

**Does OMT of the autonomic nervous
system outflow areas affect IBS-
symptoms?
a randomised controlled trial (RCT)**

Thesis to attain the title:

Master of Science

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I. Summary/Abstract

Background (2)

IBS is classified as a functional disorder of motility in the small and large intestines. 10-20% of the general population is affected by this disorder, predominantly women and imbalance of the ANS seems to be one important factor in the pathophysiology. Osteopaths claim, by treatment, to be able to influence the ANS and that is why this RCT is devoted to examine if there will be any difference in IBS-symptoms between a control-group and a treatment group when the ANS is treated with OMT.

Methods (2)

RCT design with 28 people in an intervention group and 25 people in a control group. Performed 3 treatments in the treatment group and 3 measurements were taken with 4 weeks interval between occasions in both groups. Nine IBS-symptoms measured on a VAS-scale 0-10. Symptoms measured: abdominal pain, abdominal cramps, borborygmia, diarrhoea, constipation, bloating, flatulence, feeling of incomplete evacuation and presence of mucus in feces. Treatments performed with OMT were directed to the anatomical outflow areas of the ANS.

Results (1)

There were a statistical significans for the IBS symptom abdominal cramps, borborygmia, diarrhoea and constipation in the treatment group and prescence of mucus in feces in the control group when comparing between the two groups. Nearly all individual IBS symptoms improved aswell both within the control group and within the treatment group when comparing T2-T0. The only significant difference in result between the two osteopathic centers were in the control group for the IBS symptom constipation which did reach a statistical significans.

Conclusion (1)

OMT of the ANS outflow areas can be helpful for people with IBS.

Keywords

Irritable bowel syndrome, IBS, osteopathy, treatment, autonomic nervous system

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V. List of abbreviations

ANS = Autonomic nervous system
CNS = Central nervous system
ENS = Enteric nervous system
FBDSI = Functional bowel disorder severity index
FM = Fibromyalgia
GI-tract = Gastrointestinal tract
HC = Healthy controls
HPA = Hypothalamic Pituitary Axis
HR = Heart rate
HRV = Heart rate variability
HSP = Highly sensitive person
IBS = Irritable bowel syndrome
MAP = Mean arterial pressure
OMT = Osteopathic manipulative treatment
PNS = Peripheral nervous system
PSNS = Parasympathetic nervous system
RCT = Randomised controlled trial
SNS = Sympathetic nervous system
VAS = Visual analogue scale

1 Introduction (2)

The irritable bowel syndrome (IBS) is classified as a functional disorder of motility in the small and large intestines and has been called the common cold of the stomach because of its high prevalence in the general population. It is called a functional disorder because the abnormal muscle contractions of the intestines identified in people with IBS cannot be attributed to any identifiable abnormality of the bowel (Goodman *et al*, Snyder, 2000). Studies have shown that approximately between 10% and 20% of the general population is affected by this disorder, predominantly women. In the age interval between 20-50 years the prevalence is greatest. The prevalence is higher in unmarried compared to married individuals and also in unemployed compared to employed individuals (Andrews *et al*, 2005; Camilleri *et al*, 2002). IBS is not at all a life threatening condition, however, it can be very distressing for the patient and currently, the medical practitioners have no solution to the problem (Marcer *et al* Parsons, 2006). Patients suffering from IBS often have non-gastrointestinal somatic symptoms and most experienced clinicians tend to use a holistic approach to diagnosis, observing features beyond the gut like previous history of medically unexplained symptoms, behavior, lethargy, headache, backproblems, dyspareunia and urinary symptoms (Whitehead *et al*, 2002). This knowledge is important for the doctor making the diagnosis since these features are often accompanied by IBS and the patient can avoid unnecessary examinations and referring to different specialties (Spiller, 2007). Emotional or psychologic responses to stress have a profound effect on brain chemistry, which in turn influences the enteric nervous system (Mayer, 1995). Although there is little evidence to support stress as cause, it is often implicated as an exacerbating factor (Sapolsky, 1998). Patients with IBS are known to have a higher incidence of mood disturbances, anxiety, depression, somatisation disorders, and psychologic distress (Manabe *et al*, 2009).

IBS is a very complex syndrome and is believed to originate from a combination of dysmotility, visceral hypersensitivity, mucosal immune dysregulation, alterations of bacterial flora, and Central nervous system (CNS) - Enteric nervous system (ENS) dysregulation. The contribution of these factors may vary across different individuals or within the same individual over time (Drossman, 2006).

Defecatory disturbance in IBS can be diarrhoea or constipation and in some cases the two alternate over time. In pathophysiology research and clinical trials, a pain/discomfort frequency of at least 2 days a week during screening evaluation is recommended for subject eligibility (Drossman, 2006). There are no clear biological markers existing for IBS but visceral hypersensitivity is one of several supposed biomarkers, a considerable amount of IBS patients prove to have increased sensitivity to stretching force of the wall of the intestine in the recto-sigmoid area and this hypersensitivity seems to extend all the way up to the esophagus (Manabe *et al*, 2009; Wood, 2013). The pathophysiology of IBS is still clouded by many obscurities but it has been suggested that the autonomic nervous system (ANS), via neurological pathways of the ENS, is involved in the alteration of visceral sensitivity and that the CNS, via the same pathways, can influence secretory activity and motility of the gastrointestinal tract (GI-tract), to augment this suggestion subtle abnormalities in the ANS has also been found as an underlying factor in IBS patients (Manabe *et al*, 2009). In a bachelorthesis by one of the authors to this study, there is scientific support presented that show autonomic dysfunction in IBS-patients, but whether this is a cause or a consequence of the disease stands yet to be answered. Unclear is also which part of the ANS that is dominant, but most studies point to an increased sympathetic dominance. The reason of these divided researchresults is probably due to the fact that many different factors can affect IBS (Särnbäck, 2014). In this masterthesis the authors will take the investigation of IBS one step further and evaluate if, and how, IBS-symptoms will be affected by osteopathic manipulative treatment (OMT) in a randomised controlled trial (RCT) where the outflow-areas of the ANS will be addressed.

2 Background

2.1 The IBS diagnosis (2)

Most IBS patients have abdominal pain or discomfort intermittently, with flares lasting 2–4 days. Other symptoms include bloating, abnormal stool frequency, and abnormal defaecation (Hahn *et al*, 1998). Patients can be subdivided according to stool consistency into: (1) IBS with constipation, in which patients have hard stools more than 25% of the time and loose stools less than 25% of the time; (2) IBS with diarrhoea, with loose stools more than 25% of the time and hard stools less than 25% of the time; and (3) IBS-mixed, with both hard and soft stools more than 25% of the time. Around a third of the patients have functional dyspepsia and many IBS patients also experience their symptoms to get aggravated by meals. Patients can shift (about 33%) from one subtype to another over months or years and these are called alternators (Spiller, 2007). Henry D Janowitz, a U.S. gastroenterologist and a pioneer in establishing this field, who was president of the American Gastroenterological Association and played a major role in founding the Crohn's and Colitis Foundation of America, lists in his book the symptoms of IBS, based on his years of clinical experience as: a) abdominal pain relieved by having a bowel movement; b) looser and more frequent bowel movements associated with the abdominal pain; c) bloated and distended abdomen or a feeling that the abdomen is swollen; d) a sensation that the bowel is not completely emptied after a movement. He also states that the predominant symptoms of IBS are abnormal defaecation and abdominal pain and that these symptoms might get worse if the patient is subdued to emotional or physical stress (Janowitz, 1989).

The diagnosis IBS were traditionally based on the absence of any other abdominal pathology but as a development of this the Manning criteria were created:

Manning criteria for irritable bowel syndrome:

- Pain relieved by defecation
- More frequent stools at the onset of pain
- Looser stools at the onset of pain
- Visible abdominal distension

- Passage of mucus
- Sensation of incomplete evacuation (Camilleri *et al*, 2002)

As further development of the Manning criteria different versions of the Rome criteria were created. Today there are three versions of Rome criteria: Rome I, Rome II and Rome III. Rome IV criteria is expected to be released in 2016.

Rome III criteria for irritable bowel syndrome:

Recurrent abdominal pain or discomfort* at least 3 days/month in the last 3 months associated with *two or more* of the following:

1. Relieved with defecation; and/or
2. Onset associated with a change in frequency of stool; and/or
3. Onset associated with a change in form (appearance) of stool

Criterion fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis

* "Discomfort" means an uncomfortable sensation not described as pain.

The Rome criteria were created to facilitate for the clinician to make a diagnosis of irritable bowel syndrome without having to put the patient through invasive diagnostic procedures and expensive, time-consuming examinations. When the so called "red flags" (nocturnal symptoms, rectal bleeding, abdominal abnormalities on physical examination, fever, anemia, weight loss, family history of colon cancer) are ruled out, the specificity of diagnosing with these criteria are high, even as high as 98 % according to studies (Vanner *et al*, 1999).

2.2 The basic organisation of the nervous system (2)

Understanding neurology is fundamental for understanding the pathophysiology of IBS hence a brief description of the nervous system follows.

The function of the nervous system is to control and regulate many body activities both locally and globally in the body. It acts rapidly and enables the body to react

to constantly ongoing changes of its internal and external environments (Marcer *et al* Parsons, 2006).

The nervous system is separated into two structural divisions:

- Central nervous system: brain and spinal cord
- Peripheral nervous system (PNS): somatic, autonomic, and enteric nerves in the periphery

Functionally the nervous system is divided in the autonomic, somatic and enteric nervous system. The interaction between these different functional parts of the nervous system is mainly what osteopathy affect when treating patients (Marcer *et al* Parsons, 2006). The PNS is constructed of nerve cells which are afferent (sensory) and send information to the CNS via the dorsal horn of the spinal cord, or efferent (motor) which sends impulses from the CNS or ganglia (collections of neurons outside the CNS) to target (effector) cells; somatic efferent axons (nerve cells) target skeletal muscle and visceral efferent axons target smooth muscle, cardiac muscle, and glands. These impulses exit the spinal cord via the ventral horn and through a spinal nerve (Netter *et al*, 2010). From the spinal cord exit 31 pairs of spinal nerves and from the brain and brainstem exit 12 cranial nerves, when the nerve impulse enters these it has left the CNS and is located in the PNS. The cranial nerves have some unique functions and can be both somatic and visceral (Netter *et al*, 2010).

The somatic nervous system consists of sensory and motor fibers to skin, skeletal muscles and joints. The ANS has components in both the CNS and the PNS, the major autonomic components of the CNS include the limbic forebrain, hypothalamus, several brainstem nuclei and the intermediolateral cell column of the spinal cord (Chila *et al*, 2011). The autonomic components of the PNS include numerous ganglia (collections of neuron cell bodies located outside of the CNS) and a network of fibers distributed to all tissues of the body with the exception of the hyaline cartilages, the centers of the intervertebral disks, and the parenchymal tissues of the CNS (Chila *et al*, 2011). ANS is divided into a sympathetic branch (sympathetic nervous system, SNS) and a parasympathetic branch (parasympathetic nervous system, PSNS) and these two branches consist of sensory and motor fibers to all

smooth muscle (including viscera and vasculature), cardiac muscle (heart) and glands (Netter *et al*, 2010). ANS is a two-neuron system with a preganglionic neuron in the CNS that sends its axon into a peripheral nerve to synapse (connect) on a postganglionic neuron in a peripheral autonomic ganglion. This two-neuron system does not exist in the somatic nervous system where there is only one neuron that stretches all the way from the spinal cord to the effector cell (skin, skeletal muscle or joint). The postganglionic neuron then sends its axon to the target (smooth muscle, cardiac muscle, and glands). The ANS is a visceral system, since many of the body's organs are composed of smooth muscle walls or contain secretory glandular tissue (Chila *et al*, 2011).

The SNS has two major components: vascular and visceral. The innervation of fascia, smooth muscle of vasculature and hair follicles plus secretory sweat glands in the skin is made by the vascular component and the nerve impulses is sent via the spinal nerves. The visceral component innervates smooth muscle of the gut, cardiac muscle, nodal tissue and glandular organs of the thoracic, abdominal, pelvic and perineal viscera (Chila *et al*, 2011). In the SNS preganglionic neurons only exist in the T1-L2 spinal cord level; hence the sympathetic nervous system is also known as the thoracolumbar outflow (Marcer *et Parsons*, 2006). The preganglionic axon leaves the spinal cord via a ventral root, and then enters a spinal nerve and continues via a white ramus communicans to enter the sympathetic chain. The sympathetic chain, which also can be called the sympathetic trunk, is a bilateral chain of ganglia just lateral to the vertebral bodies that run from the base of the skull to the coccyx, the location of these ganglia near the vertebrae has given them the name of the paravertebral ganglia (Chila *et al*, 2011). When the preganglionic axon has entered the sympathetic chain it can behave differently and has four options: They may synapse at that level with a postganglionic fibre that will then pass on to its target viscus. They may pass through the ganglion without synapsing and pass to a sympathetic ganglion closer to their target viscus where they will synapse with a postganglionic fibre. They may ascend or descend within the sympathetic chain and synapse at a level different to their exit level. They may ascend or descend within the sympathetic chain without synapsing and then exit to pass to a sympathetic ganglion closer to their target viscus where they will synapse (Netter *et al*, 2010). It is by ascending or descending in the sympathetic

chain that the preganglionic fibers can reach areas of the spine that anatomically lie above and below T1 and L2 levels, meaning the cervical, lower lumbar and sacral regions. When the axon leaves the sympathetic chain it can either go back to a spinal nerve or go via a splanchnic (visceral) nerve to reach its final destination (Marcer *et Parsons*, 2006). Axons of preganglionic fibres that go straight through the sympathetic chain into the body and create ganglia, the para aortic ganglia, the coeliac, mesenteric and hypogastric ganglia are the biggest ones and together they are called the prevertebral ganglia (Marcer *et Parsons*, 2006).

