. A reduction in the fatigue of 21 participants (91.3%) could be observed in the DT group, whereas in the control group only 5 (22.7%) of the participants stated lower fatigue in the second questionnaire. No changes or an increase in fatigue of the other participants was noticed.

The absolute changes $FAT_2 - FAT_1$ approximately show normal distribution and significant differences between the two groups result from the t-test ($t = 4.96$, $p = 0.00003$). The mean values of the differences between the total fatigues are -12.2 ($SD = 13.6$) in the test group and $+3.2$ ($SD = 6.0$) in the control group, respectively.

The high standard deviation of the DT group data can be explained to a high extent by an outlier (participant 9), which will be dealt with in detail in chapter 5.2.2. (discussion). The results of this outlier are considered in all calculations. Cohen's $d = 1.5$ would be $d = 2.1$ without participant 9 (both values are agreed to be 'high' effects).

From the following box and whisker plot (Fig. 3) the absolute changes of total fatigue for both groups can be deduced (from top to bottom):

upper end of the whisker: 95% percentile

upper margin of the box: 75% percentile

horizontal line within the box: median

bottom margin of the box: 25% percentile

lower end of the whisker: 5% percentile

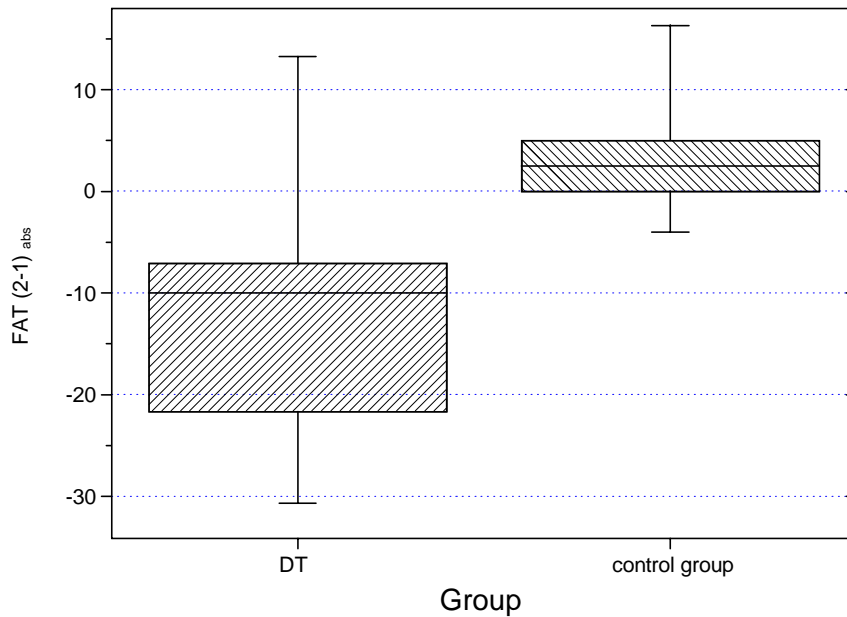


Fig. 3: Boxplot of the absolute changes of fatigue in both groups.

The absolute changes of the subscales and results of the significance tests are presented in table 8:

Group	mean	SD	test	P	significant*
Reduced Activity (AC_{2-1abs})					
DT	-10.1	14.9	U	0.001	*
control group	1.5	8.0			
General Fatigue (GE_{2-1abs})					
DT	-14,5	22.1	U	0.001	*
control group	2.3	8.2			
Reduced Motivation (MO_{2-1abs})					
DT	-9.1	14.8	T	0.007	*
control group	1.9	10.9			
Mental Fatigue (ME_{2-1abs})					
DT	-18.1	20.5	T	1*10 ⁻⁶	*
control group	10.2	11.8			
Physical Fatigue (PH_{2-1abs})					
DT	-9.4	22.2	T	0.104	-
control group	0	15.0			

Table 8: Absolute changes in the subscales and results of the significance tests.

Thus the highest absolute changes could be reached with regard to mental fatigue, the lowest with regard to physical fatigue, where no significant results could be obtained.

4.2.2. Relative Changes in Fatigue

Percental changes from the initial situation can be derived by calculation of the quotient of the observed absolute changes ($FAT_2 - FAT_1$) to the possible changes (FAT_1). By this, absolute changes which seem to be high, but which turn out to be objectively low compared to the total fatigue - can be relativized. For example, the outlier participant 9 shows an average absolute change of fatigue (compared to the control group) but relative to the initial situation of fatigue the increase turns out to be +271%.

Including the outlier, Cohen's $d = 0.6$ shows 'medium' effects, without the outlier participant 9 $d = 2.1$, indicating 'high' effects.

In the DT group changes of -23.8% ($SD=69.3$) can be observed, in the control group $+8.8\%$ ($SD=17.5$). Again, the results of the u-test demark significant differences ($p=7 \cdot 10^{-7}$). The high standard deviation (SD) can be explained by the outlier.

The following box and whisker plot (Fig. 4) shows the relative changes of total fatigue for both groups (from top to bottom):

upper end of the whisker: 95% percentile

upper margin of the box: 75% percentile

horizontal line within the box: median

bottom margin of the box: 25% percentile

lower end of the whisker: 5% percentile

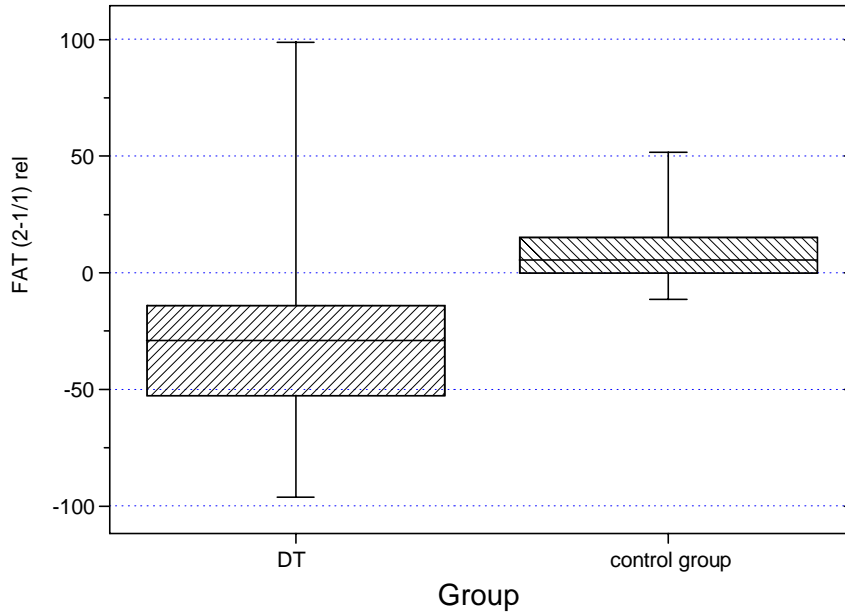


Fig. 4: Boxplot of the relative changes of fatigue in both groups.

The relative changes of the subscales and results of the significance tests are presented in table 9:

Group	N	Mean	SD	Test	p	Significant*
Reduced Activity (AC $(2-1/1)_{rel}$)						
DT	21	-32.8	40.7	U	$4 \cdot 10^{-4}$	*
control group	21	19.0	69.7			
General Fatigue (GE $(2-1/1)_{rel}$)						
DT	23	-20.8	51.7	U	$8 \cdot 10^{-4}$	*
control group	22	4.5	14.9			
Reduced Motivation (MO $(2-1/1)_{rel}$)						
DT	19	-25.9	39.9	U	0.001	*
control group	22	13.1	59.2			
Mental Fatigue (ME $(2-1/1)_{rel}$)						
DT	21	-33.1	46.5	U	$2 \cdot 10^{-6}$	*
control group	20	40.4	45.8			
Physical Fatigue (PH $(2-1/1)_{rel}$)						
DT	23	3.4	138.7	U	0.06	-
control group	22	5.0	48.6			

Table 9: Relative changes in the subscales and results of the significance tests.

Since some initial fatigue values were zero, some relative changes could not be calculated. Therefore the figure indicated in table 9 has been reduced by this value.

The highest decrease in fatigue could be observed in the category “Mental Fatigue” and the lowest on the rubric “Physical Fatigue”.

4.2.3. Additional Results

The symptoms headache, backache and troubled sleep, also collected in the questionnaires, which did not show a significant difference between the two groups in the first questionnaire, are reduced significantly in the test-group.

As can be seen in table 10, the number of these symptoms is reduced by approximately 50 percent.

Questionnaire	Headache		Backache		Sleeping problems	
	DT	Control group	DT	Control group	DT	Control group
1	15	12	17	13	12	9
2	7	16	9	13	6	10
Reduction	-53%	+33%	-47%	-	-50%	+11%

Table 10: Number of concomitant symptoms in the two questionnaires.

These data demonstrate a clear influence of the DT treatment on the concomitant symptoms of fatigue.

18 of the 23 DT participants (78.3%) consider a monthly preventive treatment as suggested, only five (21.7%) do not.

The participants would be willing to spend 45€ average per treatment, 10 persons would pay 30€, seven 60€ and one 90€ per treatment. However, no correlation between the achieved reduction in fatigue and the treatment costs could be found.

Physical changes were mentioned by 10 participants, i.e. muscle tensions, heavy hands, a stopped tinnitus, better sleep and general condition, as positive aspects, fatigue, a bleeding nose after each treatment and no relaxation during sleep as negative.

Positive psychic influences were stated by four participants. Two persons mentioned better sleep, one more motivation after the treatments and one person declared that it helped him to switch off mentally.

5. Discussion

5.1. Discussion of the Method

5.1.1. Limitations Arising from the Therapist

Since only **one single therapist** worked with both groups, the following limitations apply: The results cannot be considered as having a general application i.e. thus they do not apply to other therapists. The reproducibility and consistency and consequently the reliability of the treatment cannot be concluded from this study.