The parasympathetic nervous system is also a two-neuron system with its preganglionic neuron in the CNS and postganglionic neuron in a peripheral ganglion, the preganglionic axons are to be found in cranial nerves 3,7,9 and 10 and in the sacral spinal cord at the level of S2-S4, hence the neurons lie in the cranial nuclei associated with the mentioned cranial nerves and in the lateral gray matter of the spinal cord at levels S2-S4 (Netter *et al*, 2010). Because of the cranial and sacral location of the outflow of the preganglionic neurons in the PSNS it is also called the craniosacral outflow (Marcer *et Parsons*, 2006). A difference compared to the SNS is that the PSNS only innervates visceral organs and blood vessels in the head, neck, thorax, abdomen and pelvis, hence the PSNS does not innervate the peripheral vasculature of the extremities and trunk (Chila *et al*, 2011). Preganglionic parasympathetic axons (with exception of cranial nerve no.10 - the vagusnerve) may either pass to a peripheral ganglion in the head (ciliary, pterygopalatine, submandibular, and otic ganglia) and synapse to a postganglionic neuron which in turn innervates smooth muscle and glands of the head, or the axons exit the sacral spinal cord via a ventral root and enter the pelvic splanchnic nerves to synapse on postganglionic neurons in terminal ganglia located in or near the viscera to be innervated and afterwards pass to its effector cell (Netter *et al*, 2010). The vagus nerve is different compared to the other parasympathetic cranial nerves, its preganglionic fibers innervate ganglia in the wall of the organs of the cervical, thoracic, and superior portions of the GI-tract approximately down to the splenic flexure of the colon and from these ganglia postganglionic fibers innervate the smooth muscle layers and glands of the organ (Chila *et al*, 2011). The vagal preganglionic axons takes its course via the celiac ganglia and the superior mesenteric ganglia to reach its terminal organ and the pelvic splanchnics route goes through the infe-

rior hypogastric plexus (pelvic plexus), which is located in the endopelvic fascia. Through this plexus, the preganglionic axons can reach the visceral organs of the pelvic basin such as the urinary bladder, the internal reproductive organs, and the rectum whereas the inferior mesenteric plexus is passed to reach the descending and sigmoid colon (Netter *et al*, 2010).

Broadly, the function of the ANS is that the SNS prepares the body systems for action which includes sending more blood to the skeletal muscles whereas the PSNS has a more calming role where the body prioritises digestion etc. (Marcer *et Parsons*, 2006).

The enteric nervous system is originally considered as a part of the autonomic nervous system but nowadays it is usually said that to be plexuses and ganglia of the gastrointestinal tract that regulate bowel secretion, absorption, and motility; linked to the autonomic nervous system for optimal regulation (Netter *et al*, 2010). It consists of the Auerbach's (also called myenteric plexus) and Meissner's (also known as submucosal plexus) plexuses found throughout the wall of the GI-tract. It affects motility by controlling the secretion of glands in the GI-tract which in turn cause digestion and mucous production. The ENS allows the GI-tract to function independently of the rest of the nervous system, however, it may be greatly influenced by the autonomic nervous system (Marcer *et Parsons*, 2006). If the sympathetic activity increases, which it does when the patient is exposed to stress, this lowers or shuts down the activity of the enteric nervous. The opposite happens in rest, when the parasympathetic activity increases (Kuchera *et Kuchera*, 1994). Optimal GI functioning requires coordinated interactions of the ANS, the enteric nervous system, and the endocrine (hormonal) system (Marcer *et Parsons*, 2006).

2.3 Osteopathic considerations of the nervous system (2)

ANS is primarily involved with the day-to-day automatic functions of the visceral processes of the body and is ultimately controlled by the brain and brainstem structures. At segmental level in the spinal column nerve cells called interneurons exist, they connect nerve cells to each other and has the ability to transmit afferent nerve impulses directly to an efferent nerve cell without the impulse necessarily having to go via ascending nerve pathways in the spinal cord to the brain

hence making the individual aware of it, there are also examples when the afferent fiber connects to the efferent without an interneuron between as well. The same goes for the somatic nervous system and this is called a reflex arc, it enables automatic responses to a stimulus from either muscles, skin or connective tissue, in the somatic nervous system, or from viscera in the ANS (Chila *et al*, 2011). When both the sensory receptor and the motor effector are located in the somatic system, which is the same as the musculoskeletal system, the reflex is in osteopathic terms called a somaticosomatic reflex and when they are located in the visceral system the reflex is called a viscerovisceral reflex meaning for example that the presence of food in the stomach makes local receptors in the organ start sending impulses to the related segment of the spinal cord via afferent axons of the reflex arc, which in turn will cause the effector glands to increase secretion. Viscerovisceral reflexes are mediated via the ANS and somaticosomatic reflexes are mediated via the somatic nervous system (Marcer *et al*, 2006).

2.3.1 Viscerosomatic reflexes

For the osteopathic practitioner concerning palpatory diagnosis and treatment, knowing the ANS anatomy is of high importance due to the assumption that an increase of afferent input from somatic structures (because of pathology or dysfunction) can be expected to have an effect on visceral organs and vice versa because of what is called somatovisceral and viscerosomatic reflexes, this may in turn create tissue changes and dysfunction in neurologically related areas, for example a viscerosomatic dysfunction may create changes in paraspinal soft tissue segmentally related with sympathetic innervation to the dysfunctional organ (Chila *et al*, 2011). Osteopaths have known and used these reflexes in osteopathic treatment, in the belief that osteopathic manipulative techniques create a disruption of the viscerosomatic reflex arc and thereby enables for improvement of the underlying visceral dysfunction or disease, for many years but there are a lack of scientific studies supporting this theory. Licciardone *et al* tried to prove the relation between osteopathic palpatory findings associated with a particular chronic disease which in this case were type 2 diabetes mellitus. The results were that a potential explanation for a consistent finding of tissue changes at T11-L2 level on the right side in the diabetes group might involve viscerosomatic reflex arc but might

just as well be a false association depending on other visceral dysfunctions or simply just a chance observation, so larger prospective studies were suggested (Licciardone *et al*, 2007).

2.4 Pathophysiology of IBS (2)

The pathophysiology of IBS is still very much unclear and there is a lack of biological markers for the condition but studies have at least found some attributes to be more consistently appearing in IBS patients (Manabe *et al*, 2009). Most likely the pathophysiology involves both central and peripheral mechanisms. Central mechanisms include anxiety, depression and somatisation while peripheral dysfunction is characterised by changes in gut motility and secretion as well as visceral hypersensitivity (Barbara *et al*, 2011). A disruption of the so called brain-gut axis, which means a way of communication between sensory neurons in the GI-tract and motor response generated in the central nervous system, that provokes changes in digestive motility and secretion, causes visceral hypersensitivity and leads to cellular and molecular abnormalities in the enteroendocrine and immune systems has been suggested. In addition, genetic factors, infections and alterations of the intestinal microbiota, inflammation and food intolerance and/or hypersensitivity could play a role by altering the integrity of the intestinal barrier and increasing intestinal permeability (Spiller, 2007).

2.4.1 Alterations of intestinal motility

Studies examining the upper GI-tract (esophagus and stomach) have found that there is a relation between altered motility (movement of the intestines created by contraction of smooth muscles) and the IBS but it seems more likely that altered motility of the upper GI-tract has a stronger relation to the presence of symptoms of upper GI-disorders like hiatus hernia, esophagitis, gastritis and reflux (Posserud *et al*, 2006). There is evidence for disturbed motility of the small intestines of IBS patients as a group but it has not been possible to find a uniform pattern of motility within this group or a consequent correlation between patient symptoms and alterations of motility. It is not clear whether the motility disturbances exist due to factors related to the CNS or the ENS but there is evidence indicating that both of them

are involved (Kellow *et al*, 1992; Posserud *et al*, 2006). Concerning the colon there are similarities with the small intestines regarding alterations of motility, no uniform motility pattern has been found but evidence shows that there are alterations of motility compared to healthy controls. It seems that exaggerated colonic response to stimuli, like food and perhaps also stress and emotions, which together with visceral hypersensitivity can be devastating for the patient, may anticipate the symptomatic picture of the patient. Alterations in gastrointestinal reflex activity among IBS patients appears to be generally accepted but more studies is required in this area as well (Posserud *et al*, 2006).

2.4.2 Visceral hypersensitivity

It is well recognised that visceral hypersensitivity can occur due to (1) sensitisation of primary sensory afferents (nerve cells) innervating the viscera, (2) hyperexcitability of spinal ascending neurons (central sensitisation) receiving synaptic input from the viscera, and (3) dysregulation of descending neural pathways that modulate spinal nociceptive (pain) transmission. (Sengupta, 2009). Lowered perception thresholds for balloon distension in IBS patients have been demonstrated in the rectum and colon, as well as in the esophagus, stomach and the small intestine. These findings support a generalised enhancement of gastrointestinal sensitivity in IBS patients. It is unclear whether IBS patients have a general hypersensitivity since divergent results exist regarding somatic sensitivity (Posserud *et al*, 2006).

2.4.3 Dysfunctional gas transit

Many IBS patients complain over bloating and experience that they have too much gas in their abdomen which in turn causes abdominal pain and this has been proposed to be secondary to disordered intestinal motility in combination with visceral hypersensitivity (Posserud *et al*, 2006). A large proportion of patients with IBS has been shown to have impaired transit and tolerance of intestinal externally induced gas which reproduced their symptoms. This dysfunctional gas transit may represent a possible mechanism of IBS symptoms, specifically pain and bloating (Serra *et al*, 2006). Of great interest, especially for the osteopath whose treatment is aiming at improving posture, it has been proven that physical activity and body pos-

ture can improve abdominal gas transit (Dainese *et al*, 2004; Dainese *et al*, 2003). Later studies have shown that in patients reporting bloating, the small bowel is the gut region most responsible for ineffective gas propulsion (Salvioli *et al*, 2005). However, the proximal region of colon is important as well regarding areas responsible for bloating (Hernando-Harder *et al*, 2010).

To sum up, IBS patients do not seem to produce more gas than a healthy person but can still have gas related symptoms because of dysfunction in the transit of gas combined with visceral hypersensitivity (Posserud *et al*, 2006).

2.4.4 Affected gastrointestinal secretion

Gastrointestinal secretion is difficult to measure in studies hence there are not many clinical trials performed in the area but there are some that indicate that abnormal gut water secretion. The densities of some peptides (biological molecules) mediating gut motility, secretion and sensation, *e.g.*, serotonin, peptide YY, pancreatic polypeptide, enteroglucagon, somatostatin, *etc.* were reduced in the colon of IBS patients and it seems like abnormal gut water secretion is one of many possible contributing factors in the development of IBS (El-Sahly *et al*, 2012). There is also some evidence supporting altered secretion in the small intestine of IBS patients (Posserud *et al*, 2006).

2.4.5 Gastroenteritis

A prior history of bacterial or viral gastroenteritis may play an important role as a trigger in the development of IBS (Konturek *et al*, 2011). A review of postinfectious irritable bowel syndrome made by Halvorson *et al* came to the conclusion that there is a sevenfold increase in the risk of developing functional bowel disorders, like IBS, following gastrointestinal infection (Halvorson *et al*, 2006). There are studies presenting an abnormal number of bacteria in the small intestine in IBS patients and this results in small intestinal bacterial overgrowth which in turn can be caused by abnormal small intestinal motor function, if this is a cause of IBS or not is not known but it is very possible it can lead to an infection which, as stated earlier, increases the risk of developing IBS (Posserud *et al*, 2006).

2.4.6 Brain-gut axis

The brain-gut axis is explained in simple terms as bidirectional pathways linking emotional and cognitive centers in the brain with visceral afferent sensation and intestinal function, this bidirectional system includes hypothalamic- pituitary- adrenal (HPA) axis with important effects on GI motility, sensation and immune function, and also the communication between the CNS and the gut via the ANS (sympathetic and parasympathetic pathways) by modulation of the ENS (Spiller, 2007). Comparing IBS patients and healthy controls has shown differences in activation of pain processing areas in the brain (anterior cingulate cortex, thalamus, insula and prefrontal cortex) between the two groups (Hobson *et Asis*, 2004). There are studies showing alterations in different areas of the brain-gut axis in IBS patients but the results are inconclusive (Posserud *et al*, 2006) Osteopathy is a manual therapy which places emphasis on normal mobility of tissues. It respects the inter-relationship of mind and body and recognises that the human body functions as a dynamic unit. This fits perfectly with the concept of the the brain-gut axis. It seems likely that the different osteopathic treatment modalities are able to intervene at different levels of this brain-gut axis (Hundscheid *et al*, 2007). This study will further focus on the ANS as a part of the brain-gut axis and try to evaluate how important this part is in the pathophysiology of IBS.

2.5 Different methods of treatment of IBS (2)

Important factors regarding IBS patients is to offer an explanation of their condition, reassurance and lifestyle advice is important as well, more than 50% of patients visiting the doctor at the first consultation believe they have a serious disease and to reassure them that this is not the case is the first and very important step in the treatment (Spiller, 2007). Most patients have tried, on their own before seeing the doctor, different modifications of their diet, in many cases unsuccessfully. One study came to the conclusion that almost half of the patients participating had symptom improvement from a strict diet for three weeks but it is unclear how much of this that was placebo, dairy products and wheat were the products that the greatest part of the participants responded negatively to (Nanda *et al*, 1989).

Psychological treatment might help those patients believing that stress is an important factor, but studies performed could not prove much change in bowel symptoms (Spiller, 2007). Hypnotherapy has been proven to have short-term effect in significantly alleviate overall gastrointestinal symptoms in IBS patients. More studies is needed to evaluate the long-term effect of hypnotherapy (Lee *et al*, 2014). Some IBS patients turns to homeopathy for help but there are few studies performed and those existing mostly lack important information of data, high or unknown risk of bias, short-term follow-up (Peckham *et al*, 2014). Acupuncture may be the choice of therapy for others but sham-controlled RCTs have not been able to find any benefits of acupuncture relative to a credible sham acupuncture control for IBS symptom severity or IBS-related quality of life (Manheimer *et al*, 2013). Many patients prefer drug therapy which is what most doctors recommend and the only help the public medical care can provide, besides lifestyle advice, but in most RCTs evaluating this therapy the true effect of drug therapy is smaller than the placebo effect and the need for more effective remedies for IBS is substantial, however antispasmodics might relieve abdominal pain, Serotonin type 3 antagonists may improve diarrhoea or constipation and pain, tricyclic antidepressants possibly improves pain especially in diarrhoea-predominant patients (Spiller, 2007). Currently there are more agents than ever before available for gastroenterology practitioners to treat symptoms related to IBS but, despite progress in the understanding of IBS pathophysiology, there still does not exist any targeted treatment (Wall *et al*, 2014).