The **working environment** was unaccustomed, since the treatments took place at the participants' workplace. The treatments therefore took place in an unfamiliar environment, which might have an effect on relaxation and concentration.

Subconscious expectations, that the therapy and as such the study be successful could have caused mental pressure, which could lead to a sub-optimal treatment. An improvement in the results of the test group is, as explained above, not to be expected.

5.1.2. Limitations Arising from the Participants.

The participants were unknown to the therapist and were divided randomly into the two groups.

Criteria for exclusion from the study were known consumptive diseases, diseases of the thyroid gland, pregnancy and depression. In addition, no participants were included who had recently been on holiday or sick leave. One participant with anaemia and one with diagnosed high blood pressure were not excluded, since both conditions have been well-controlled with medication for several years, nor were menopausal or menstruating women. The corresponding data were retained for further consideration of possible abnormal results.

5.1.3. Limitations in the Design of the Study

Due to the strict time frame for the completion of this dissertation and the considerable organisation necessary to contact participants through company doctors, the scope of the examinations opted for was less far reaching than I had originally intended. This fact not only influenced the number of participants, but also the number of groups. It would, for example, be interesting to include another group to be treated with other osteopathic techniques.

Two treatments per participant are the absolute minimum in order to demonstrate the effectiveness of the treatments, since especially the first is likely to produce reactions which make the participants insecure and may influence their evaluation.

A further issue would be to examine the lasting effect of the treatments, which would require another questionnaire after a period of time.

For organisational reasons and due to the limited time frame **the originally planned placebo treatment could be not carried out** in the control group. It is therefore not possible to demonstrate the distinction between the effect of treatment and a placebo effect.

5.2. Discussion of the Results

5.2.1. Discussion of the Results of MFI-20

The results clearly show that Diagnostic Touch treatments are effective for fatigue patients (cf. Fig. 5 and 6). The two treatments achieved an average reduction of 23.8% by comparison with the original degree of fatigue, which represents a significantly better result in comparison with the control group (increase in fatigue of +8.8% over the same period of time, cf. Fig. 5). The greatest reduction was achieved in the rubric "Physical Fatigue". The internal consistency of the answers corresponds to values stated in the relevant literature.

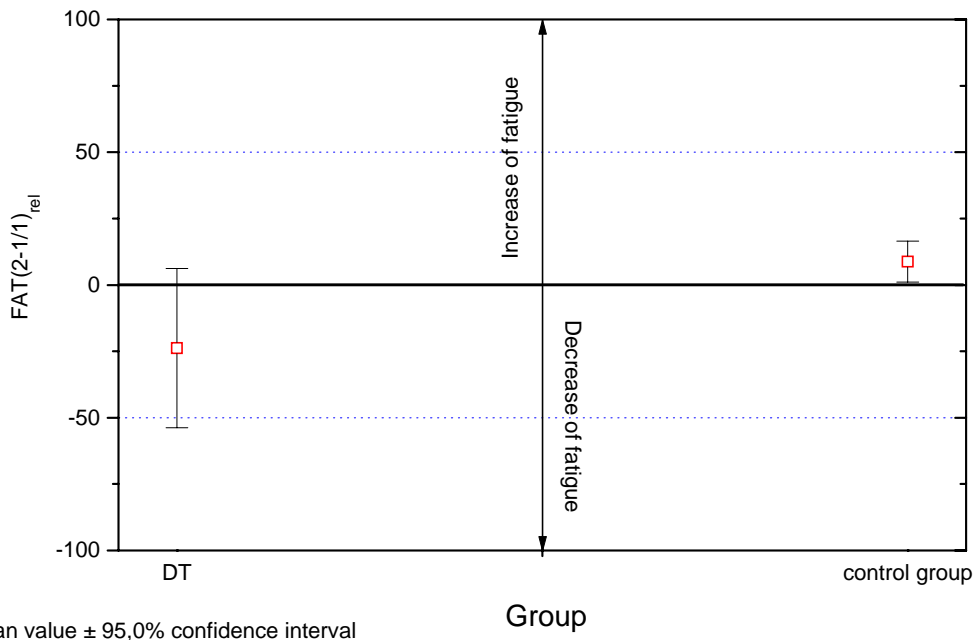


Fig. 5: Mean values of the relative change of fatigue in both groups (+/- 95% confidence interval).

Following the treatments 21 of the 23 participants (91.3%) displayed a lesser degree of fatigue than previously (Fig. 6).

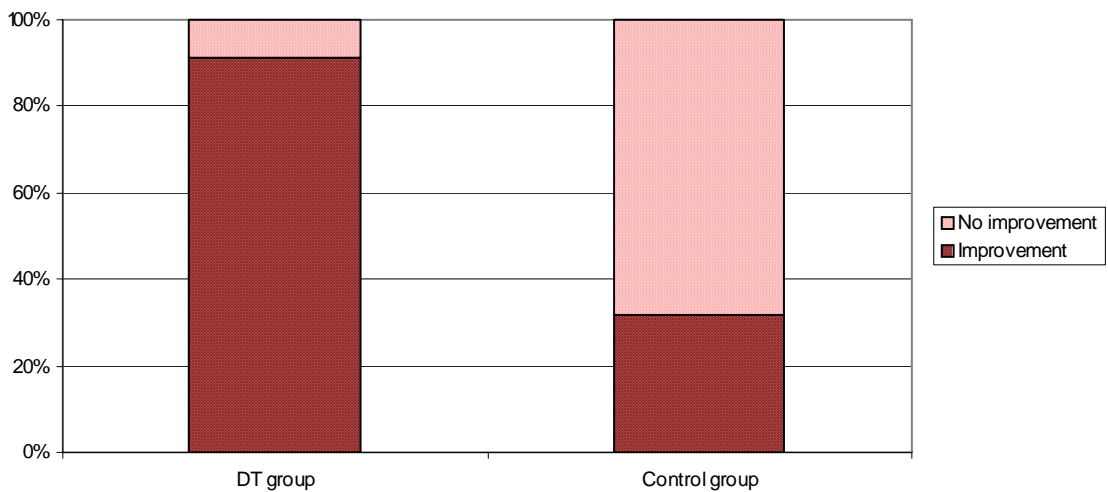


Fig. 6: Comparison of the number of participants with and without improvement of fatigue in both groups.

The appearance of attendant symptoms (headaches, back pain and sleep disorders) could be reduced by about 50%. 18 of the 23 participants in the DT-group (78.3%) consider a monthly preventive treatment to be worthwhile, only 5 did not.

Since no placebo treatments were carried out in the control group, a placebo effect cannot be excluded.

5.2.2. Discussion of Individual Cases

The two participants who displayed a worsening in fatigue were participants 1 and 9. Whilst the fatigue of participant 1 remained essentially similar with a worsening of 6.1% (worse assessment of 4 and better assessment of 2 points questioned by 1 degree in each case), participant 9 complained of utter sleeplessness following the treatments.

The change in her fatigue values was 271% by comparison with the first questionnaire, whereby primarily physical fatigue and general fatigue were affected. However, I don't attribute this immense deterioration to the technique of treatment per se. I suspect that a problem was already latent prior to the treatments, which didn't manifest itself in the initial selection process. I further suspect that abated symptoms of previously existing problems were either activated by the use of Diagnostic Touch or happened to occur by chance at the same time as the treatments. I can find no explanation for such an effect caused by the treatment alone. The participant's symptoms were normalised after several acupuncture treatments by a doctor.

The one participant with anaemia and the one with diagnosed high blood pressure showed no abnormal results which might have indicated necessary changes in their prescribed medication.

5.2.3. Discussion of the Results of the Initial Survey

From the results of questionnaire 1 (cf. chapter 4.1.1.) it can be seen that the initial survey indicates a greater discrepancy between the two groups (study and control group) than the actual questionnaire used. The questionnaire used, MFI-20, is more detailed than the initial questionnaire and demonstrates

a good and even cross-section in both groups at the first questionnaire. The use of this method for the initial selection process to obtain suitable groups of participants was therefore effective, in spite of the greater differences between the two groups.

5.2.4. Discussion of Other Changes Caused by the Therapy

I attribute the positive influence of DT technique on the symptoms of headache, back pain and sleep disorders to the fact that the use of an osteopathic technique by an osteopath is never only intended to alleviate a specific symptom; rather the patient's whole body is treated. Particularly with a functional technique, such as the cranio-sacral technique used in this study, neurological, fascial and humoral connections render many positive effects possible.

Positive psychic changes were noticed by 4 participants in the DT group (chapter 4.2.3.). These may perhaps only be positive effects due to the positive attitude and expectations of the participants towards the treatment, perhaps this is also evidence of the postulated total effect of a single osteopathic technique on body, spirit and mind.

The physical changes directly following the treatments can be considered as a typical direct compensatory reaction of the body to the treatment. I further believe that each treatment according to the intensity of its effect leads to a new, changed state of balance in the body and can thereby lead to an individual realignment in any area of the body.

6. Summary and Evaluation

In summary, the study confirms my practical experience and my hypothesis as to the osteopathic effectiveness of the Diagnostic Touch Technique in clearly reducing fatigue (chapter 4.2.). The model I use to explain this effect makes reference to the bioenergy mentioned in the study as described by Rollin Becker (2001). When psychological or physical traumas in the form of biokinetic energy are stored in the body tissues and the biodynamic energy of so-called health does not entirely succeed in freeing the body from this energy, which is stored in so-called strain-patterns, then it seems obvious to me that the body will constantly be lacking in energy for health. If such strain-patterns can be at least partially released through treatment and thereby biodynamic energy is made available in greater quantity again to the organism, one may have a plausible explanation for a reduction in ever present fatigue and an increase in resilience and subjective well-being.

The references made in chapter 2.3. to the work of Irvin Korr (1963) provide clear explanations for the physiological causal relations and effects of a treatment.