2.6 Osteopathic considerations in IBS (2)

Kuchera states that osteopaths have been using viscerosomatic reflexes to aid them in their diagnosis of different visceral diseases and dysfunctions for over 100 years (Kuchera *et* Kuchera, 1994). Osteopaths consider themselves to be able to, by treatment, affect the autonomic and enteric nervous system in the patient. To be able to do this, the osteopath consider some areas of the spine, where nerves from the sympathetic nervous system has its outflow to the intestines, to be very important. These levels of the spine is generally from thoracic vertebra number 7 to lumbar vertebra number 2 (Netter *et al*, 2010). Conversely, the parasympathetic outflow via the vagus nerve and the pelvic splanchnic nerves will be important, this

includes the suboccipital area, the carotid sheath and mediastinum for the vagus nerve and the level of sacral vertebra number 2-4 plus the sacroiliac joints for the pelvic splanchnic nerves (Marcer *et Parsons*, 2006). Other important areas in osteopathic treatment of IBS, by affecting the autonomic nervous system, is the autonomic plexuses, namely the celiac plexus, superior and inferior mesenteric plexuses and the superior and inferior hypogastric plexuses, primarily because of their role in influencing the enteric nervous system (Kuchera *et Kuchera*, 1994). One of the main principles in osteopathy is the interrelationship of structure and function and the osteopathic treatment and diagnosis relies on manual contact with the patient, treatment consists of gentle stretching, mobilising and manipulation of body tissues (musculoskeletal and visceral) with the aim to restore physiological motion hence blood and lymph flow and in turn tissue health (Hundscheid *et al*, 2007). Osteopathy is a holistic approach and focuses on the whole person instead of just the symptoms which means that the treatment will be individualised for each patient, regarding IBS an important part of the treatment will be to make sure that the abdominal organs have satisfying mobility in relation to surrounding structures and peritoneal suspension mechanisms and attachments (Hundscheid *et al*, 2007). Dysfunction in the connections between the brain and the gut which broadly is composed of the ANS and ENS seems to be involved in IBS and this makes osteopathic treatment to an interesting choice of therapy, Hundscheid *et al* conducted a randomised clinical trial in 2007 comparing standard care and osteopathic treatment of IBS patients and the results were very uplifting for the patients in the IBS group, 68% in the osteopathic group experienced definite overall improvement in symptoms and 27% showed slight improvement compared to 18% definite and 27% slight improvement in the standard care group (Hundscheid *et al*, 2007).

2.7 OMT techniques affecting the ANS (1)

The OMT techniques used in this thesis is a combination of functional and cranio-sacral techniques. All with the intention to balance the ANS and the relationship between SNS/PSNS.

2.7.1 OMT techniques affecting the ANS.

Florance, *et al* (2012) did a pilot sham-controlled study on IBS patients. The outcomes of the study was to look at changes on the IBS severity score amongst quality of life, bowel habits and psychological factors. The result showed that IBS severity had decreased in both groups after day 7 and 28. The patients who did receive osteopathic treatment had the biggest decrease compared to the sham group of patients. Anxiety and depression score decreased in both groups. Osteopathy should be considered as an effective complementary alternative medicine treatment in handling IBS patients and their symptoms. The study from Wieting, *et al* (2013) looked at the effect of OMT in the postoperative recovery of patients undergoing coronary artery bypass graft (CABG). All of the 17 OMT patients could be discharged 0.55 days earlier than those in the placebo and control group. As well as number of days to first postoperative bowel movement was 3.5, 4.0 and 4.0 for the OMT group, the placebo and the control group. Using OMT as a daily postoperative treatment can improve functional recovery of patients who did surgery on their CABG.

2.7.2 Functional OMT techniques

Functional techniques is a system of osteopathic techniques with the philosophy that a segmental dysfunction is palpable as an increasing resistance to motion at certain directions. The specific dysfunction can be detected by several different methods such as the quality of the movement rather than range of motion. Afferent feedback to the spinal cord is disturbed in the specific dysfunctional segment. The proprioceptive mechanisms are keeping the disturbance, the afferents will be silent and no longer firing according to Hartman (2001). According to Giles, *et al* (2013) healthy subjects who did get upper cervical spine manipulations could support the hypothesis that suboccipital decompression affect the heart rate variability which affects the ANS. IBS patients reacts heavily on internal and external stimuli through the extrinsic ANS control connections. For that reason the OMT is effective by enhancing the function-structure relationship.

The aim for the treating osteopath should be to normalise the ANS activity to the intestine, promote lymphatic flow and reduce somatic joint dysfunctions – especially in the area for the innervation to the intestine (Kuchera *et* Kuchera, 1994). OMT techniques in a patient with IBS is designed to:

- Balance the extrinsic ANS both SNS/PSNS
- Enhance venous and lymphatic circulation and decrease congestion in the GI-tract.
- Remove joint somatic dysfunctions which plays a major part in the facilitated spinal cord segments. (Kuchera *et* Kuchera, 1994).

2.7.3 OMT Rib raising technique

Henderson, *et al* (2010) did study the effect of rib raising on the ANS using non-invasive biomarkers. The result they came up with is to suggest that the SNS can change and decrease its activation straight after the OMT technique is performed on the patient. The rib raising technique is designed to minimise hypersympathetic activity. Direct techniques and other deep articulating techniques alter muscle tone and neural reflexes that affect ANS. Performing rib raising techniques in a rhythmic and repetitive way give the ribs more freedom to be able to perform more efficient movements. This procedure is initially believed to stimulate the sympathetic efferent activity but in the long run to do the opposite, reduce sympathetic outflow activity according to Wallace *et al*, (2003). Hypersympathetic activity is present in all diseases and dysfunctions. Understanding the effect of the activity for a specific illness it can be treated with the OMT in the following ways:

- Rib raising inhibition and soft tissue techniques to the D/L area, especially Th10-L2.
- Treatment of the sympathetic ganglia with functional techniques (Kuchera *et* Kuchera, 1994).

2.7.4 Myofascial OMT techniques

According to Henley, *et al* (2008) a myofascial release which is an OMT technique (where you affect the PSNS) can improve and balance a sympathetic tone of the ANS. This shows how there is a connection and association between the OMT and the ANS. Myofascial release techniques are effective when it is appropriate to eliminate hypertension in soft tissues (Wallace *et al*, 2003). Purdy, *et al* (1996) studied the effect of soft tissue manipulation in the suboccipital region on digital blood flow. All to measure the activity of the sympathetic nervous system. The result from both groups shows that a change in the ANS happens with this specific suboccipital manipulation and as well only touching the suboccipital triangle.

2.7.5 Cranio-sacral techniques

The cranio-sacral techniques is based on the concept of:

- The existence of an inherent motility of the CNS.
- An inherent motility and pulsatile nature of the cerebro-spinal fluid (CSF).
- The existence of reciprocal tension membranes, namely the meninges, particularly the falx cerebelli and the tentorium.
- The mobility of the central bones around articular axes.
- The mobility of the sacrum between the ilia.

Cranial techniques are thought to have a balancing effect especially on the SNS/PSNS. (Wallace *et al*, 2003). The left half of the colon gets its innervation from the pelvic splanchnic nerves which is PSNS dominant and the vagus cranial nerve supplies the rest of the GI-tract. Therefore it is of interest for the treating osteopath to reduce all restrictions around the sacroiliac joints and reduce stress in the PSNS. In the cranial region treatment of OA, AA and C2 is of importance and appropriate techniques used are decompression of the structure around jugular foramen and occipitomastoid suture (Kuchera *et al* Kuchera, 1994). Using the V-spread hold when treating the occipitomastoid suture is a simple and safe technique (King *et al* Lay, 2003).

3 Questions / hypotheses

Null hypothesis (H_0): OMT of the anatomical neural outflow areas of the ANS will not show statistically significant difference ($p > 0,05$) of the severity of IBS-symptoms within the treatment group.

Alternative Hypothesis (H_A): OMT of the anatomical neural outflow areas of the ANS will show statistically significant difference ($p > 0,05$) of the severity of IBS-symptoms within the treatment group.

Second Null hypothesis (H_0): OMT of the anatomical neural outflow areas of the ANS will not show statistically significant difference ($p > 0,05$) in the change of IBS-symptoms between the treatment group and the control group.

Second Alternative Hypothesis (H_A): OMT of the anatomical neural outflow areas of the ANS will show statistically significant difference ($p > 0,05$) in the change of IBS-symptoms between the treatment group and the control group.

Third Null hypothesis (H_0): OMT of the anatomical neural outflow areas of the ANS will not show statistically significant difference ($p > 0,05$) in the change of IBS-symptoms between the treatment centers.

Third Alternative Hypothesis (H_A): OMT of the anatomical neural outflow areas of the ANS will show statistically significant difference ($p > 0,05$) in the change of IBS-symptoms between the treatment centers.

The authors are interested in if there is a statistically significant difference between the treatment group and the control group when the mean-value of all 9 IBS-symptoms merged together and then divided by 9 is calculated and compared to the same value from the other group. This will allow the reader to get a simple general appreciation of the total result of this study just by looking at and comparing two numbers.

The authors are also interested in comparing all 9 IBS-symptoms individually between groups to see if the difference between some symptoms are greater than

others and as a last comparison they want to compare the results of the two treatment centers where the study was performed to see if there is possible to see any statistically significant differences depending on who did the treatments.

4 Methodology (2)

4.1 Type of study

Randomised controlled trial

4.2 Subjects

Participants of the study were recruited in the area around Borås and Gothenburg for one of the studycenters and in the area around Hagfors and Sunne for the second studycenter.

Information about IBS-predominance of every subject was recorded, patients with a higher tendency of diarrhoea symptoms were placed in the diarrhoea-predominant subgroup, those with a higher tendency of constipation symptoms were placed in the constipation-predominant subgroup and patients with a mix of diarrhoea and constipation were placed in the alternating-predominant subgroup.

4.2.1 Inclusion and exclusion criteria

Inclusion criteria:

- Patients with the presence of IBS diagnosed at the discretion of a medical specialist (gastroenterologist) after exclusion of somatic pathology or conditions that could explain the abdominal complaints. Diagnosis of IBS will have to be made by using the Rome III criteria.
- Adults between 16-70 years of age
- Both male and female were eligible

Exclusion criteria:

- Patients with concomitant renal or liver disease, alcoholism, heart failure, peptic ulcer disease, inflammatory bowel disease (Chron's or ulcerative colitis) psychiatric illness, and prior abdominal surgery with the exception of appendectomy, herniotomy, hysterectomy and surgery because of hemorrhoids.

- Patients with rheumatologic disease or symptoms were excluded.
- People that do not understand Swedish are excluded.
- Patients that have consulted osteopathic treatment the last six months.
- Patients that have started medical treatment or any other therapy, including change of their diet, for their IBS the last two months.
- Patients that are pregnant

4.2.2 Subjects acquisition

The authors contacted their local association of gastrointestinal disorders and offered the IBS-patients to participate in the study. Patients were also recruited via Facebook and by adverts in the local newspaper. Personal contacts of the authors as well as notes on notice boards in local stores and restaurants were also used.

4.2.3 Number of subjects

The total number of participants in the study were 53 people, 24 of them were handled by the studycenter in Kinna and divided into 13 in the treatment group 11 in the controlgroup, 29 of them were handled by the studycenter in Hagfors and divided into 15 in the treatment group and 14 in the controlgroup. 4 participants were males, the randomisation process put one male i every group. Three participants that were to take part, left the study, all of them for personal reasons, two from the control group in Kinna, one from the control group in Hagfors.

9 patients that wanted to participate in the study were excluded, 5 of them did not meet the inclusion criteria, 3 of them had inflammatory bowel disease and one was pregnant.

4.2.4 Information to participants

IBS-patients that were interested in participating in the study got an email with information about the study and six questions regarding background information, symptoms and pathologies that they were expected to answer and send back to the authors (appendix 9.1).

4.2.5 Randomisation

When the authors couldn't get more patients willing to participate in the study that fitted the inclusion/exclusion criteria, everyones pseudoalias were written down on separate notes, folded together, and then placed in a box. A person not involved in

the study conducted the randomisation and put every other note that was pulled from the box in the treatment group respectively the controlgroup. The type of randomisation was a simple randomisation and to prevent the groupsise to be unequal the first note was put in the control group and the second note was put in the treatment group, the third note was put in the control group and the fourth note was put in the treatment group etc.

4.3 Target parameters

4.3.1 Primary target parameter

The severity of nine different IBS-symptoms measured on a VAS-scale 0-100mm: Abdominal pain, abdominal cramps, borborygmi, diarrhoea, constipation, meteorism (bloating), flatulence, feeling of incomplete evacuation of feces and presence of mucous.

4.4 Measuring instruments

4.4.1 Visual analogue scale

A visual analogue scale (VAS) 100mm graded from 0-10 where 0=absent and 10=worst imaginable was used to measure the level of symptom in the 9 symptom-categories.

4.4.2 Handling of measurements

All patients filled in their formulas and left them, or sended by post, to their treating osteopath. Formulas were sorted and left to a person not involved in the study whom measured the VAS scales and filled a prepared Microsoft excelfile with the number 0-10 rounded of to one decimal. The usage of the data was done in a pseudonymised way (which means in an encrypted fashion. The recorded data were not stored under the subjects name, but under a numerical code). The names and the corresponding numerical code were documented in a separately managed list. Only the authors have access to these lists. The transfer of the gathered data for research purposes only takes place in a pseudonymised fashion. The same applies for the publication of results of this thesis.

4.5 Interventions

4.5.1 Osteopathic manipulative treatment

The treating osteopath performed specific OMT techniques on the ANS and PSNS outflow areas of the body. The OMT techniques used in this study were very calm and gentle functional, myofascial, cranial and ribraising techniques. The techniques were the same on every patient and addressed the upper cervical, the thoracic spine and ribs and the sacral area. The techniques consisted of and were performed in the order as follows:

- Decompression of the occipitomastoid suture (supine) – the therapist holds the occiput of the patient in the palms of his hands and has the indexfinger inferior and the longfinger superior to the occipitomastoid suture adding a gentle separation between the fingers bilaterally (King *et* Lay, 2003).



Figure 1. Photo: Decompression of the occipitomastoid suture

- Suboccipital inhibition (supine) – the therapist holds the occiput in his hands and bends four fingers bilaterally from the indexfinger to the littlefinger so that the tips of the fingers become the area of contact to the suboccipital muscles of the patient. The therapist then waits for a release in tension of the tissue (Purdy *et al*, 1996).



Figure 2. Photo: Suboccipital inhibition

- Sacral hold (supine) – the therapist sits on the right hand of the patient, holds his right hand under the patients sacrum and his left hand under the dorsolumbar junction and tries to improve the balance and mobility of primarily the sacrum in relation to the dorsolumbar area (Wallace *et al*, 2003).



Figure 3. Photo: Sacral hold

- Rib-raising of costae 1-10 bilaterally (prone) – the therapist stands on the right hand of the patient and holds the right arm of the patient with his right arm. The therapist's right hand holds the shoulderjoint of the patient and the therapist's right forearm supports the right upperarm of the patient allowing the patient to completely relax in the shouldergirdle. A gentle clockwise rotation of the patients right arm is performed by the therapist in a rhythmic repetitive manner and the left hand of the therapist inhibits the paraspinal musculature in the area of the costovertebral joint that for the moment is activated by the passive movement of the patients arm. This is repeated until all ribs connected to the ribcage have been mobilised and this is repeated until the therapist decides that appropriate change has happened. The left side will then be addressed in the same way (Kuchera et Kuchera, 1994).



Figure 4. Photo: Rib-raise

The two authors performed the treatments and every treatment consisted of 20 minutes OMT, every single technique were used in 4-6 minutes. All patients in the treatment group had 3 treatments with an interval of 2-3 weeks between treatments. Before the first treatment and directly after the third treatment the subjects in the treatment group filled the IBS symptomscale (appendix 9.2), they did this by themselves without anyone disturbing them. A followup was made 4 weeks after the last treatment, meaning that the patients in the treatment group got an envelope with a stamp and the address of the treating osteopath at their last treatment session containing one IBS symptomscale-formula which they were expected to fill in and return. The therapists (authors) had practised the treatment-techniques together before the experiment started to make sure that they were performed as similarly as possible.