One comparable example of functional techniques is the Fluid-Impulse-Technique. With the aid of Fluid-Impulse-Techniques (e.g. Liquor Fluctuations) gentle impulses are sent via the body fluids to the part of the body to be treated. A fluid impulse can be transmitted to the sacrum or from the end of the foot on the opposite side from the malfunction. The spontaneous appearance of fluid impulses in the organism – as part of homeodynamic processes – can be used therapeutically to support healing and regulatory processes (Liem, 2006).

Further models of explanation which seem plausible to me are the Tensegrity-Model according to Fuller (1961) and models from quantum mechanics. I think that in the future many solutions to unanswered questions in these areas can be found.

Confirmation of the success of the DT technique in the treatment of fatigue by other therapists would be necessary for a generally valid statement on the effectiveness of the technique used.

In future studies on this subject it would be interesting to include a placebo group, in order to exclude placebo effects.

A greater number of participants in each group would increase the reliability of the results found here.

A long term study over several months with a varying number of treatments would be of interest. This would allow seasonally influenced fluctuations in fatigue to be more clearly distinguished making the desirability of preventive osteopathic treatments more obvious. Thus osteopathic preventive treatment could be offered as a safeguarded alternative to the large variety of partially questionable preventive health treatments available.

A control group in which each participant receives a completely individual osteopathic treatment could lead to further conclusions about preventive treatments, the effectiveness and the importance of the Diagnostic Touch technique.

The choice of treatment techniques an osteopath uses in one treatment on a particular patient should always be based on the symptoms and the current constitution of the patient. I believe however, that in a treatment which aims at a holistic concept, it is important to know which techniques have the most far-reaching effect. Thus localised techniques can be harmonised and integrated with the whole body. I view functional techniques especially from this standpoint. Therefore Diagnostic Touch has a high value amongst the osteopathic treatment techniques I use in my daily practice.

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8. Table of Illustrations

Illustration 1	TREMEL, Salzburg, 2006
Illustration 2	TREMEL, Salzburg, 2006
Illustration 3	TREMEL, Salzburg, 2006
Illustration 4	TREMEL, Salzburg, 2006

Appendix 1

Abstract

Abstract

The aim of this study is to confirm my hypothesis that “Diagnostic Touch Therapy” (DT) according to R.E. Becker (1997) brings about a reduction in fatigue.

The scope of the term fatigue in this work I define as „the state of weariness following a period of exertion, mental or physical characterised by a decreased capacity for work and reduced efficiency to respond to stimuli”.

Data concerning fatigue are collected by means of the questionnaire MFI-20. The participants recruited in one company are divided in two groups.

The 23 participants of the study group are treated twice by means of DT, the 22 participants of the control group are only asked to complete the MFI-20 (without placebo treatment) in order to register possible seasonal loads.

In the therapy I use four different positioned handholds on the patient lying supine on the couch; they are named in order of application and according to the contact area of my hands on the patient: Occiput, Scapulae, Feet and Sacrum.

The first questionnaire is filled in before the therapies, the second two weeks after the second treatment. After the second questionnaire, absolute and relative changes in fatigue are calculated for both groups. A decrease in fatigue can be deduced from the answers of 21 of the 23 participants in the DT-group (91.3%), whereas only five of the 22 members of the control group mentioned a decrease in fatigue (23.8%).

In the DT group an average relative decrease in fatigue of -23.8% ($SD=69.3$) can be observed between the two questionnaires, in the control group an average increase of fatigue of $+8.8\%$ ($SD=17.5$). Results of the u-test show significant differences ($p=7*10^{-7}$).

In addition, concomitant symptoms of fatigue, e.g. headache, backache and troubled sleep, are significantly reduced in the study-group after the two treatments.

In summary, my hypothesis is confirmed by the results obtained in this study.

Key words: Osteopathy, Fatigue, Diagnostic Touch, MFI-20

Appendix 2
Questionnaires

Appendix 2a

Pre-Questionnaire and Numerical Substitutes for the Answers

	question	possible answers	direction*	variable
General data	ID			G ID
	age	[y]		G age
	sex	male/female		G sex
	working hours per week	[h/week]		G wh w
During the last 4 weeks after a typical working day...	I feel tired and exhausted	highly/rather/hardly/not at all	+	O tired
	I feel motivated to undertake something	highly/rather/hardly/not at all	-	O mot
	I am able to concentrate	highly/rather/hardly/not at all	-	O conc
	I am active	highly/rather/hardly/not at all	-	O active

direction*	abbreviation	positive (+)	negative (-)
highly	hi	100	0
rather	r	66.7	33.3
hardly	h	33.3	66.7
not at all	n	0	100

Appendix 2b

Questionnaire MFI-20

	question	possible answers	direction*	variable
General data	ID			G ID
	age	[y]		G age
	sex	male/female		G sex
	working hours per week	[h/week]		G wh w
During the last 6 weeks I experienced...	holidays/sick-leave	yes/no		P hol
	amorousness	yes/no		P am
	grief	yes/no		P grief
	accident	yes/no		P acc
	headache	yes/no		P head
	back-ache	yes/no		P back
	troubled sleep	yes/no		P sleep
	menses	yes/no		P menses
I know about the following diagnosed diseases	hypertension	yes/no		D hypert
	chronical infection	yes/no		D infect
	thyroid disease	yes/no		D thyroid
	anaemia	yes/no		D anaem
	diabetes	yes/no		D diab
	depression	yes/no		D depr
	I have to take medicine regularly	yes/no (which medicine)		D med
General fatigue (MFI-20)	I feel fit	highly/rather/hardly/not at all	-	Ge fit
	I feel tired	highly/rather/hardly/not at all	+	Ge tired
	I am rested	highly/rather/hardly/not at all	-	Ge rested
	I tire easily	highly/rather/hardly/not at all	+	Ge tiring
Physical fatigue (MFI-20)	Physically I feel only able to do a little	highly/rather/hardly/not at all	+	Ph do little
	Physically I can take on a lot	highly/rather/hardly/not at all	-	Ph do lot
	Physically I feel I am in a bad condition	highly/rather/hardly/not at all	+	Ph b c
	Physically I feel I am in an excellent condition	highly/rather/hardly/not at all	-	Ph exc c
Reduced activity (MFI-20)	I feel very active	highly/rather/hardly/not at all	-	Ac active
	I think that I do a lot in a day	highly/rather/hardly/not at all	-	Ac do lot
	I think that I do very little in a day	highly/rather/hardly/not at all	+	Ac do little
	I get only little done	highly/rather/hardly/not at all	+	Ac little
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	highly/rather/hardly/not at all	-	Mo all
	I dread having to do things	highly/rather/hardly/not at all	+	Mo dread
	I have a lot of plans	highly/rather/hardly/not at all	-	Mo plans
	I do not feel like doing anything	highly/rather/hardly/not at all	+	Mo nothing
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	highly/rather/hardly/not at all	-	Me keep
	I can concentrate well	highly/rather/hardly/not at all	-	Me conc
	It takes me a lot of effort to concentrate	highly/rather/hardly/not at all	+	Me effort
	My thoughts wander easily	highly/rather/hardly/not at all	+	Me wander
For the last 4 weeks I encountered	physical changes	yes/no (description)		Ch phys
	psychic changes	yes/no (description)		Ch psych
	changes in health	yes/no (description)		Ch health
Prevention	I consider a monthly preventive treatment as meaningful	yes/no		G prevention
	For a monthly treatment I would pay ...	0-30-60-90-120€		O costs
During the last 4 weeks after a typical working day...	I feel tired and exhausted	highly/rather/hardly/not at all		O tired
	I feel motivated to undertake something	highly/rather/hardly/not at all		O mot
	I am able to concentrate	highly/rather/hardly/not at all		O conc
	I am active	highly/rather/hardly/not at all		O active
Diagnostical tests	systolical blood pressure	[mm]		T BP sys
	diasystolical blood pressure	[mm]		T BP dia
	pulse			T pulse
	global listening (standing)			T GL standing
	global listening (sitting)			T GL sitting
	global listening (abdominal)			T GL abdom

direction*	abbreviation	positive (+)	negative (-)
highly	hi	100	0
rather	r	66.7	33.3
hardly	h	33.3	66.7
not at all	n	0	100