4.5.2 Control group

The control group filled the IBS symptomscale-formula with the same interval as the treatment group, approximately 4 weeks between first and second fulfillment and approximately 4 weeks between the second and third fulfillment. Envelope with stamp and returnaddress to the author containing 3 IBS symptomscales, one "Patient declaration of consent"-form and instructions on how to fill the formulas and what to do with the papers was sent to all participants in the control group. Each time a form was to be filled in, the author reminded all participants in the control group by email and requested a confirmation that the form was filled in. As a reward to the patients in the control group they got a gift certificate for two osteopathic treatments to use after the study was completed.

4.5.3 Patient declaration of consent

All participants taking part in this study have signed a patient declaration of consent form (appendix 9.3) These are stored at the osteopath performing the treatments.

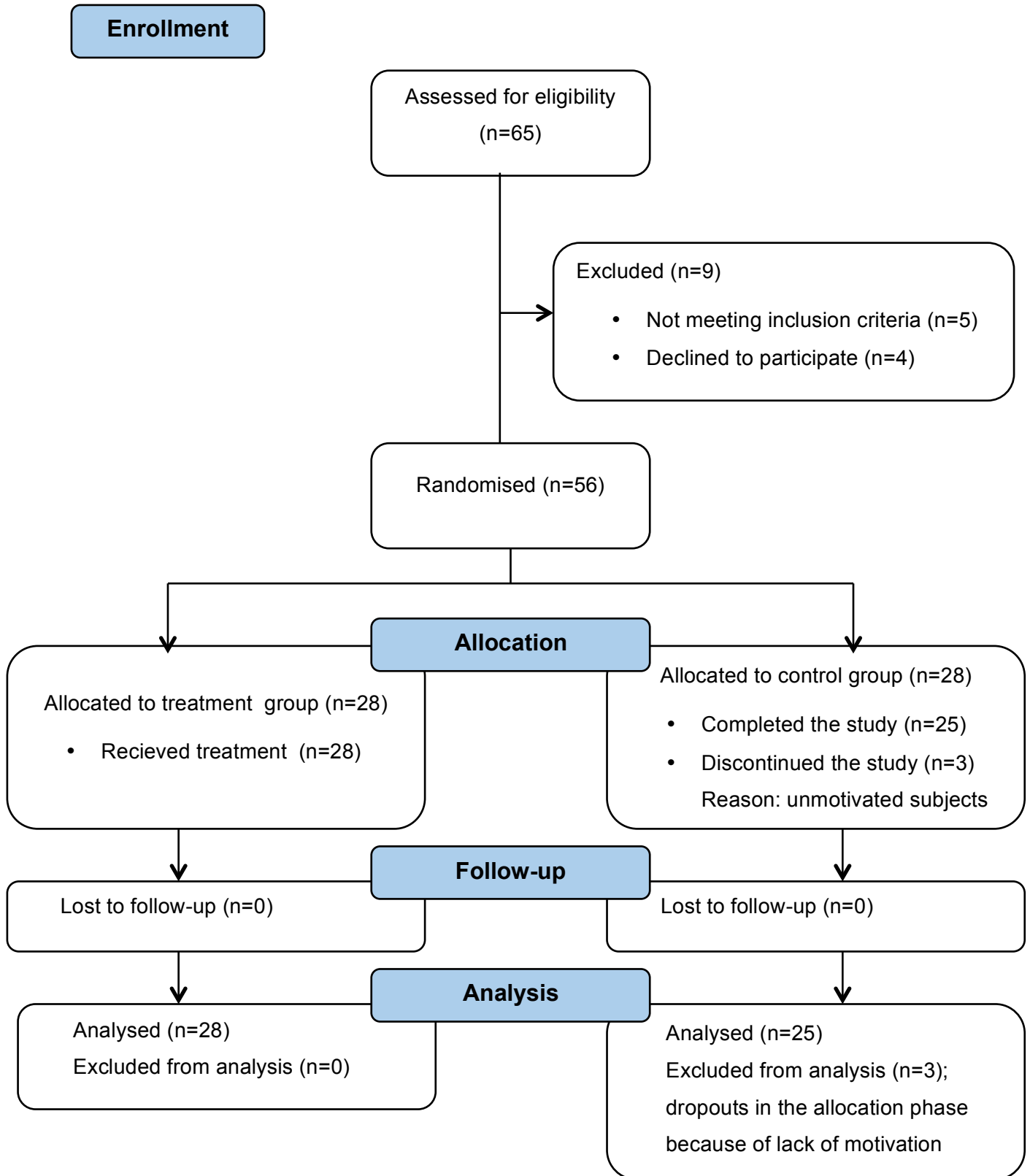
4.6 Schedule

- February 2015 - Writing and submitting exposé
- March 2015 - Recruitment of patients
- April - May 2015 - Treatments of participants in the treatment group performed
Participants in the control group filled their formulas
Writing of background
- June 2015 - Writing of background
Gathering of followup formulas from the treatment group
Gathering of formulas from the control group
- July 2015 - Analysing statistics
Writing of methods part
- Aug. - sept. 2015 - Writing of results part
Writing of discussion and conclusion

4.7 Statistics

All statistics were made by Dipl. -Math. Ulrike Von Hehn at medistat GmbH in Kiel Germany. Test for normal distribution using Shapiro Wilk tests, figures (boxplots), Friedman tests, Wilcoxon matched pairs tests, Kruskal Wallis tests and U tests were performed.

4.8 Flow chart



5 Results (1)

The following chapter is a presentation of the participants characteristics and mean IBS symptom VAS score difference between control group and treatment group. Then follow a presentation of mean IBS symptom VAS score difference within control group and treatment group. The last part is presenting the IBS symptom VAS score difference between the two osteopathic treatment centers (named Maria and Mattias) that this RCT study is based on.

5.1 Participants characteristics

There were 2 (8%) men and 23 (92%) women in the control group with a total of 25 participants. There were 2 (7%) men and 26 (93%) women in the treatment group with a total of 28 participants. All together there were 53 people who participated in the multi-center RCT study.

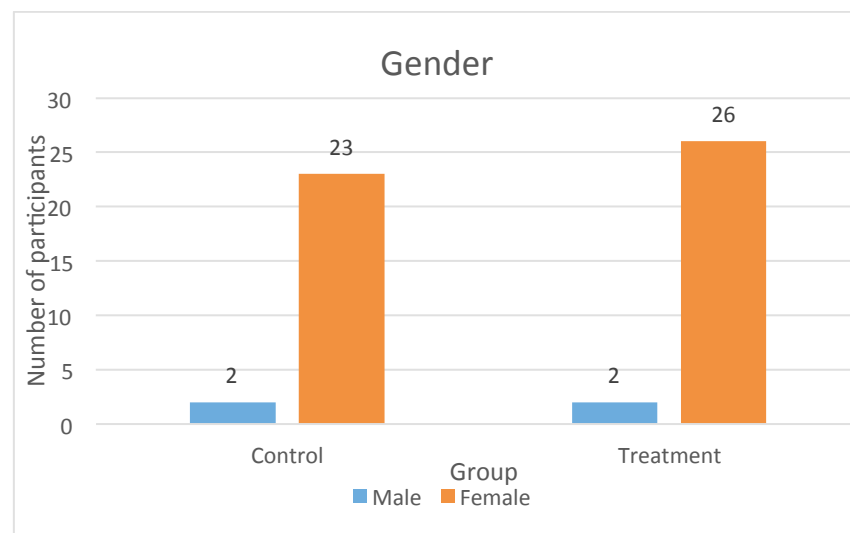


Figure 5. Gender of the participants in the control group and treatment group.

Table 1. Descriptive statistics for age.

Group	N	Mean	Std deviation	Median	Minimum	Maximum	p-value
Control	25	36,28	15,16	33	16	68	0,096
Treatment	28	37,86	12,49	36	20	69	0,153

The age range in the control group was 16-68 years with a median of 33 years. In the treatment group the age range was 20-69 years with a median of 36 years.

In the control group mean age 36,28 SD±15,16 (p=0,096) and in the treatment group mean age 37,86 SD±12,49 (p=0,153).

Table 2. Independent samples T-test testing the significans for age.

Variable	F	Significans	T	df	Sign (2-seitig)
Age Variance is the same	1340	-0,252	-415	51	0,680

Independent samples T-test showed no significant difference in age p=0,680.

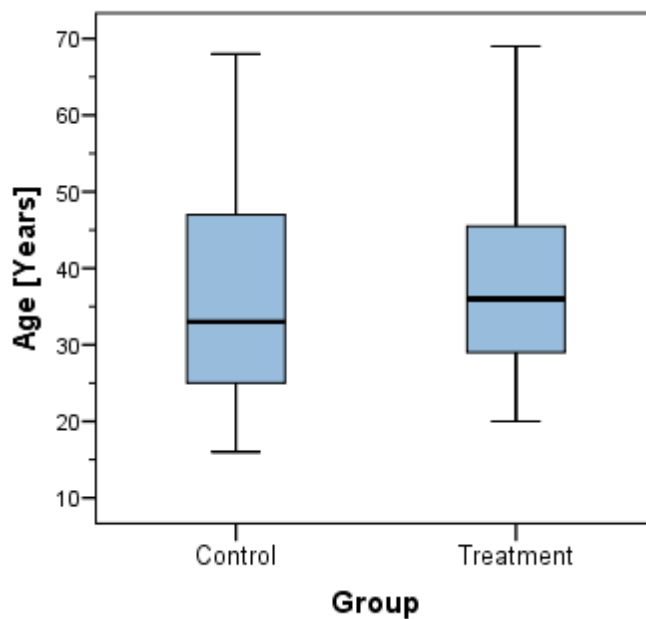


Figure 6. Median age of the participants in the control group and treatment group.

In the control group there were 4 (16%) participants working in healthcare, 2 (8%) in teaching, 5 (20%) were students, 8 (32%) working in an office and 6 (24%) working in the other category.

In the treatment group there were 7 (25%) participants working in healthcare, 4 (14%) in teaching, 2 (7%) were students, 10 (36%) working in an office and 5 (18%) working in the other category. 0

The category „other“ = chef, senior citizen x 2 , hair dresser, unemployed, mechanics, manufacturer x 2, construction, maternity leave, sales person.

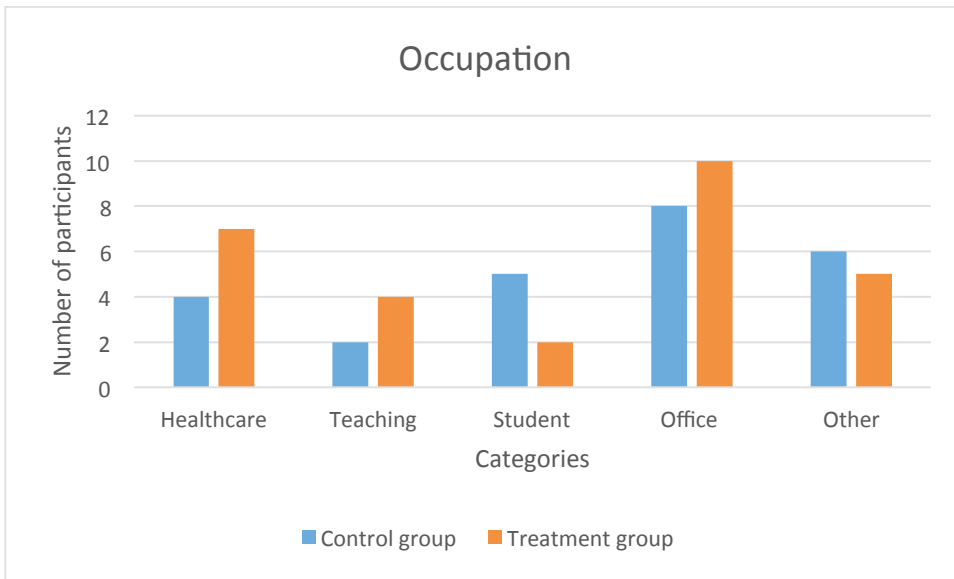


Figure 7. Participants occupation categories in the control group and treatment group.

There were 8 (31%) participants in the control group and 8 (30%) participants in the treatment group who did have pathologies. 18 (69%) in the control group and 19 (70%) in the treatment group did not have any pathologies.

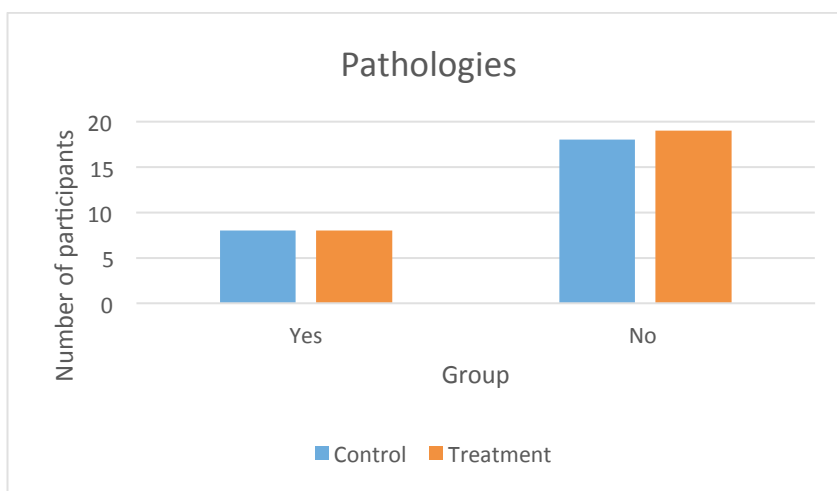


Figure 8. Number of participants with or without pathologies in control group and treatment group.

In the control group 9 (35%) participants had surgery prior the RCT. 17 (65 %) in the control group did not have any surgery. In the treatment group 10 (37%) participants had had surgery prior the study and 17 (63%) participants had not had any surgery.

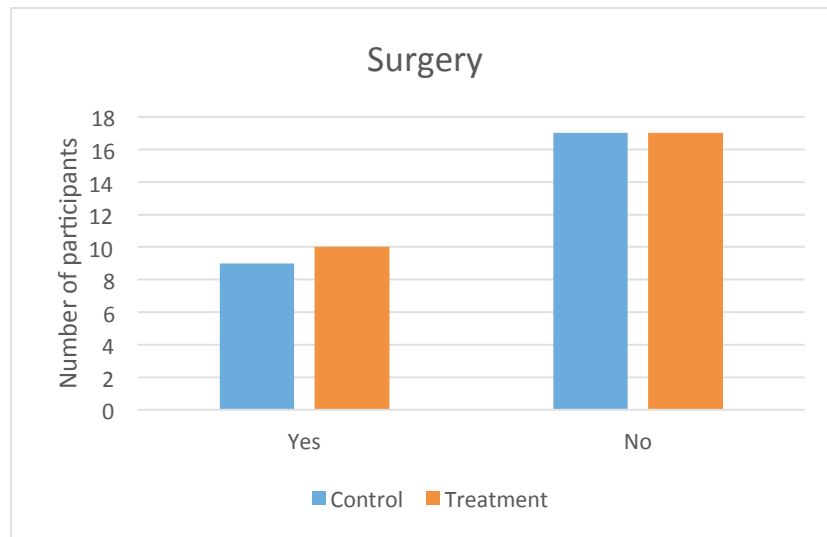


Figure 9. Participants who have had surgery or not in the control group and treatment group.

In the control group 8 (31%) participants did use medication. 9 (33%) in the treatment group used medication. In the control group there were 18 (69%) participants who did not use any medication and in the treatment group there were 18 (67%) of the participants who did not use medication.

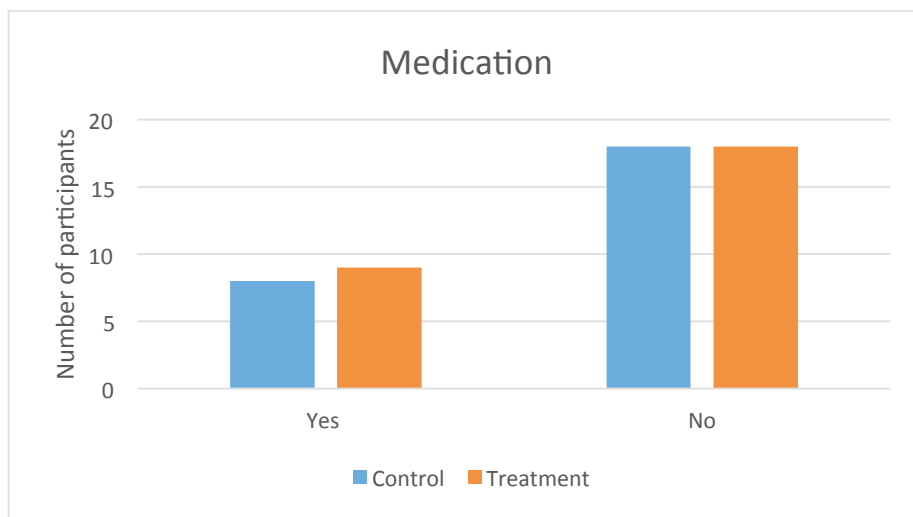


Figure 10. Participants in the control group and treatment group using or not using medication.

In the control group 2 (8%) participants had diarrhoea, 8 (32%) participants had constipation and 15 (60%) participants had alternating IBS predominance. In the treatment group 7(25%) participants had diarrhoea, 8 (29%) participants had constipation and 13 (46%) participants had alternating IBS predominance.

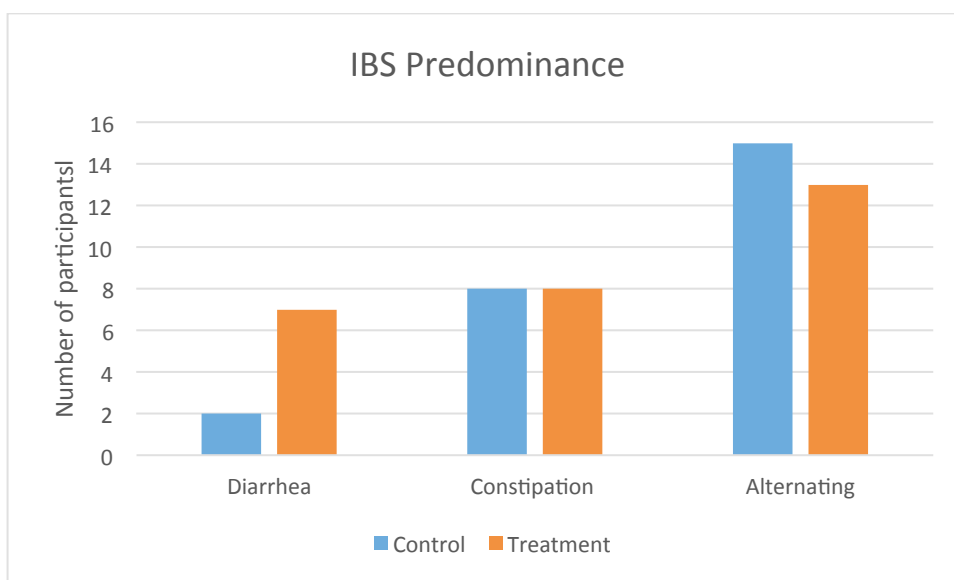


Figure 11. Participants IBS predominance in the control group and treatment group.

5.2 Mean difference in timepoint T0, T1 and T2 in control group and treatment group.

A presentation of the mean difference in all three timepoints and single IBS symptoms VAS score difference between timepoints T2-T0.

T0 = is the first measurement before the first osteopathic treatment for the treatment group. Control group did not receive any treatment.

T1 = is 4 weeks after T0. Between T0 and T1 is 3x20 min osteopathic treatment given to the participants in the treatment group. Control group did not receive any treatment.

T2 = follow-up is 4 weeks after T1 timepoint. No osteopathic treatment was performed in this timeperiod for the treatment group. Neither for the control group.

Timepoints are valid for all data. Significant p-value is marked in red.

Table 3. Descriptive data for mean symptom score at each timepoint in the control group and treatment group.

Group	Mean symptom	N	Mean	Std deviation	Min	Max	Median	p-value
Control	T0	25	4,17	1,29	1,41	6,14	4,30	0,200
	T1	25	3,68	1,37	1,31	6,18	3,82	0,200
	T2	25	4,04	1,46	0,80	5,91	4,37	0,111
	Difference T2-T0	25	-0,13	1,02	-2,71	1,52	-0,12	0,200
Treatment	T0	28	4,79	1,47	1,70	6,96	5,14	0,024
	T1	28	3,13	1,66	0,24	6,44	2,62	0,038
	T2	28	2,76	2,01	0,28	6,47	2,44	0,104
	Difference T2-T0	28	-2,04	1,70	-5,69	0,87	-2,03	0,200

In the control group T0 mean 4,17 with SD± 1,29 (p=0,200), T1 mean 3,68 with SD± 1,37 (p=0,200) and T2 mean 4,04 with SD± 1,46 (p=0,111).

Mean difference T2-T0 -0,13 with SD± 1,02 (p=0,200)

In the treatment group T0 mean 4,79 with SD± 1,47 (p=0,024), T1 mean 3,13 with SD± 1,66 (p=0,038) and T2 mean 2,76 with SD± 2,01 (p=0,104).

Mean difference T2-T0 -2,04 with SD± 1,70 (p=0,200).

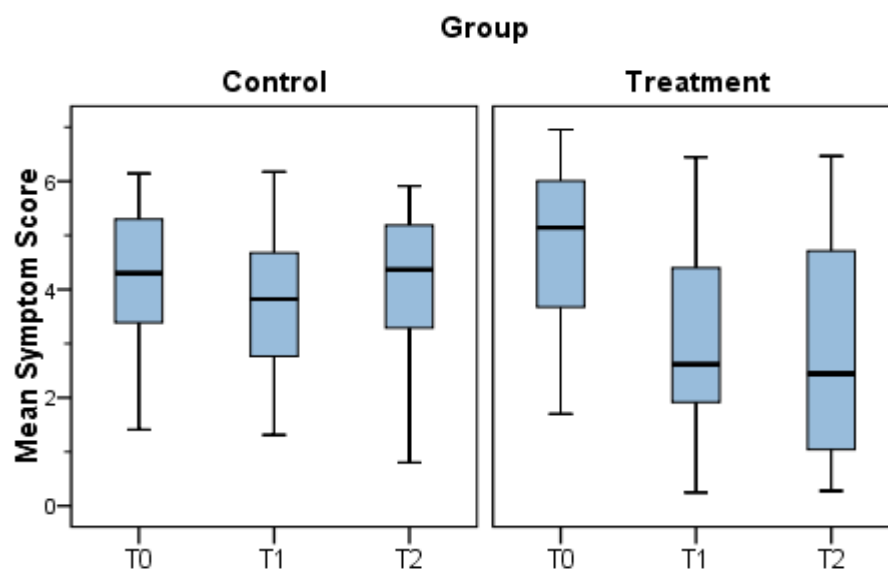


Figure 12. All participants mean VAS score merged together at each time-point in control group and treatment group.

Summary:

In the control group there were no significant difference. In the treatment group there were significant difference in T0 and T1. T0 mean 4,79 with SD± 1,47 (p=0,024), T1 mean 3,13 with SD± 1,66 (p=0,038)

5.3 Single IBS symptom VAS score T2-T0 difference between control group and treatment group.

A presentation of all 9 IBS symptom VAS score difference between the control group and treatment group with a summary at the end.

Table 4. Descriptive data for difference in T2-T0 for IBS symptom abdominal pain between control group and treatment group.

Group	N	Mean	Std deviation	Median	Min	Max	p-value
Control	25	-1,76	2,61	-0,10	-5,60	5,40	0,995
Treatment	28	-1,85	2,27	-1,65	-5,70	3,70	0,486

In the control group the mean difference abdominal pain score was -1,76 with SD± 2,61 (p=0,995). In the treatment group mean difference abdominal pain score was -1,85 with SD± 2,27 (p=0,486).

Table 5. Descriptive data difference in T2-T0 for the IBS symptom abdominal cramps between control group and treatment group.

Group	N	Mean	Std deviation	Median	Min	Max	p-value
Control	25	0,31	2,83	0,00	-6,20	5,40	0,521
Treatment	28	-1,57	2,67	-0,55	-5,60	2,60	0,011

In the control group the mean difference of the IBS symptom abdominal cramps score was 0,31 with SD± 2,83 (p=0,521). In the treatment group mean difference was - 1,57 with SD± 2,67 (p=0,011) which is a significant difference.

Table 6. Descriptive data difference in T2-T0 for the IBS symptom borborygmia between control group and treatment .

Group	N	Mean	Std de- viation	Median	Min	Max	p- value
Control	25	0,20	2,18	0,00	-3,90	4,00	0,617
Treatment	28	-1,81	2,94	-0,75	-8,00	2,10	0,029

In the control group the mean difference of the IBS symptom borborygmia score was 0,20 with SD± 2,18 (p=0,617). In the treatment group mean difference was -1,81 with SD± 2,94 (p=0.029) which is a significant difference.

Table 7. Descriptive data difference in T2-T0 for the IBS symptom diarrhoea between control group and treatment group.

Group	N	Mean	Std de- viation	Median	Min	Max	p- value
Control	25	0,42	2,61	0,00	-5,00	8,10	0,079
Treatment	28	-1,76	2,73	-0,55	-8,30	2,40	0,011

In the control group the mean difference of the IBS symptom diarrhoea score was 0,42 with SD± 2,61 (p=0,079). In the treatment group mean difference was -1,76 with SD± 2,73 (p=0,011) which is a significant difference.

Table 8. Descriptive data difference in T2-T0 for the IBS symptom constipation between control group and treatment group.

Group	N	Mean	Std deviation	Median	Min	Max	p-value
Control	25	0,47	2,42	0,20	-5,80	5,60	0,245
Treatment	28	-1,22	2,64	-0,55	-8,40	6,50	0,009

In the control group the mean difference of the IBS symptom constipation score was 0,47 with SD± 2,42 (p=0,245). In the treatment group mean difference was -1,22 with SD± 2,64 (p=0.009) which is a significant difference.

Table 9. Descriptive data difference in T2-T0 for the IBS symptom bloating between control group and treatment group.

Group	N	Mean	Std deviation	Median	Min	Max	p-value
Control	25	-0,91	2,98	-0,30	-8,50	3,40	0,070
Treatment	28	-2,98	2,87	-3,15	-7,80	2,50	0,612

In the control group the mean difference of the IBS symptom bloating score was -0,91 with SD± 2,98 (p=0,070). In the treatment group mean difference was -2,98 with SD± 2,87 (p=0,612).

Table 10. Descriptive data difference in T2-T0 for the IBS symptom flatulence between control group and treatment group.

Group	N	Mean	Std deviation	Median	Min	Max	p-value
Control	25	-0,32	2,57	-0,40	-6,10	5,40	0,987
Treatment	28	-2,32	2,88	-1,55	-7,70	4,60	0,268

In the control group the mean difference of the IBS symptom flatulence score was -0,32 with SD± 2,57 (p=0,987). In the treatment group mean difference was -2,32 with SD± 2,88 (p=0,268).

Table 11. Descriptive data difference in T2-T0 for the IBS symptom feeling of incomplete evacuation between control group and treatment group.

Group	N	Mean	Std deviation	Median	Min	Max	p-value
Control	25	-0,41	2,88	-0,30	-6,10	6,70	0,910
Treatment	28	-3,08	3,36	-0,45	-7,80	6,30	0,224

In the control group the mean difference of the IBS symptom feeling of incomplete evacuation score was -0,41 with SD± 2,88 (p=0,910). In the treatment group mean difference was -3,08 with SD± 3,36 (p=0,224).

Table 12. Descriptive data difference in T2-T0 for the IBS symptom presence of mucus in feces between control group and treatment group.

Group	N	Mean	Std deviation	Median	Min	Max	p-value
Control	25	-0,74	1,88	-0,30	-7,60	1,90	0,000
Treatment	28	-1,67	2,91	-0,45	-8,40	4,30	0,104

In the control group the mean difference of the IBS symptom presence of mucus score was -0,74 with SD± 1,88 (p=0,000) which is a significant difference. In the treatment group mean difference was -1,67 with SD± 2,91 (p=0,104).