Appendix 3

Table of Results

Appendix 3a

Table of Results

Questionnaire 1 DT-Group

DT/Q1	Probationer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
General data	ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	age	55	29	32	51	31	37	50	50	38	55	36	48	41	36	47	31
	sex	m	f	f	m	f	m	f	m	f	m	m	f	m	f	m	m
	working hours per week	40	45	55	40	55	42	50	55	40	62	60	50	50	25	55	60
During the last 4 weeks after a typical working day...	I feel tired and exhausted	r	r	hi	h	hi	r	r	n	h	r	r	r	h	r	r	h
	I feel motivated to undertake something	h	h	h	hi	h	hi	h	h	r	h	h	h	n	h	h	r
	I am able to concentrate	r	h	h	hi	h	r	hi	h	r	r	h	r	h	r	r	hi
	I am active	h	h	h	h	n	h	h	n	h	h	h	h	n	h	h	hi
During the last 6 weeks I experienced...	holidays	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	amorousness	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	grief	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	accident	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	headache	n	y	n	n	y	n	n	n	n	y	y	y	y	y	n	y
	back-ache	y	y	y	n	y	y	n	n	n	y	n	y	y	y	y	y
	troubled sleep	y	n	y	n	n	y	y	n	n	n	y	n	n	n	y	n
	menses		n	n		n		y		n				n		n	
I know about the following diagnosed diseases	hypertension	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n
	chronical infection	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	thyroid disease	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	anaemia	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	diabetes	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	depression	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	I have to take medicine regularly *	n	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n
General fatigue (MFI-20)	I feel fit	h	h	h	hi	h	n	h	r	r	r	r	r	r	r	r	r
	I feel tired	r	r	hi	n	hi	hi	r	h	h	h	hi	h	r	h	h	h
	I am rested	h	n	h	r	h	h	n	r	r	r	r	r	h	r	r	r
	I tire easily	h	hi	h	h	hi	h	r	h	n	r	h	h	h	n	h	h
Physical fatigue (MFI-20)	Physically I feel only able to do a little	h	r	h	n	r	h	r	h	n	h	h	h	n	r	n	
	Physically I can take on a lot	r	h	r	r	h	h	h	r	hi	r	r	hi	r	hi	r	
	Physically I feel I am in a bad condition	h	r	r	h	r	h	n	r	n	h	h	n	h	hi	r	
	Physically I feel I am in an excellent condition	n	h	h	r	h	h	r	h	r	r	h	hi	r	n	h	
Reduced activity (MFI-20)	I feel very active	h	h	h	h	r	h	r	n	hi	h	n	hi	h	h	h	
	I think that I do a lot in a day	h	h	hi	r	hi	hi	r	r	hi	hi	r	hi	r	r	r	
	I think that I do very little in a day	r	r	n	n	h	n	h	h	n	n	n	n	h	h	h	
	I get only little done	r	r	n	h	h	h	h	h	n	n	h	n	r	h	h	
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	h	n	h	r	h	hi	n	h	hi	hi	hi	hi	h	r	h	
	I dread having to do things	r	r	h	n	r	n	n	r	n	n	n	n	h	hi	h	
	I have a lot of plans	h	h	r	r	hi	r	h	h	hi	hi	hi	hi	r	hi	hi	
	I do not feel like doing anything	h	r	r	h	h	h	h	r	n	n	h	n	r	n	h	
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	r	h	r	hi	r	r	r	h	r	hi	h	hi	h	r	h	
	I can concentrate well	r	h	h	r	r	r	r	h	r	hi	h	hi	h	r	h	
	It takes me a lot of effort to concentrate	r	r	r	h	h	r	r	r	n	n	hi	n	r	hi		
	My thoughts wander easily	h	hi	h	hi	r	h	hi	hi	h	r	hi	n	r	hi		

* Medicine

pill

against hypertension

DT/Q1	Probationer	19	301	302	303	304	305	307
General data	ID	19	301	302	303	304	305	307
	age	38	29	40	35	38	52	29
	sex	m	f	m	m	m	f	f
	working hours per week	50	43	55	40	47	40	20
During the last 4 weeks after a typical working day...	I feel tired and exhausted	hi	r	r	h	r	r	r
	I feel motivated to undertake something	h	h	r	r	h	h	r
	I am able to concentrate	h	r	r	r	h	r	hi
	I am active	r	h	h	r	r	n	h
During the last 6 weeks I experienced...	holidays	n	n	n	n	n	n	n
	amorousness	n	n	n	n	n	n	n
	grief	n	n	n	n	n	n	n
	accident	n	n	n	n	n	n	n
	headache	y	n	n	y	n	y	y
	back-ache	n	y	n	y	y	n	n
	troubled sleep	n	n	y	n	y	y	n
menses		n				n	n	
I know about the following diagnosed diseases	hypertension	n	n	n	n	n	n	n
	chronical infection	n	n	n	n	n	n	n
	thyroid disease	n	n	n	n	n	n	n
	anaemia	n	n	n	n	n	n	n
	diabetes	n	n	n	n	n	n	n
	depression	n	n	n	n	n	n	n
	I have to take medicine regularly *	y	n	n	n	n	n	n
General fatigue (MFI-20)	I feel fit	r	h	h	r	r	h	h
	I feel tired	r	hi	r	h	r	r	r
	I am rested	h	h	h	r	h	h	h
	I tire easily	h	hi	h	r	r	r	r
Physical fatigue (MFI-20)	Physically I feel only able to do a little	n	r	h	n	h	r	r
	Physically I can take on a lot	r	h	r	hi	r	h	r
	Physically I feel I am in a bad condition	h	r	h	h	h	r	r
	Physically I feel I am in an excellent condition	r	n	r	hi	r	h	h
Reduced activity (MFI-20)	I feel very active	r	h	h	r	h	h	h
	I think that I do a lot in a day	hi	r	h	hi	r	r	r
	I think that I do very little in a day	n	n	r	n	h	h	h
	I get only little done	h	n	r	h	h	h	h
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	r	h	r	r	h	h	r
	I dread having to do things	n	h	h	h	h	r	h
	I have a lot of plans	r	r	r	h	h	h	r
	I do not feel like doing anything	n	r	h	h	r	r	h
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	hi	h	hi	hi	h	r	r
	I can concentrate well	r	h	hi	hi	h	h	r
	It takes me a lot of effort to concentrate	h	r	h	h	r	r	h
	My thoughts wander easily	h	r	h	h	r	r	h

* Medicine

asthmaspray

Appendix 3b

Table of Results

Questionnaire 2 DT-Group

DT/Q2	Probationer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
General data	ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	age	55	29	32	51	31	37	50	50	38	55	36	48	41	36	47	31
	sex	m	f	f	m	f	m	f	m	f	m	m	f	m	f	m	m
	working hours per week	40	45	55	40	55	42	50	55	40	62	60	50	50	25	55	60
During the last 6 weeks I experienced...	holidays	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	amorousness	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	grief	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	accident	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	headache	n	n	n	n	n	n	n	n	n	y	n	y	y	y	n	n
	back-ache	y	n	y	n	y	n	n	n	n	n	n	y	y	n	y	n
	troubled sleep	y	n	y	n	n	n	n	n	y	n	n	n	n	n	y	n
	menses		n	n			n		n		n		n		n		
I know about the following diagnosed diseases	hypertension	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n
	chronical infection	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	thyroid disease	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	anaemia	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	diabetes	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	depression	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	I have to take medicine regularly*	n	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n
General fatigue	I feel fit	h	h	h	hi	r	h	h	r	h	r	r	hi	r	r	hi	r
	I feel tired	r	r	r	n	h	h	h	r	h	r	r	n	r	h	h	n
	I am rested	h	h	h	r	r	h	r	r	h	hi	r	hi	h	r	h	r
	I tire easily	r	r	h	n	h	h	h	h	r	n	h	n	h	h	h	n
Physical fatigue	Physically I feel only able to do a little	r	r	h	n	h	h	n	h	h	n	h	n	h	n	h	n
	Physically I can take on a lot	r	h	r	hi	r	h	hi	r	h	r	hi	hi	r	hi	hi	r
	Physically I feel I am in a bad condition	r	r	r	n	h	h	h	r	r	h	h	n	n	n	h	n
	Physically I feel I am in an excellent condition	n	h	h	hi	h	h	r	h	h	r	h	hi	hi	hi	r	r
Reduced activity	I feel very active	h	h	h	hi	r	h	r	h	r	r	h	hi	r	hi	h	hi
	I think that I do a lot in a day	h	h	hi	hi	r	hi	r	r	hi	hi	hi	hi	r	hi	h	hi
	I think that I do very little in a day	r	r	n	n	h	n	n	h	n	n	n	n	h	n	r	n
	I get only little done	r	h	n	n	h	n	n	h	n	n	n	n	h	n	h	n
Reduced motivation	I feel like doing all sorts of nice things	h	h	h	hi	r	r	r	r	r	r	hi	hi	r	hi	h	hi
	I dread having to do things	h	r	n	n	h	h	n	r	n	n	n	n	h	r	h	n
	I have a lot of plans	h	r	h	hi	r	r	r	h	r	hi	hi	hi	r	r	hi	hi
	I do not feel like doing anything	r	r	h	n	h	h	n	h	h	n	h	n	h	n	h	n
Mental fatigue	When I am doing something I can keep my thoughts on it	r	h	r	hi	r	hi	r	h	r	hi	hi	hi	r	r	r	hi
	I can concentrate well	r	h	r	hi	r	hi	r	r	h	hi	hi	hi	r	r	r	hi
	It takes me a lot of effort to concentrate	r	r	h	n	h	h	n	h	r	n	h	n	h	r	h	n
	My thoughts wander easily	n	r	h	n	r	n	h	h	r	h	h	n	h	r	h	n

DT/Q2	Probationer	19	301	302	303	304	305	307
General data	ID	19	301	302	303	304	305	306
	age	38	29	40	35	38	52	29
	sex	m	f	m	m	m	f	f
	working hours per week	50	43	55	40	47	40	20
During the last 6 weeks I experienced...	holidays	n	n	n	n	n	n	n
	amorousness	n	n	n	n	n	n	n
	grief	n	n	n	n	n	n	n
	accident	n	n	n	n	n	n	n
	headache	y	n	n	n	y	n	y
	back-ache	n	y	n	y	y	n	n
	troubled sleep	n	n	y	n	y	n	n
menses		n				n	n	
I know about the following diagnosed diseases	hypertension	n	n	n	n	n	n	n
	chronical infection	n	n	n	n	n	n	n
	thyroid disease	n	n	n	n	n	n	n
	anaemia	n	n	n	n	n	n	n
	diabetes	n	n	n	n	n	n	n
	depression	n	n	n	n	n	n	n
	I have to take medicine regularly*	y	n	n	n	n	n	n
General fatigue	I feel fit	r	hi	r	r	r	r	r
	I feel tired	r	h	h	h	r	h	h
	I am rested	h	r	r	r	h	r	hi
	I tire easily	h	h	h	h	r	h	h
Physical fatigue	Physically I feel only able to do a little	h	h	h	h	h	h	h
	Physically I can take on a lot	r	r	r	r	r	r	hi
	Physically I feel I am in a bad condition	h	h	h	n	h	h	h
	Physically I feel I am in an excellent condition	r	r	r	hi	h	r	r
Reduced activity	I feel very active	r	r	r	hi	h	r	r
	I think that I do a lot in a day	hi	hi	r	r	h	r	hi
	I think that I do very little in a day	n	n	h	n	h	h	h
	I get only little done	n	n	h	h	h	h	h
Reduced motivation	I feel like doing all sorts of nice things	r	r	r	r	r	r	hi
	I dread having to do things	n	h	h	h	h	h	h
	I have a lot of plans	hi	r	r	r	r	r	hi
	I do not feel like doing anything	n	n	h	n	h	h	h
Mental fatigue	When I am doing something I can keep my thoughts on it	hi	r	hi	hi	h	r	hi
	I can concentrate well	r	r	hi	hi	r	r	hi
	It takes me a lot of effort to concentrate	n	h	h	h	r	h	h
	My thoughts wander easily	h	h	h	h	hi	n	h

DT/Q2	Probationer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
For the last 4 weeks I encountered	physical changes**	n	y	n	n	y	n	y	n	y	y	n	y	y	n	n	n
	psychic changes***	n	n	n	n	n	n	n	n	y	n	y	n	n	n	n	n
	changes in health ****	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n
Prevention	I consider a monthly preventive treatment as meaningful	n	n	y	y	y	y	y	y	n	y	y	y	y	n	y	y
	For a monthly treatment I would pay (0-30-60-90-120 Euro)			30	30	30	30	30	60	n	60	30	30	60		60	60
Diagnostical tests	systolical blood pressure	135	118	109	133	109	118	126	133	114	133	132	118	137	136	128	133
	diasystolical blood pressure	81	72	64	78	61	77	77	85	65	82	79	74	85	89	71	77
	pulse	69	86	65	92	64	66	72	74	74	56	74	82	57	68	64	74
	global listening (standing)	li	d	ant	d	d	li/v	li	d	li	d	d	d	-	re	-	d
	global listening (sitting)	d	d	li	0	-	-	li	d	li	0	0	-	-	-	-	d
	global listening (abdominal)	0	0	-	-	-	-	-	0	-	0	-	-	-	-	re	0

* Medicine

** description of physical changes

*** description of psychic changes

**** description of changes in health

pill	against hypertension	
muscle tension	fatigue	heavy hands
	no relaxation during sleep	bleeding nose
	tired	switching off of mind
	tired	
		(no comments)

DT/Q2	Probationer	19	301	302	303	304	305	307
For the last 4 weeks I encountered	physical changes**	n	y	n	y	n	n	y
	psychic changes***	n	y	y	n	n	y	n
	changes in health ****	n	n	n	n	n	n	n
Prevention	I consider a monthly preventive treatment as meaningful	y	y	y	y	y	n	y
	For a monthly treatment I would pay (0-30-60-90-120 Euro)	30	60	30	30	60		90
Diagnostical tests	systolical blood pressure	139	119	108	142	139	120	122
	diasystolical blood pressure	88	73	60	78	83	69	75
	pulse	71	78	73	75	60	62	72
	global listening (standing)	li	-	d	d	-	li	-
	global listening (sitting)	0	-	-	li	re	0	li
	global listening (abdominal)	0	-	li	-	-	0	-

* Medicine

** description of physical changes

*** description of psychic changes

**** description of changes in health

asthmaspray

sleep
much
better

more
motivat
ion

Tinnitus
stopped

very
good
sleep

feel
better

Appendix 3c

Table of Results

Questionnaire 1 Control-Group

control/Q1	Probationer	201	202	203	204	205	207	208	209	211	212	213	215	217	218	219	
General data	ID	201	202	203	204	205	207	208	209	211	212	213	215	217	218	219	
	age	29	40	35	38	52	29	25	24	32	37	34	32	35	25	52	
	sex	f	m	m	m	f	f	f	m	f	m	m	m	m	m	m	m
	working hours per week	43	55	40	47	40	20	20	38	40	48	40	47	48	48	48	42
During the last 4 weeks after a typical working day...	I feel tired and exhausted	r	r	h	r	r	r	h	r	r	r	r	r	h	r	r	
	I feel motivated to undertake something	h	h	r	h	n	h	r	h	r	h	r	r	r	h	h	
	I am able to concentrate	h	r	hi	h	h	r	h	r	h	r	r	r	r	hi	r	
	I am active	h	h	r	r	h	h	r	h	hi	h	r	h	r	h	h	
During the last 6 weeks I experienced...	holidays	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	amorousness	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	
	grief	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	
	accident	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	headache	y	n	y	n	n	y	n	y	y	n	n	y	n	n	y	
	back-ache	y	n	n	y	n	n	n	n	y	y	y	y	y	n	y	
	troubled sleep	n	y	n	y	y	n	n	n	y	y	n	y	n	n	n	
menses	n					n	n	n	n								
I know about the following diagnosed diseases	hypertension	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	chronical infection	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	thyroid disease	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	anaemia	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	
	diabetes	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	depression	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	I have to take medicine regularly *	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	
General fatigue (MFI-20)	I feel fit	h	h	r	r	h	h	h	r	r	r	h	h	r	r	h	
	I feel tired	r	r	h	r	r	r	r	r	r	h	r	r	h	r	r	
	I am rested	h	h	r	h	r	h	h	r	h	h	n	n	r	h	h	
	I tire easily	hi	h	r	r	r	r	r	h	hi	r	r	r	r	r	r	
Physical fatigue (MFI-20)	Physically I feel only able to do a little	r	h	n	h	h	h	r	r	n	hi	n	h	h	r	h	
	Physically I can take on a lot	h	r	hi	r	r	r	h	r	r	n	r	r	r	r	h	
	Physically I feel I am in a bad condition	r	h	h	h	h	r	r	h	n	h	n	r	h	h	r	
	Physically I feel I am in an excellent condition	n	h	r	h	r	h	n	r	r	h	r	h	r	r	h	
Reduced activity (MFI-20)	I feel very active	h	n	hi	h	r	h	h	r	r	h	hi	r	hi	h	h	
	I think that I do a lot in a day	r	h	hi	r	r	r	r	r	hi	r	hi	hi	hi	h	h	
	I think that I do very little in a day	h	r	n	h	h	h	r	h	n	h	n	n	h	r	r	
	I get only little done	h	r	h	h	h	h	hi	h	n	h	n	n	n	h	r	
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	h	h	r	h	r	r	h	r	r	h	r	r	r	h	h	
	I dread having to do things	h	h	h	h	h	h	r	h	n	h	n	n	h	n	r	
	I have a lot of plans	r	r	r	h	r	r	r	r	hi	h	hi	r	hi	r	h	
	I do not feel like doing anything	r	h	h	r	h	h	r	h	n	h	n	h	r	h	r	
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	r	hi	hi	h	hi	r	h	r	r	hi	r	h	r	hi	r	
	I can concentrate well	r	hi	hi	h	hi	r	n	r	r	r	r	r	r	hi	r	
	It takes me a lot of effort to concentrate	h	n	n	r	h	n	hi	r	h	h	r	r	h	n	h	
	My thoughts wander easily	r	h	h	r	r	r	hi	r	h	hi	r	n	h	n	h	

control/Q1	Probationer	220	221	222	223	224	225	227
General data	ID	220	221	222	223	224	225	227
	age	29	36	32	36	28	35	56
	sex	f	m	f	m	f	f	m
	working hours per week	45	62	46	46	45	39	50
During the last 4 weeks after a typical working day...	I feel tired and exhausted	hi	r	hi	r	h	r	r
	I feel motivated to undertake something	h	r	h	h	r	r	h
	I am able to concentrate	r	r	r	r	r	r	r
	I am active	h	hi	h	h	r	h	h
During the last 6 weeks I experienced...	holidays	n	n	n	n	n	n	n
	amorousness	y	n	n	n	n	n	n
	grief	n	n	n	n	n	n	n
	accident	n	n	n	n	n	n	n
	headache	y	y	y	n	y	y	n
	back-ache	n	y	y	y	y	y	n
	troubled sleep	y	n	y	y	n	n	n
menses	n		n		n	n		
I know about the following diagnosed diseases	hypertension	n	n	n	n	n	n	n
	chronical infection	n	n	n	n	n	n	n
	thyroid disease	n	n	n	n	n	n	n
	anaemia	n	n	n	n	n	n	n
	diabetes	n	n	n	n	n	n	n
	depression	n	n	n	n	n	n	n
I have to take medicine regularly *	n	n	n	n	n	n	n	
General fatigue (MFI-20)	I feel fit	h	h	h	r	h	h	r
	I feel tired	hi	r	hi	h	r	r	r
	I am rested	n	n	h	r	r	h	n
	I tire easily	r	h	r	r	h	h	h
Physical fatigue (MFI-20)	Physically I feel only able to do a little	r	n	h	n	r	hi	r
	Physically I can take on a lot	h	r	r	r	h	h	r
	Physically I feel I am in a bad condition	hi	h	r	h	r	r	r
	Physically I feel I am in an excellent condition	n	r	h	r	h	h	h
Reduced activity (MFI-20)	I feel very active	h	r	h	r	h	h	h
	I think that I do a lot in a day	r	hi	r	hi	r	h	hi
	I think that I do very little in a day	n	n	h	n	n	r	n
	I get only little done	r	n	h	n	n	r	n
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	h	hi	r	hi	r	r	hi
	I dread having to do things	n	h	n	h	r	hi	n
	I have a lot of plans	n	hi	hi	r	hi	hi	r
	I do not feel like doing anything	r	n	hi	hi	r	r	n
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	r	r	hi	r	hi	r	hi
	I can concentrate well	r	r	r	r	r	r	hi
	It takes me a lot of effort to concentrate	h	h	n	h	h	h	n
	My thoughts wander easily	h	h	h	r	h	h	n