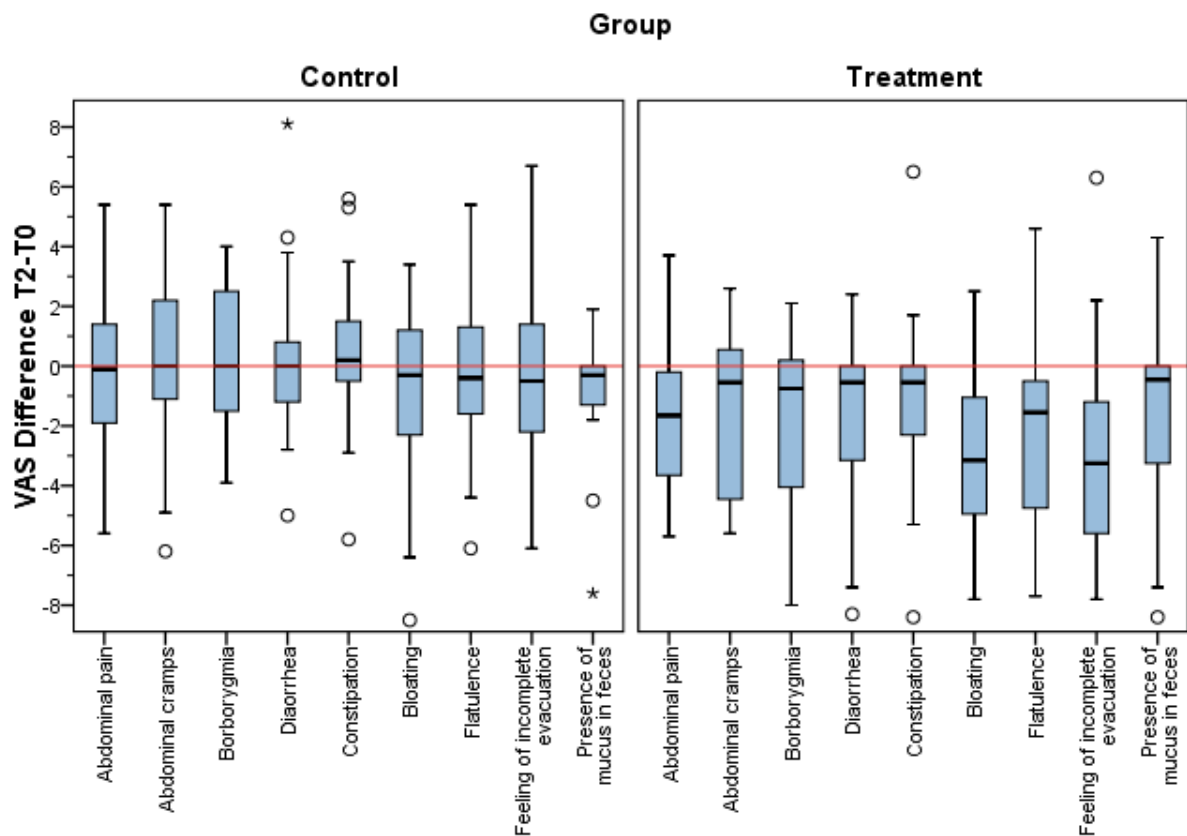


Figure 13. Median VAS score difference between timepoints T2-T0 in the control group and treatment group.

Summary

5 of 9 IBS symptoms showed a significant difference in the mean VAS score difference T2-T0. 4 in the treatment group and 1 in the control group.

In the treatment group the mean difference of the IBS symptom abdominal cramps score was -1,57 with SD± 2,67 (p=0,011).

In the treatment group the mean difference of the IBS symptom borborygmia score was -1,81 with SD± 2,94 (p=0,029).

In the treatment group the mean difference of the IBS symptom diarrhoea score was -1,76 with SD± 2,73 (p=0,011).

In the treatment group the mean difference of the IBS symptom constipation score was -1,22 with SD± 2,64 (p=0,009).

In the control group the mean difference of the IBS symptom presence of mucus score was -0,74 with SD± 1,88 (p=0,000).

5.4 Difference in IBS symptom VAS score within control group and treatment group.

9 tables and box-plots will present each IBS symptom descriptive data. The box-plots present each mean VAS score for each measurement (T0, T1 and T2) for control group and treatment group. Significant changes is marked in red.

T0= the first measurement and before the first osteopathic treatment in the treatment group. The control group did not receive any treatment.

T1= after 4 weeks from T0. The treatment group did get 3 x 20 minutes osteopathic treatment between T0 and T1. The control group did not receive any treatment.

T2= follow-up 4 weeks after T1. No treatments were given in the control group and treatment group.

All three time points T0, T1 and T2 for the measurements are valid for all data.

Table 12. Descriptive data for IBS symptom abdominal pain at each time-point in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	p-value
Control	T0	25	4,22	2,21	4,00	0,3	8,1	0,437
	T1	25	3,64	2,24	3,10	0,0	7,5	0,196
	T2	25	4,05	2,26	4,30	0,0	8,6	0,764
Treatment	T0	28	4,56	2,13	4,70	0,3	8,4	0,640
	T1	28	3,10	2,45	2,65	0,0	8,3	0,035
	T2	28	2,70	2,90	1,55	0,0	9,0	0,000

In the control group T0 mean 4,22 with SD± 2,21 (p=0,437), T1 mean 3,64 SD± 2,24 (p=0,196) and T2 mean 4,05 with SD± 2,26 (p=0,764).

In the treatment group T0 mean 4,56 with SD± 2,13 (p=0,640), T1 mean 3,10 SD± 2,45 (p=0,035) and T2 mean 2,70 with SD± 2,90 (p=0,000).

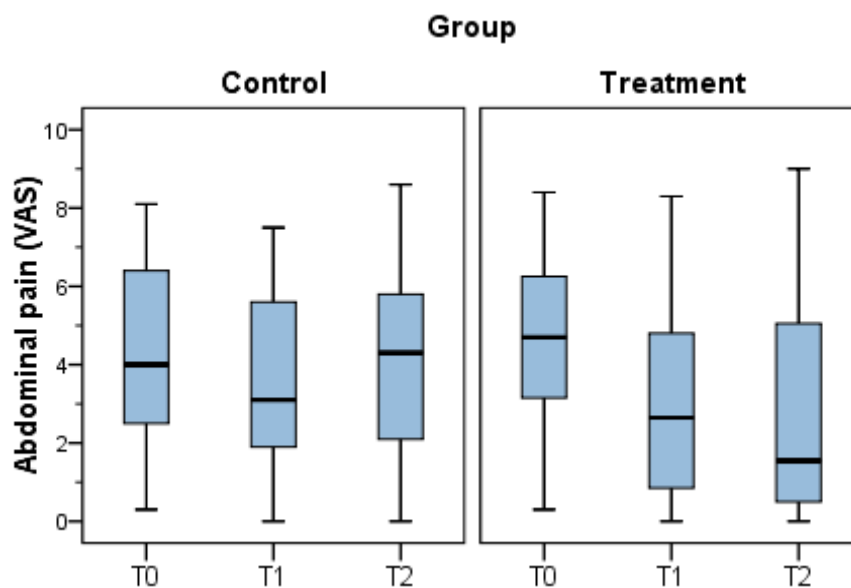


Figure 14. Development of subjective abdominal pain measured with the VAS scale in the control and treatment group.

Summary:

In the IBS symptom abdominal pain treatment group timepoint T1 and T2 did show a significant difference T1 mean 3,10 SD± 2,45 (p=0,035) and T2 mean 2,70 with SD± 2,90 (p=0,000).

Table 13. Descriptive data for IBS symptom abdominal cramps at each timepoint in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	p-value
Control	T0	25	2,86	2,66	2,20	0,0	10,0	0,011
	T1	25	2,47	1,97	2,20	0,0	7,1	0,071
	T2	25	3,17	2,49	3,10	0,0	10,0	0,069
Treatment	T0	28	4,38	2,44	5,15	0,0	8,2	0,048
	T1	28	2,78	2,70	2,15	0,0	8,8	0,006
	T2	28	2,80	3,00	1,30	0,0	8,7	0,000

In the control group T0 mean 2,86 with SD± 2,66 (p=0,011), T1 median 2,47 SD± 1,97 (p=0,071) and T2 mean 3,17 with SD± 2,49 (p=0,069).

In the treatment group T0 mean 4,38 with SD± 2,44 (p=0,048), T1 mean 2,78 SD± 2,70 (p=0,006) and T2 mean 2,80 with SD± 3,00 (p=0,000).

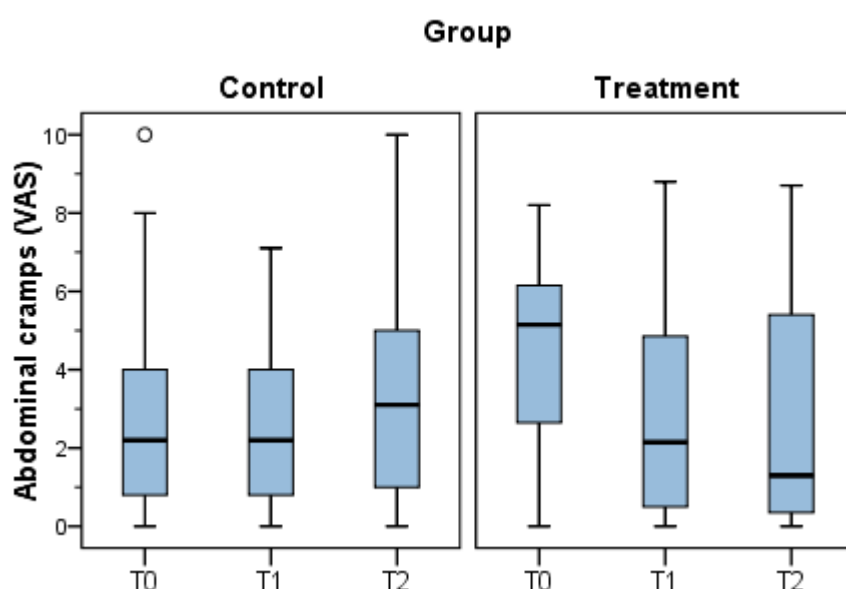


Figure 15. Development of subjective abdominal cramps measured with the VAS scale in the control group and treatment group.

Summary:

In the IBS symptom abdominal cramps control group T0 showed a significant difference, T0 median 2,86 with SD± 2,66 (p=0,011). In the abdominal cramps treatment group all timepoints T0, T1 and T2 did show a significant difference. T0 mean 4,38 with SD± 2,44 (p=0,048), T1 mean 2,78 SD± 2,70 (p=0,006) and T2 mean 2,80 with SD± 3,00 (p=0,000).

Table 14. Descriptive data for IBS symptom borborygmia at each timepoint in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	p-value
Control	T0	25	3,28	2,55	2,80	0,3	9,4	0,021
	T1	25	3,23	2,49	2,50	0,0	9,4	0,078
	T2	25	3,49	2,55	2,90	0,0	8,9	0,162
Treatment	T0	28	4,82	3,10	5,10	0,0	10,0	0,053
	T1	28	3,58	2,70	2,80	0,0	9,2	0,021
	T2	28	3,01	2,71	2,15	0,0	9,1	0,001

In the control group T0 mean 3,28 with SD± 2,55 (p=0,021), T1 mean 3,23 SD± 2,49 (p=0,078) and T2 mean 3,49 with SD± 2,55 (p=0,162).

In the treatment group T0 mean 4,82 with SD± 3,10 (p=0,053), T1 mean 3,58 SD± 2,80 (p=0,021) and T2 mean 3,01 with SD± 2,71 (p=0,001).

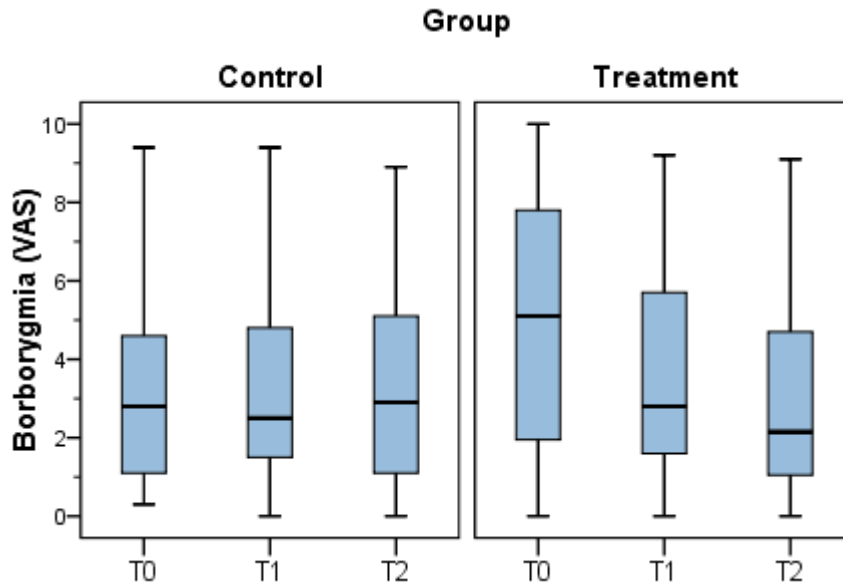


Figure 16. Development of subjective borborygmia measured with VAS scale in the control group and treatment group.

Summary:

In the IBS symptom borborygmia in the control group T0 showed a significant difference, T0 mean 3,28 with SD± 2,55 (p=0,021). In the borborygmia treatment group T1 and T2 did show a significant difference. T1 mean 3,58 SD± 2,70 (p=0,021) and T2 mean 3,011 with SD± 2,71 (p=0,001).

Table 15. Descriptive data for IBS symptom diarrhoea at each timepoint in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	p-value
Control	T0	25	2,79	2,83	1,80	0,0	9,0	0,001
	T1	25	3,02	2,79	2,00	0,0	8,5	0,007
	T2	25	3,22	2,96	1,90	0,0	9,1	0,005

Treatment	T0	28	4,08	3,15	4,70	0,0	8,9	0,001
	T1	28	2,30	2,62	1,55	0,0	8,5	0,000
	T2	28	2,31	2,64	1,70	0,0	8,7	0,000

In the control group T0 mean 2,79 with SD± 2,83 (p=0,001), T1 mean 3,02 SD± 2,79 (p=0,007) and T2 mean 3,22 with SD± 2,96 (p=0,005).

In the treatment group T0 mean 4,08 with SD± 3,15 (p=0,001), T1 mean 2,30 SD± 2,62 (p=0,000) and T2 mean 2,31 with SD± 2,64 (p=0,000).

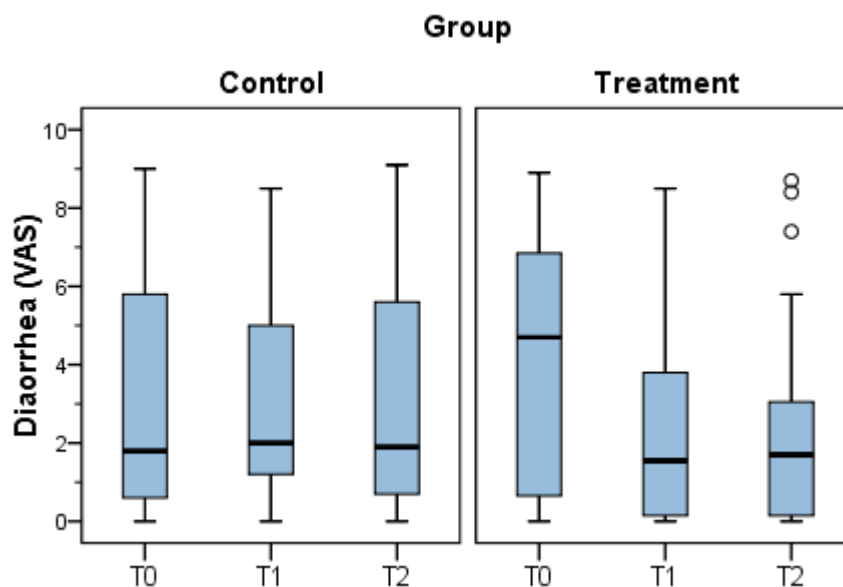


Figure 17. Development of subjective diarrhoea measured with VAS scale in the control group and treatment group.