Appendix 3d

Table of Results

Questionnaire 2 Control-Group

control/Q2	Probationer	201	202	203	204	205	207	208	209	211	212	213	215	217	218	219	
General data	ID	201	202	203	204	205	207	208	209	211	212	213	215	217	218	219	
	age	29	40	35	38	52	29	25	24	32	37	34	32	35	25	52	
	sex	f	m	m	m	f	f	f	m	f	m	m	m	m	m	m	m
	working hours per week	43	55	40	47	40	20	20	38	40	48	40	47	48	48	42	
During the last 6 weeks I experienced...	holidays	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	amorousness	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	
	grief	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	accident	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	headache	y	n	y	n	y	y	y	y	y	y	n	y	y	y	y	
	back-ache	y	n	n	y	n	n	n	n	y	y	y	y	y	y	y	
	troubled sleep	n	y	n	y	y	n	y	n	y	n	n	y	n	n	n	
	menses	n				n	n	n		n							
I know about the following diagnosed diseases	hypertension	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	chronical infection	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	thyroid disease	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	anaemia	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	diabetes	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	depression	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	
	I have to take medicine regularly*	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	
General fatigue	I feel fit	h	h	r	r	h	h	h	h	r	h	h	h	r	r	h	
	I feel tired	hi	r	h	r	r	r	r	r	h	r	hi	r	h	r	r	
	I am rested	h	h	r	h	h	h	h	h	h	h	n	h	r	h	h	
	I tire easily	hi	h	r	r	r	r	r	h	hi	r	hi	r	r	r	r	
Physical fatigue	Physically I feel only able to do a little	r	h	n	h	r	r	h	r	h	r	h	r	n	hi	h	
	Physically I can take on a lot	h	r	hi	r	h	r	r	r	r	h	r	r	r	r	h	
	Physically I feel I am in a bad condition	r	h	h	h	r	r	h	r	h	r	h	h	h	h	r	
	Physically I feel I am in an excellent condition	n	r	hi	r	h	h	h	h	r	h	r	r	r	r	h	
Reduced activity	I feel very active	h	h	r	h	h	h	h	h	r	h	hi	r	r	h	h	
	I think that I do a lot in a day	r	h	hi	r	r	r	h	r	hi	r	hi	hi	r	h	h	
	I think that I do very little in a day	n	r	n	h	h	h	r	h	n	h	n	n	h	r	r	
	I get only little done	n	r	h	h	h	h	hi	h	n	h	n	n	h	h	r	
Reduced motivation	I feel like doing all sorts of nice things	h	r	r	h	h	r	h	r	r	h	hi	r	r	r	r	
	I dread having to do things	h	h	h	h	r	h	r	h	h	r	n	n	h	n	r	
	I have a lot of plans	r	r	h	h	h	r	h	r	hi	r	hi	r	hi	hi	h	
	I do not feel like doing anything	r	h	h	r	r	h	r	h	h	r	n	r	h	h	r	
Mental fatigue	When I am doing something I can keep my thoughts on it	h	hi	hi	h	r	r	h	r	h	r	r	h	r	r	h	
	I can concentrate well	h	hi	hi	h	h	r	n	r	h	r	r	h	r	r	h	
	It takes me a lot of effort to concentrate	r	h	h	r	r	h	hi	r	r	h	hi	r	h	h	r	
	My thoughts wander easily	r	h	h	r	r	h	hi	r	r	r	r	h	h	n	h	

control/Q2	Probationer	220	221	222	223	224	225	227
General data	ID	220	221	222	223	224	225	227
	age	29	36	32	36	28	35	56
	sex	f	m	f	m	f	f	m
	working hours per week	45	62	46	46	45	39	50
During the last 6 weeks I experienced...	holidays	n	n	n	n	n	n	n
	amorousness	y	n	n	n	n	n	n
	grief	n	n	n	n	n	n	n
	accident	n	n	n	n	n	n	n
	headache	y	n	y	n	y	y	n
	back-ache	y	y	y	n	y	n	n
	troubled sleep	y	n	y	y	y	n	n
menses	n		n		n	n		
I know about the following diagnosed diseases	hypertension	n	n	n	n	n	n	n
	chronical infection	n	n	n	n	n	n	n
	thyroid disease	n	n	n	n	n	n	n
	anaemia	n	n	n	n	n	n	n
	diabetes	n	n	n	n	n	n	n
	depression	n	n	n	n	n	n	n
I have to take medicine regularly*	n	n	n	n	n	n	n	
General fatigue	I feel fit	h	h	h	r	r	h	r
	I feel tired	hi	r	r	r	h	r	r
	I am rested	n	n	h	h	h	h	h
	I tire easily	hi	h	r	h	h	r	h
Physical fatigue	Physically I feel only able to do a little	r	n	r	n	r	r	r
	Physically I can take on a lot	h	hi	h	r	h	h	r
	Physically I feel I am in a bad condition	hi	n	r	h	r	r	h
	Physically I feel I am in an excellent condition	n	hi	h	r	n	h	h
Reduced activity	I feel very active	n	r	h	r	h	h	h
	I think that I do a lot in a day	r	hi	r	hi	hi	h	hi
	I think that I do very little in a day	n	n	h	n	n	r	n
	I get only little done	r	n	h	n	n	r	n
Reduced motivation	I feel like doing all sorts of nice things	h	hi	r	hi	r	r	hi
	I dread having to do things	h	h	h	h	r	hi	h
	I have a lot of plans	h	hi	r	hi	r	hi	r
	I do not feel like doing anything	h	n	r	hi	h	hi	n
Mental fatigue	When I am doing something I can keep my thoughts on it	h	r	r	r	r	r	hi
	I can concentrate well	h	r	r	r	r	r	hi
	It takes me a lot of effort to concentrate	h	h	h	h	h	h	n
	My thoughts wander easily	h	h	h	r	h	h	n

Appendix 3e

Table of Results

Calculated Values DT -Group

		Probationer															
DT/Q1	Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		DT	DT	DT	DT	DT	DT	DT	DT	DT	DT	DT	DT	DT	DT	DT	DT
General fatigue (MFI-20)	I feel fit	66.67	66.67	66.67	0.00	66.67	100.00	66.67	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33
	I feel tired	66.67	66.67	100.00	0.00	100.00	100.00	66.67	33.33	33.33	33.33	100.00	33.33	66.67	33.33	33.33	33.33
	I am rested	66.67	100.00	66.67	33.33	66.67	66.67	100.00	33.33	33.33	33.33	33.33	33.33	66.67	33.33	33.33	33.33
	I tire easily	33.33	100.00	33.33	33.33	100.00	33.33	66.67	33.33	0.00	66.67	33.33	33.33	33.33	0.00	33.33	33.33
Physical fatigue (MFI-20)	Physically I feel only able to do a little	33.33	66.67	33.33	0.00	66.67	33.33	66.67	33.33	0.00	33.33	33.33	33.33	33.33	0.00	66.67	0.00
	Physically I can take on a lot	33.33	66.67	33.33	33.33	66.67	66.67	66.67	33.33	0.00	33.33	33.33	0.00	33.33	0.00	33.33	33.33
	Physically I feel I am in a bad condition	33.33	66.67	66.67	33.33	66.67	33.33	0.00	66.67	0.00	33.33	33.33	0.00	33.33	100.00	66.67	0.00
	Physically I feel I am in an excellent condition	100.00	66.67	66.67	33.33	66.67	66.67	33.33	66.67	33.33	33.33	33.33	66.67	0.00	33.33	100.00	66.67
Reduced activity (MFI-20)	I feel very active	66.67	66.67	66.67	66.67	33.33	66.67	33.33	100.00	0.00	66.67	100.00	0.00	66.67	66.67	66.67	33.33
	I think that I do a lot in a day	66.67	66.67	0.00	33.33	0.00	0.00	33.33	33.33	0.00	0.00	33.33	0.00	33.33	33.33	33.33	33.33
	I think that I do very little in a day	66.67	66.67	0.00	0.00	33.33	0.00	33.33	33.33	0.00	0.00	0.00	0.00	33.33	33.33	33.33	33.33
	I get only little done	66.67	66.67	0.00	33.33	33.33	33.33	33.33	33.33	0.00	0.00	33.33	0.00	66.67	33.33	33.33	0.00
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	66.67	100.00	66.67	33.33	66.67	0.00	100.00	66.67	0.00	0.00	0.00	0.00	66.67	33.33	66.67	0.00
	I dread having to do things	66.67	66.67	33.33	0.00	66.67	0.00	0.00	66.67	0.00	0.00	0.00	0.00	33.33	100.00	33.33	0.00
	I have a lot of plans	66.67	66.67	33.33	33.33	0.00	33.33	66.67	66.67	0.00	0.00	0.00	0.00	33.33	0.00	0.00	0.00
	I do not feel like doing anything	33.33	66.67	66.67	33.33	33.33	33.33	33.33	66.67	0.00	0.00	33.33	0.00	66.67	0.00	33.33	0.00
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	33.33	66.67	33.33	0.00	33.33	33.33	33.33	66.67	33.33	0.00	66.67	0.00	66.67	33.33	66.67	0.00
	I can concentrate well	33.33	66.67	66.67	33.33	33.33	33.33	33.33	66.67	33.33	0.00	66.67	0.00	66.67	33.33	66.67	0.00
	It takes me a lot of effort to concentrate	66.67	66.67	66.67	33.33	33.33	66.67	66.67	66.67	0.00	0.00	100.00	0.00	66.67	100.00	66.67	0.00
	My thoughts wander easily	33.33	100.00	33.33	100.00	66.67	33.33	100.00	100.00	33.33	66.67	100.00	0.00	66.67	100.00	66.67	0.00
Calculated values Q1	General fatigue (total)	58.33	83.33	66.67	16.67	83.33	75.00	75.00	33.33	25.00	41.67	50.00	33.33	50.00	25.00	33.33	33.33
	Physical fatigue (total)	50.00	66.67	50.00	25.00	66.67	50.00	41.67	50.00	8.33	33.33	41.67	8.33	33.33	50.00	58.33	16.67
	Reduced activity (total)	66.67	66.67	16.67	33.33	25.00	25.00	33.33	50.00	0.00	16.67	41.67	0.00	50.00	41.67	41.67	25.00
	Reduced motivation (total)	58.33	75.00	50.00	25.00	41.67	16.67	50.00	66.67	0.00	0.00	8.33	0.00	50.00	33.33	33.33	0.00
	Mental fatigue (total)	41.67	75.00	50.00	41.67	41.67	41.67	58.33	75.00	25.00	16.67	83.33	0.00	66.67	66.67	66.67	0.00
	Total fatigue (Q1)	55.00	73.33	46.67	28.33	51.67	41.67	51.67	55.00	11.67	21.67	45.00	8.33	50.00	43.33	46.67	15.00