Summary:

In the IBS symptom diarrhoea the control group all timepoints showed a significant difference, T0 mean 2,79 with SD± 2,83 (p=0,001), T1 mean 3,02 SD± 2,79 (p=0,007) and T2 mean 3,22 with SD± 2,96 (p=0,005).

In the diarrhoea treatment group all timepoints showed a significant difference T0 mean 4,08 with SD± 3,15 (p=0,001), T1 mean 2,30 SD± 2,62 (p=0,000) and T2 mean 2,31 with SD± 2,64 (p=0,000).

Table 16. Descriptive data for IBS symptom constipation at each timepoint in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	p-value
Control	T0	25	4,18	3,09	4,00	0,1	10,0	0,092
	T1	25	3,47	3,15	3,10	0,0	10,0	0,010
	T2	25	4,66	2,97	4,80	0,0	10,0	0,139
Treatment	T0	28	3,04	3,18	1,55	0,0	9,5	0,001
	T1	28	2,15	2,51	1,30	0,0	9,2	0,000
	T2	28	1,81	2,43	0,70	0,0	7,7	0,000

In the control group T0 mean 4,18 with SD± 3,09 (p=0,09), T1 mean 3,47 SD± 3,15 (p=0,010) and T2 mean 4,66 with SD± 2,97 (p=0,139).

In the treatment group T0 median 3,04 with SD± 3,18 (p=0,001), T1 mean 2,15 SD± 2,51 (p=0,000) and T2 mean 1,81 with SD± 2,43 (p=0,000).

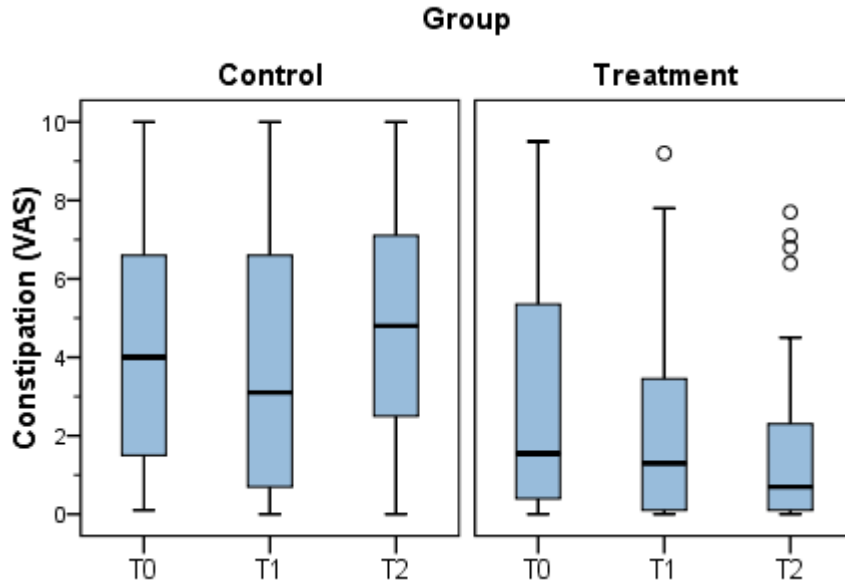


Figure 18. Development of subjective constipation measured with VAS scale at each measurement in the control group and treatment group.

Summary:

In the IBS symptom constipation control group T1 showed a significant difference. T1 mean 3,47 SD± 3,15 median (p=0,010). In the constipation treatment group all timepoints showed a significant difference. T0 mean 3,04 with SD± 3,18 (p=0,001), T1 mean 2,15 SD± 2,51 (p=0,000) and T2 mean 1,81 with SD± 2,43 (p=0,000).

Table 17. Descriptive data for IBS symptom bloating at each timepoint in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	p-value
Control	T0	25	6,36	2,77	6,60	0,3	10,0	0,024
	T1	25	5,50	2,71	6,20	0,3	9,4	0,116
	T2	25	5,45	2,93	6,20	0,1	8,7	0,006

Treatment	T0	28	7,01	2,09	7,45	1,4	10,0	0,082
	T1	28	4,78	2,96	5,20	0,0	9,7	0,252
	T2	28	4,02	3,16	3,30	0,0	9,8	0,031

In the control group T0 mean 6,36 with SD± 2,77 (p=0,024), T1 mean 5,56 SD± 2,71 (p=0,016) and T2 mean 5,45 with SD± 2,93 (p=0,006).

In the treatment group T0 mean 7,01 with SD± 2,09 (p=0,082), T1 mean 4,78 SD± 2,96 (p=0,252) and T2 mean 4,02 with SD± 3,16 (p=0,031).

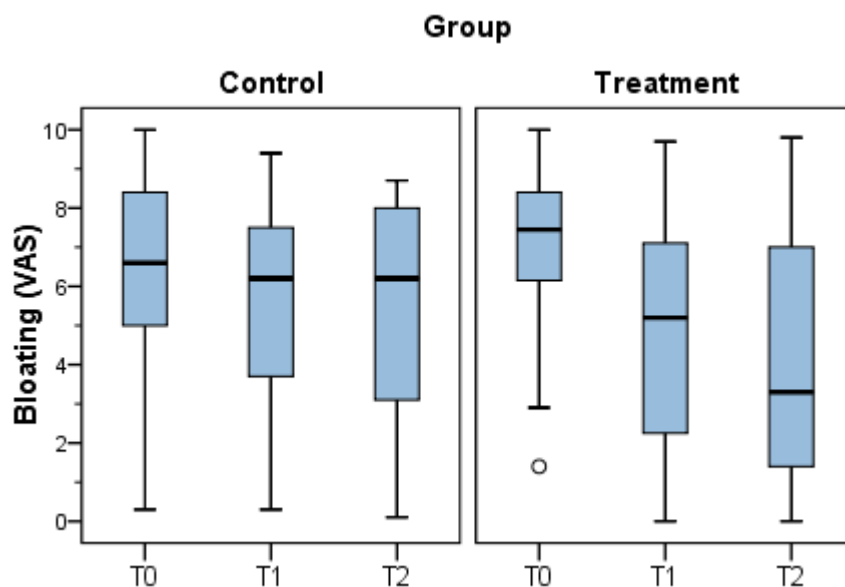


Figure 19. Development of subjective bloating measured with VAS scale in the control group and treatment group.

Summary:

In the IBS symptom bloating control group T0 and T2 showed a significant difference. T0 mean 6,36 with SD± 2,77 (p=0,024) and T2 median 5,45 with SD± 2,93 (p=0,006).

In the bloating treatment group T2 showed a significant difference. T2 mean 4,02 with SD± 3,16 (p=0,031).

Table 18. Descriptive data for IBS symptom flatulence at each timepoint in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	p-value
Control	T0	25	5,94	2,73	6,60	0,5	9,5	0,052
	T1	25	5,05	2,86	4,90	0,0	8,7	0,050
	T2	25	5,61	2,50	5,80	0,6	10,0	0,583
Treatment	T0	28	6,40	2,51	7,25	1,5	9,7	0,001
	T1	28	4,39	2,48	3,95	0,0	8,8	0,282
	T2	28	4,08	3,15	3,50	0,2	9,8	0,011

In the control group T0 mean 5,94 with SD± 2,73 (p=0,052), T1 mean 5,05 SD± 2,86 (p=0,050) and T2 mean 5,61 with SD± 2,50 (p=0,583).

In the treatment group T0 mean 6,40 with SD± 2,51 (p=0,001), T1 mean 4,39 SD± 2,48 (p=0,282) and T2 mean 4,08 with SD± 3,15 (p=0,011).

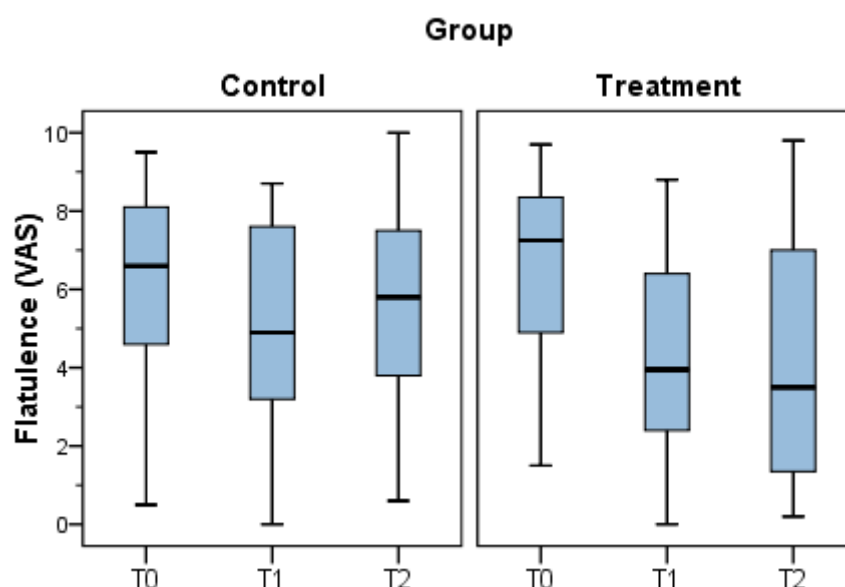


Figure 20. Development of subjective flatulence measured with VAS scale in the control group and treatment group.

Summary:

In the IBS symptom flatulence control group T1 showed a significant difference. T1 mean 5,05 with SD± 2,86 (p=0,050).

In the flatulence treatment group T0 and T2 showed a significant difference. T0 mean 6,40 with SD± 2,51 (p=0,001) and T2 mean 4,08 with SD± 3,15 (p=0,011).

Table 19. Descriptive data for IBS symptom presence of mucus in feces at each timepoint in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	P-value
Control	T0	25	2,48	3,05	1,40	0,0	10,0	0,000
	T1	25	1,89	2,75	0,50	0,0	9,7	0,000
	T2	25	1,74	2,65	0,40	0,0	9,4	0,000
Treatment	T0	28	2,91	3,09	2,00	0,0	8,6	0,000
	T1	28	1,35	2,04	0,15	0,0	7,1	0,000
	T2	28	1,23	2,18	0,10	0,0	9,3	0,000

In the control group T0 mean 2,48 with SD± 3,05 (p=0,000), T1 mean 1,89 SD± 2,75 (p=0,000) and T2 mean 1,74 with SD± 2,65 (p=0,000).

In the treatment group T0 mean 2,91 with SD± 3,09 (p=0,000), T1 mean 1,35 SD± 2,04 (p=0,000) and T2 mean 1,23 with SD± 2,18 (p=0,000).

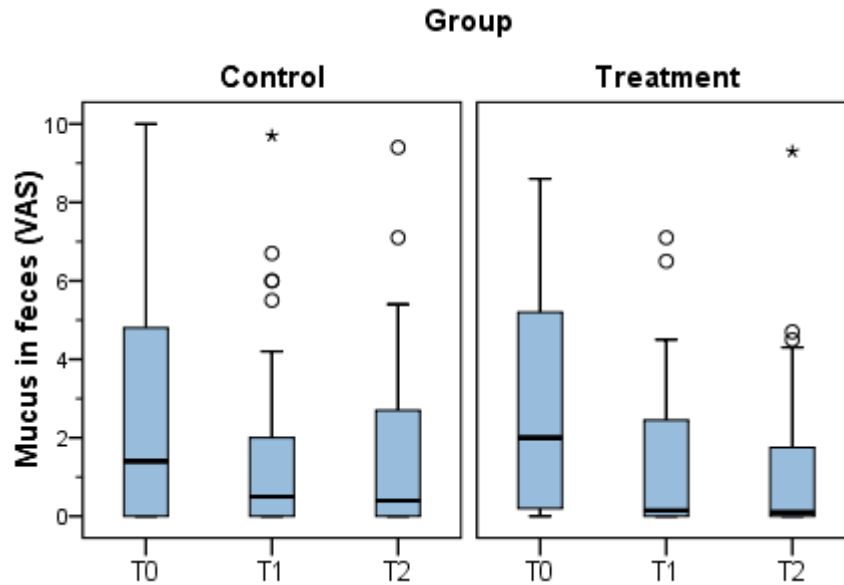


Figure 21. Development of subjective presence of mucus in feces measured with VAS scale in the control group and treatment group.

Summary:

In all timepoints T0, T1 and T2 in the control group and treatment group there was a significant difference. In the control group T0 mean 2,48 with SD± 3,05 (p=0,000), T1 mean 1,89 SD± 2,75 (p=0,000) and T2 mean 1,74 with SD± 2,65 (p=0,000).

In the treatment group T0 mean 2,91 with SD± 3,09 (p=0,000), T1 mean 1,35 SD± 2,04 (p=0,000) and T2 mean 1,23 with SD± 2,18 (p=0,000).

Table 20. Descriptive data for IBS symptom feeling of incomplete evacuation at each timepoint in the control group and treatment group.

Group	Timepoint	N	Mean	Std deviation	Median	Min	Max	p-value
Control	T0	25	5,37	2,89	6,30	0,2	9,6	0,123
	T1	25	4,74	2,76	4,80	0,0	9,7	0,707
	T2	25	4,96	2,81	5,10	0,5	10,0	0,422
Treatment	T0	28	5,91	2,99	7,05	0,0	9,3	0,002
	T1	28	3,72	2,79	3,85	0,0	9,4	0,028
	T2	28	2,83	2,72	1,55	0,0	8,7	0,003

In the control group T0 mean 5,37 with SD± 2,89 (p=0,123), T1 mean 4,74 SD± 2,76 (p=0,707) and T2 mean 4,96 with SD± 2,81 (p=0,422).

In the treatment group T0 mean 5,91 with SD± 2,99 (p=0,002), T1 mean 3,72 SD± 2,79 (p=0,028) and T2 mean 2,83 with SD± 2,72 (p=0,003).