		Probationer	19	301	302	303	304	305	307
DT/Q1	Group	DT	DT	DT	DT	DT	DT	DT	DT
General fatigue (MFI-20)	I feel fit	33.33	66.67	66.67	33.33	33.33	66.67	66.67	66.67
	I feel tired	66.67	100.00	66.67	33.33	66.67	66.67	66.67	66.67
	I am rested	66.67	66.67	66.67	33.33	66.67	66.67	66.67	66.67
	I tire easily	33.33	100.00	33.33	66.67	66.67	66.67	66.67	66.67
Physical fatigue (MFI-20)	Physically I feel only able to do a little	0.00	66.67	33.33	0.00	33.33	66.67	66.67	66.67
	Physically I can take on a lot	33.33	66.67	33.33	0.00	33.33	66.67	33.33	33.33
	Physically I feel I am in a bad condition	33.33	66.67	33.33	33.33	33.33	66.67	66.67	66.67
	Physically I feel I am in an excellent condition	33.33	100.00	33.33	0.00	33.33	66.67	66.67	66.67
Reduced activity (MFI-20)	I feel very active	33.33	66.67	66.67	33.33	66.67	66.67	66.67	66.67
	I think that I do a lot in a day	0.00	33.33	66.67	0.00	33.33	33.33	33.33	33.33
	I think that I do very little in a day	0.00	0.00	66.67	0.00	33.33	33.33	33.33	33.33
	I get only little done	33.33	0.00	66.67	33.33	33.33	33.33	33.33	33.33
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	33.33	66.67	33.33	33.33	66.67	66.67	66.67	33.33
	I dread having to do things	0.00	33.33	33.33	33.33	33.33	66.67	66.67	33.33
	I have a lot of plans	33.33	33.33	33.33	66.67	66.67	66.67	33.33	33.33
	I do not feel like doing anything	0.00	66.67	33.33	33.33	66.67	66.67	66.67	33.33
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	0.00	66.67	0.00	0.00	66.67	33.33	33.33	33.33
	I can concentrate well	33.33	66.67	0.00	0.00	66.67	66.67	33.33	33.33
	It takes me a lot of effort to concentrate	33.33	66.67	33.33	33.33	66.67	66.67	33.33	33.33
	My thoughts wander easily	33.33	66.67	33.33	33.33	66.67	66.67	33.33	33.33
Calculated values Q1	General fatigue (total)	50.00	83.33	58.33	41.67	58.33	66.67	66.67	66.67
	Physical fatigue (total)	25.00	75.00	33.33	8.33	33.33	66.67	58.33	58.33
	Reduced activity (total)	16.67	25.00	66.67	16.67	41.67	41.67	41.67	41.67
	Reduced motivation (total)	16.67	50.00	33.33	41.67	58.33	66.67	66.67	33.33
	Mental fatigue (total)	25.00	66.67	16.67	16.67	66.67	58.33	33.33	33.33
	Total fatigue (Q1)	26.67	60.00	41.67	25.00	51.67	60.00	46.67	46.67

	Probationer	19	301	302	303	304	305	307
DT/Q2								
General fatigue (MFI-20)	I feel fit	33.33	0.00	33.33	33.33	33.33	33.33	33.33
	I feel tired	66.67	33.33	33.33	33.33	66.67	33.33	33.33
	I am rested	66.67	33.33	33.33	33.33	66.67	33.33	0.00
	I tire easily	33.33	33.33	33.33	33.33	66.67	33.33	33.33
Physical fatigue (MFI-20)	Physically I feel only able to do a little	33.33	33.33	33.33	33.33	33.33	33.33	33.33
	Physically I can take on a lot	33.33	33.33	33.33	33.33	33.33	33.33	0.00
	Physically I feel I am in a bad condition	33.33	33.33	33.33	0.00	33.33	33.33	33.33
	Physically I feel I am in an excellent condition	33.33	33.33	33.33	0.00	66.67	33.33	33.33
Reduced activity (MFI-20)	I feel very active	33.33	33.33	33.33	0.00	66.67	33.33	33.33
	I think that I do a lot in a day	0.00	0.00	33.33	33.33	66.67	33.33	0.00
	I think that I do very little in a day	0.00	0.00	33.33	0.00	33.33	33.33	33.33
	I get only little done	0.00	0.00	33.33	33.33	33.33	33.33	33.33
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	33.33	33.33	33.33	33.33	33.33	33.33	0.00
	I dread having to do things	0.00	33.33	33.33	33.33	33.33	33.33	33.33
	I have a lot of plans	0.00	33.33	33.33	33.33	33.33	33.33	0.00
	I do not feel like doing anything	0.00	0.00	33.33	0.00	33.33	33.33	33.33
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	0.00	33.33	0.00	0.00	66.67	33.33	0.00
	I can concentrate well	33.33	33.33	0.00	0.00	33.33	33.33	0.00
	It takes me a lot of effort to concentrate	0.00	33.33	33.33	33.33	66.67	33.33	33.33
	My thoughts wander easily	33.33	33.33	33.33	33.33	1.00	0.00	33.33
Calculated values Q2	General fatigue (total)	50.00	25.00	33.33	33.33	58.33	33.33	25.00
	Physical fatigue (total)	33.33	33.33	33.33	16.67	41.67	33.33	25.00
	Reduced activity (total)	8.33	8.33	33.33	16.67	50.00	33.33	25.00
	Reduced motivation (total)	8.33	25.00	33.33	25.00	33.33	33.33	16.67
	Mental fatigue (total)	16.67	33.33	16.67	16.67	41.92	25.00	16.67
	Total fatigue (Q2)	23.33	25.00	30.00	21.67	45.05	31.67	21.67
Calculated values	FAT 2-1	-3.33	-35.00	-11.67	-3.33	-6.62	-28.33	-25.00
	FAT (2-1)/1	-12.50	-58.33	-28.00	-13.33	-12.81	-47.22	-53.57
Calculated values (subscales)	GE 2-1	0.00	-58.33	-25.00	-8.33	0.00	-33.33	-41.67
	PH 2-1	8.33	-41.67	0.00	8.33	8.33	-33.33	-33.33
	AC 2-1	-8.33	-16.67	-33.33	0.00	8.33	-8.33	-16.67
	MO 2-1	-8.33	-25.00	0.00	-16.67	-25.00	-33.33	-16.67
	ME 2-1	-8.33	-33.33	0.00	0.00	-24.75	-33.33	-16.67
	GE (2-1)/1	0.00	-70.00	-42.86	-20.00	0.00	-50.00	-62.50
	PH (2-1)/1	33.33	-55.56	0.00	100.00	25.00	-50.00	-57.14
	AC (2-1)/1	-50.00	-66.67	-50.00	0.00	20.00	-20.00	-40.00
	MO (2-1)/1	-50.00	-50.00	0.00	-40.00	-42.86	-50.00	-50.00
ME (2-1)/1	-33.33	-50.00	0.00	0.00	-37.13	-57.14	-50.00	

no value due to zero in Q1

Appendix 3f

Table of Results

Calculated Values Control -Group

		201	202	203	204	205	207	208	209	211	212	213	215	217	218	219
control/Q1	Probationer															
	Group	cg	cg	cg	cg	cg	cg	cg	cg	cg	cg	cg	cg	cg	cg	cg
General fatigue (MFI-20)	I feel fit	66.67	66.67	33.33	33.33	66.67	66.67	66.67	33.33	33.33	33.33	66.67	66.67	33.33	33.33	66.67
	I feel tired	66.67	66.67	33.33	66.67	66.67	66.67	66.67	66.67	66.67	33.33	66.67	66.67	33.33	66.67	66.67
	I am rested	66.67	66.67	33.33	66.67	33.33	66.67	66.67	33.33	66.67	66.67	100.00	100.00	33.33	66.67	66.67
	I tire easily	100.00	33.33	66.67	66.67	66.67	66.67	66.67	33.33	100.00	66.67	66.67	66.67	66.67	66.67	66.67
Physical fatigue (MFI-20)	Physically I feel only able to do a little	66.67	33.33	0.00	33.33	33.33	33.33	66.67	66.67	0.00	100.00	0.00	33.33	33.33	66.67	33.33
	Physically I can take on a lot	66.67	33.33	0.00	33.33	33.33	33.33	66.67	33.33	33.33	100.00	33.33	33.33	33.33	33.33	66.67
	Physically I feel I am in a bad condition	66.67	33.33	33.33	33.33	33.33	66.67	66.67	33.33	0.00	33.33	0.00	66.67	33.33	33.33	66.67
	Physically I feel I am in an excellent condition	100.00	66.67	33.33	66.67	33.33	66.67	100.00	33.33	33.33	66.67	33.33	66.67	33.33	33.33	66.67
Reduced activity (MFI-20)	I feel very active	66.67	100.00	0.00	66.67	33.33	66.67	66.67	33.33	33.33	66.67	0.00	33.33	0.00	66.67	66.67
	I think that I do a lot in a day	33.33	66.67	0.00	33.33	33.33	33.33	33.33	33.33	0.00	33.33	0.00	0.00	0.00	66.67	66.67
	I think that I do very little in a day	33.33	66.67	0.00	33.33	33.33	33.33	66.67	33.33	0.00	33.33	0.00	0.00	33.33	66.67	66.67
	I get only little done	33.33	66.67	33.33	33.33	33.33	33.33	100.00	33.33	0.00	33.33	0.00	0.00	0.00	33.33	66.67
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	66.67	66.67	33.33	66.67	33.33	33.33	66.67	33.33	33.33	66.67	33.33	33.33	33.33	66.67	66.67
	I dread having to do things	33.33	33.33	33.33	33.33	33.33	33.33	66.67	33.33	0.00	33.33	0.00	0.00	33.33	0.00	66.67
	I have a lot of plans	33.33	33.33	33.33	66.67	33.33	33.33	33.33	33.33	0.00	66.67	0.00	33.33	0.00	33.33	66.67
	I do not feel like doing anything	66.67	33.33	33.33	66.67	33.33	33.33	66.67	33.33	0.00	33.33	0.00	33.33	66.67	33.33	66.67
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	33.33	0.00	0.00	66.67	0.00	33.33	66.67	33.33	33.33	0.00	33.33	66.67	33.33	0.00	33.33
	I can concentrate well	33.33	0.00	0.00	66.67	0.00	33.33	100.00	33.33	33.33	33.33	33.33	33.33	33.33	0.00	33.33
	It takes me a lot of effort to concentrate	33.33	0.00	0.00	66.67	33.33	0.00	100.00	66.67	33.33	33.33	66.67	66.67	33.33	0.00	33.33
	My thoughts wander easily	66.67	33.33	33.33	66.67	66.67	66.67	100.00	66.67	33.33	100.00	66.67	0.00	33.33	0.00	33.33
Calculated values Q1	General fatigue (total)	75.00	58.33	41.67	58.33	58.33	66.67	66.67	41.67	66.67	50.00	75.00	75.00	41.67	58.33	66.67
	Physical fatigue (total)	75.00	41.67	16.67	41.67	33.33	50.00	75.00	41.67	16.67	75.00	16.67	50.00	33.33	41.67	58.33
	Reduced activity (total)	41.67	75.00	8.33	41.67	33.33	41.67	66.67	33.33	8.33	41.67	0.00	8.33	8.33	58.33	66.67
	Reduced motivation (total)	50.00	41.67	33.33	58.33	33.33	33.33	58.33	33.33	8.33	50.00	8.33	25.00	33.33	33.33	66.67
	Mental fatigue (total)	41.67	8.33	8.33	66.67	25.00	33.33	91.67	50.00	33.33	41.67	50.00	41.67	33.33	0.00	33.33
	Total fatigue (Q1)	56.67	45.00	21.67	53.33	36.67	45.00	71.67	40.00	26.67	51.67	30.00	40.00	30.00	38.33	58.33

		Probationer	220	221	222	223	224	225	227
control/Q1	Group		cg	cg	cg	cg	cg	cg	cg
General fatigue (MFI-20)	I feel fit	66.67	66.67	66.67	33.33	66.67	66.67	33.33	
	I feel tired	100.00	66.67	100.00	33.33	66.67	66.67	66.67	
	I am rested	100.00	100.00	66.67	33.33	33.33	66.67	100.00	
	I tire easily	66.67	33.33	66.67	66.67	33.33	33.33	33.33	
Physical fatigue (MFI-20)	Physically I feel only able to do a little	66.67	0.00	33.33	0.00	66.67	100.00	66.67	
	Physically I can take on a lot	66.67	33.33	33.33	33.33	66.67	66.67	33.33	
	Physically I feel I am in a bad condition	100.00	33.33	66.67	33.33	66.67	66.67	66.67	
	Physically I feel I am in an excellent condition	100.00	33.33	66.67	33.33	66.67	66.67	66.67	
Reduced activity (MFI-20)	I feel very active	66.67	33.33	66.67	33.33	66.67	66.67	66.67	
	I think that I do a lot in a day	33.33	0.00	33.33	0.00	33.33	66.67	0.00	
	I think that I do very little in a day	0.00	0.00	33.33	0.00	0.00	66.67	0.00	
	I get only little done	66.67	0.00	33.33	0.00	0.00	66.67	0.00	
Reduced motivation (MFI-20)	I feel like doing all sorts of nice things	66.67	0.00	33.33	0.00	33.33	33.33	0.00	
	I dread having to do things	0.00	33.33	0.00	33.33	66.67	100.00	0.00	
	I have a lot of plans	100.00	0.00	0.00	33.33	0.00	0.00	33.33	
	I do not feel like doing anything	66.67	0.00	100.00	100.00	66.67	66.67	0.00	
Mental fatigue (MFI-20)	When I am doing something I can keep my thoughts on it	33.33	33.33	0.00	33.33	0.00	33.33	0.00	
	I can concentrate well	33.33	33.33	33.33	33.33	33.33	33.33	0.00	
	It takes me a lot of effort to concentrate	33.33	33.33	0.00	33.33	33.33	33.33	0.00	
	My thoughts wander easily	33.33	33.33	33.33	66.67	33.33	33.33	0.00	
Calculated values Q1	General fatigue (total)	83.33	66.67	75.00	41.67	50.00	58.33	58.33	
	Physical fatigue (total)	83.33	25.00	50.00	25.00	66.67	75.00	58.33	
	Reduced activity (total)	41.67	8.33	41.67	8.33	25.00	66.67	16.67	
	Reduced motivation (total)	58.33	8.33	33.33	41.67	41.67	50.00	8.33	
	Mental fatigue (total)	33.33	33.33	16.67	41.67	25.00	33.33	0.00	
	Total fatigue (Q1)	60.00	28.33	43.33	31.67	41.67	56.67	28.33	

Probationer	220	221	222	223	224	225	227
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control/Q2

General fatigue (MFI-20)	I feel fit	66.67	66.67	66.67	33.33	33.33	66.67	33.33
	I feel tired	100.00	66.67	66.67	66.67	33.33	66.67	66.67
	I am rested	100.00	100.00	66.67	66.67	66.67	66.67	66.67
	I tire easily	100.00	33.33	66.67	33.33	33.33	66.67	33.33
Physical fatigue (MFI-20)	Physically I feel only able to do a little	66.67	0.00	66.67	0.00	66.67	66.67	66.67
	Physically I can take on a lot	66.67	0.00	66.67	33.33	66.67	66.67	33.33
	Physically I feel I am in a bad condition	100.00	0.00	66.67	33.33	66.67	66.67	33.33
	Physically I feel I am in an excellent condition	100.00	0.00	66.67	33.33	100.00	66.67	66.67
Reduced activity (MFI-20)	I feel very active	100.00	33.33	66.67	33.33	66.67	66.67	66.67
	I think that I do a lot in a day	33.33	0.00	33.33	0.00	0.00	66.67	0.00
	I think that I do very little in a day	0.00	0.00	33.33	0.00	0.00	66.67	0.00
Reduced motivation (MFI-20)	I get only little done	66.67	0.00	33.33	0.00	0.00	66.67	0.00
	I feel like doing all sorts of nice things	66.67	0.00	33.33	0.00	33.33	33.33	0.00
	I dread having to do things	33.33	33.33	33.33	33.33	66.67	100.00	33.33
	I have a lot of plans	66.67	0.00	33.33	0.00	33.33	0.00	33.33
Mental fatigue (MFI-20)	I do not feel like doing anything	33.33	0.00	66.67	100.00	33.33	100.00	0.00
	When I am doing something I can keep my thoughts on it	66.67	33.33	33.33	33.33	33.33	33.33	0.00
	I can concentrate well	66.67	33.33	33.33	33.33	33.33	33.33	0.00
	It takes me a lot of effort to concentrate	33.33	33.33	33.33	33.33	33.33	33.33	0.00
Calculated values Q2	My thoughts wander easily	33.33	33.33	33.33	66.67	33.33	33.33	0.00
	General fatigue (total)	91.67	66.67	66.67	50.00	41.67	66.67	50.00
	Physical fatigue (total)	83.33	0.00	66.67	25.00	75.00	66.67	50.00
	Reduced activity (total)	50.00	8.33	41.67	8.33	16.67	66.67	16.67
	Reduced motivation (total)	50.00	8.33	41.67	33.33	41.67	58.33	16.67
	Mental fatigue (total)	50.00	33.33	33.33	41.67	33.33	33.33	0.00
Calculated values	Total fatigue (Q2)	65.00	23.33	50.00	31.67	41.67	58.33	26.67
	FAT 2-1	5.00	-5.00	6.67	0.00	0.00	1.67	-1.67
Calculated values (subscales)	FAT (2-1)/1	8.33	-17.65	15.38	0.00	0.00	2.94	-5.88
	GE 2-1	8.33	0.00	-8.33	8.33	-8.33	8.33	-8.33
	PH 2-1	0.00	-25.00	16.67	0.00	8.33	-8.33	-8.33
	AC 2-1	8.33	0.00	0.00	0.00	-8.33	0.00	0.00
	MO 2-1	-8.33	0.00	8.33	-8.33	0.00	8.33	8.33
	ME 2-1	16.67	0.00	16.67	0.00	8.33	0.00	0.00
	GE (2-1)/1	0.10	0.00	-0.11	0.20	-0.17	0.14	-0.14
	PH (2-1)/1	0.00	-1.00	0.33	0.00	0.12	-0.11	-0.14
	AC (2-1)/1	0.20	0.00	0.00	0.00	-0.33	0.00	0.00
	MO (2-1)/1	-0.14	0.00	0.25	-0.20	0.00	0.17	1.00
	ME (2-1)/1	0.50	0.00	1.00	0.00	0.33	0.00	

no value due to zero in Q1