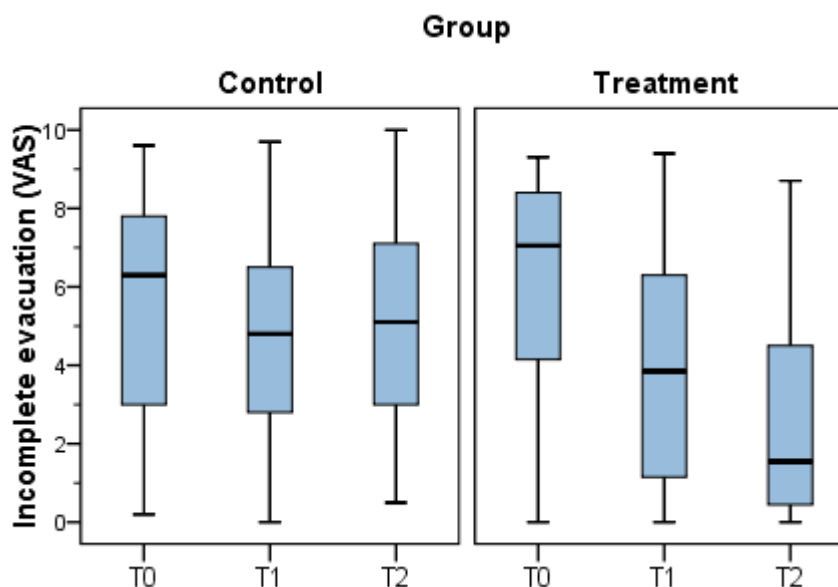


Figure 22. Development of subjective feeling of incomplete evacuation measured with VAS scale in the control group and treatment group.

Summary:

In the IBS symptom feeling of incomplete evacuation treatment ment group all timepoints T0, T1 and T2 showed a significant difference. T0 mean 5,91 with SD± 2,99 (p=0,002), T1 mean 3,72 SD± 2,79 (p=0,028) and T2 mean 2,83 with SD± 2,72 (p=0,003).

5.5 Mean ranks and VAS score difference in T2-T0 between the two treatment centers.

The authors wanted to know if there was a difference between all the participants VAS score between the two osteopathic treatment centers. Below there are two tables presenting the result. If there is a significant difference p-value is marked in red. Mann-Whitney U test was used for the analyse.

Table 21. IBS symptom VAS score p-value difference for the control group in timepoints T2-T0 between the two osteopathic centers.

IBS symptom control group N25	Center Maria Mean ranks N14	Center Mattias Mean ranks N11	VAS Difference T2-T0 Asymp sig p<0,05
Abdominal pain	11,93	14,36	0,149
Abdominal cramps	13,87	15,23	0,434
Borborygmia	15,1	10,45	0,134
Diarrhoea	13,68	12,14	0,609
Constipation	16,57	8,45	0,005
Bloating	14,64	10,91	0,222
Flatulence	12,68	13,41	0,809
Incomplete evacuation	12,82	13,23	0,893
Presence of mucus	12,57	13,55	0,767

Table 22. IBS symptom VAS score p-value difference for the treatment group in timepoint T2-T0 between the two osteopathic centers.

IBS symptom treatment group N28	Center Maria Mean ranks N15	Center Mattias Mean ranks N13	VAS Difference T2-T0 Exact sig p<0,05
Abdominal pain	13,87	15,23	0,683
Abdominal cramps	13,87	15,23	0,683
Borborygmia	13,23	15,96	0,387
Diarrhoea	16,13	12,62	0,274
Constipation	14,51	14,51	0,999
Bloating	12,53	16,77	0,185
Flatulence	13,81	15,31	0,651
Incomplete evacuation	12,83	16,42	0,254
Presence of mucus	13,47	15,69	0,496

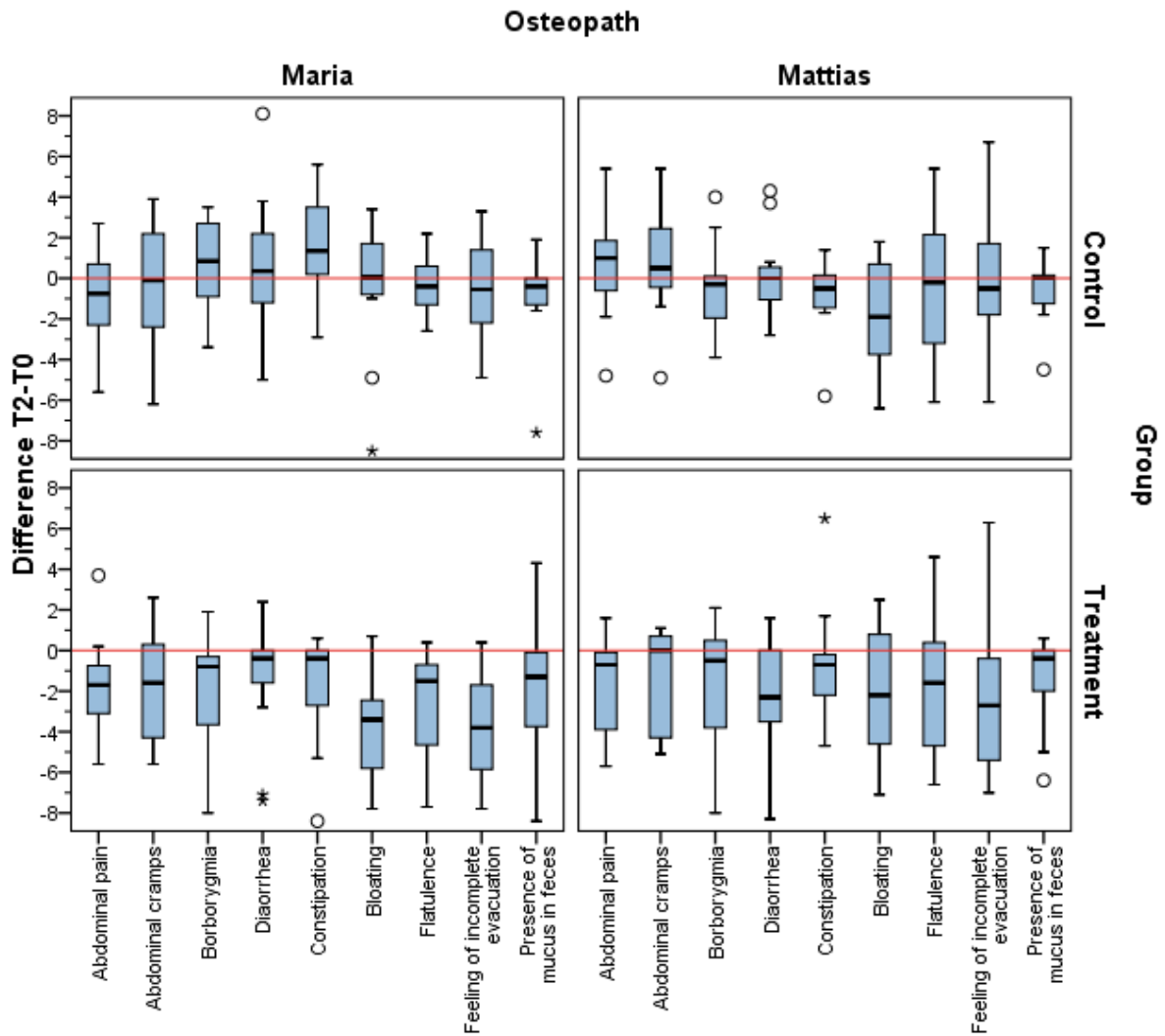


Figure 23. Difference in IBS symptom VAS score T2-T0 between the control group and treatment group at the two treatment centers.

Summary:

In the control group there was a significant difference in the IBS symptom constipation. In the „center Maria“ the mean ranks were 16,47 and in the „center Mattias“ the mean ranks were 8,45. T2-T0 VAS difference ($p=0,005$).

6 Discussion

6.1 Discussion of methodology (2)

The inclusion criteria demanding a diagnosis from a gastroenterologist ensures as good as possible that a correct diagnosis is set, in addition to this the Rome III criteria for diagnosing IBS is well validated, there is a 98% accuracy of a correct IBS diagnosis even without having performed other diagnostic procedures (Vanner *et al*, 1999) hence the risk of participants with incorrect diagnosis is reduced. The major pathologies written in the exclusion criteria all have the possibility of affecting gastrointestinal symptoms and regarding rheumatologic diseases there have been found connections between e.g. ankylosing spondylitis and gastrointestinal symptoms (Goodman *et Snyder*, 2000). Age of the patients varied between 16-70 and this dispersion is a representation of both the young adult, the adult and the elderly patient which all have the potential to develop IBS (Andrews *et al*, 2005). There is a possibility that age may have an effect on how the patient answers to the treatment hence the authors tried to cover all the different age-phases.

Hormonal changes like pregnancy also created the possibility of confounders hence this is in the exclusion criteria. More attempts to eliminate confounders were made by the fact that the exclusion criteria removed participants that had done changes in their diet or medication the last two months before the study and also participants that had consulted osteopathic treatment the last six months prior to the study. The participants were also asked not to make any changes in medication or diet during the study to prevent performance bias, but on many occasions there were performance bias that might have been added which the authors have had no control over, for example if a participant changed workplace or work schedules that created new food habits, sickness or other problems in the family that induced extra stress etc. (Jüni *et al*, 2001).

Patient characteristics are shown which is important to the reader in order to be able to assess the context and generalisability of a study's results (Vandenbroucke *et al*, 2007). Patients were recruited from different social classes, geographical locations and age-groups which decrease the risk of confounders related to this.

Four males participated and they were randomised by coincidence to 2 in the control group and 2 in the treatment group which eliminates gender as a confounder. Regarding this randomisation, if it were to be done again, a change of methodology to ensure that equal, or as close as possible, distribution of males vs. females would have been preferred to avoid confounders, however coincidence were on the side of the authors this time. The fact that two male subjects were randomised in each group, age was quite similar between treatment and control-groups and subgroups of IBS were accounted for in the statistics, decreases the risk of confounders (Jüni *et al*, 2001).

The use of VAS scale is a validated measurement for quantitative assessment of abdominal pain hence a good way to measure the severity of IBS-symptoms (Gallagher *et al*, 2002). To minimise the risk of detection bias all patients filled out their forms alone without influence of the therapist and the VAS-measurements were measured and recorded by a person with no interest in the study, this person was also educated in how to use the ruler to make the measurements as specific as possible. To prevent detection bias the outcome assessor did not know either which group the patient belonged to, which gender the participant had, or the name because of the pseudoalias all participants were given in the beginning of the study.

Randomisation with computer software was not performed but selection bias was reduced because there in fact was a randomisation and it was performed by a person with no involvement in the study, blinded to participants name and gender, which creates a type of blinding of the assessors, according to Jüni *et al*, 2001, this is an adequate randomisation regarding generation of allocation sequences and concealment of allocation sequences. Attrition bias should not be an issue since all three dropouts left before starting filling the first IBS-symptom scale form.

Performance bias was addressed by the fact that the two executors of the treatments met before the first intervention and agreed on how to specifically execute the techniques that were used in the study (Vandenbroucke *et al*, 2007). One of the authors (Maria) knew some of her patients prior to the study which may have added a slight performance bias effect, also if the therapist were stressed during the treatment because of time pressure may have performance biased the treatment techniques. Blinding of the therapists to whether the patient lying on the bench

was located to the control group or treatment group was not possible, as were blinding of the study participants to which group they belonged to, but the risk of performance bias due to this were estimated to be minimal (Jüni *et al*, 2001). Three treatment s with approximately 2 weeks interval were, by the authors, considered to be the lowest limit for how many treatment s the authors had to do to get measurements where a significant difference might be seen compared to the controls. With this said, more treatment s during a longer period of time would have been preferred to possibly get more consistent and fair results. Regarding the number of participants (n=53), even though the aim was at 60 patients, it should be considered as quite a large study on this academic level, however the Irritable bowel syndrome is a condition which presents itself in numerous different manners and varies vastly between different periods which make it interesting to examine larger populations over a longer period of time (Goodman *et Snyder*, 2000). A small number of participants does not necessarily mean that a study is of low quality but it is important to discuss the number of participants and why this size was considered relevant, to take this research one step further and increase the group size would probably require some kind of funding (Higgins *et Green*, 2008).

It is possible to argue whether the techniques used in the study were the most appropriate to use for the purpose they were meant for or not. There will probably be some differences in opinion from different osteopaths, however the techniques used have validation in osteopathic literature and in scientific articles (see background 2.7). The order the techniques were performed in aimed to primarily address the PSNS in a supine position and then the SNS in a prone position, mainly to let the patient rest in the same position as long as possible without having to turn on the bench more than necessarily. This is one factor which, in itself, may have a calming effect on the ANS (Chila *et al*, 2011). All major outflow-areas of the ANS from the spinal cord is covered with these techniques, the fact that the therapist holds one hand below the sacrum and the other hand in the area of the dorsolumbar junction allows the therapist to affect both the pelvic splanchnics (PSNS) and the lower parts of the sympathetic trunk (SNS). Patients in the control group were offered two free treatment s, after the study was finished, as compensation for their participation but no salary was payed and the risk of funding bias

because of this is minimal. To sum up the method part, it has been carefully planned to, as much as possible, avoid confounders and bias and the weaknesses in the method are few and small.

6.2 Discussion of results (1)

The first part of the discussion will be presented with patient characteristics, mean symptom score, VAS score difference between control group and treatment group and at the end the IBS VAS score T2-T0 difference between the two treatment centers. There will be a comparison as well between the results of this RCT and three previous published studies on IBS. The last part presents different stressors which could negatively influence patients IBS symptoms.

6.2.1 Patient characteristics.

In the study there were 53 participants in total. 92,5 % were women and 7,5 % men. The mean age in the control group was 36,28 years and 37,86 years in the treatment group. A confounding factor is age and sex. The age variable were checked since the p-value was not significant $p=0,680$. To summarise it it was dominated by women with quite a young age even if the youngest participant were 16 years and the oldest were 69 years there is a big variance for age and it represents a fair segment that IBS is present at any age in the population. There were participants using medication, the inclusion criteria allowed no changes in the past 2 months and nobody gave notice of any changes during the study. Looking at the participants occupation the majority of them were working in a social environment. Healthcare, school (including students) and office. Especially people who were working in a "caring, providing" and stressful environment can have a tendency to be more sensitive. The author took notice of that when treating and talking to the participants in the treatment group and several of them confirmed that they have a HSP (highly sensitive person) character.

6.2.2 Mean symptom score in timepoint T0, T1 and T2 in control group and treatment group.

Looking at the mean symptom score and the changes that occurred within the control group and the treatment group there were no significant difference in the control group. In the treatment group there were significant changes at T0 ($p=0,024$) and T1 ($p=0,038$). There were also a change in the T2-T0 total mean symptom score. The control group made a small improvement (-0,13) and the treatment group made a larger improvement (-2,04). It was not big enough to reach statistical significance. The most interesting and one of the main questions the authors wanted to investigate by writing the thesis were to compare the results of the single IBS symptoms between the control group and treatment group. Also to see if the osteopathic treatment approach did have an effect by using indirect and functional techniques.

6.2.3 Difference in mean IBS symptom VAS score between control group and treatment group.

Comparing the difference between the control group and the treatment group in all single IBS symptoms there were 4 in the treatment group and 1 in the control group that reached a statistical significance. In the control group there were 8 single IBS symptoms that did not reach a statistical significance and 5 IBS symptoms in the treatment group that did not reach a statistical significance. Below are the IBS symptoms that did reach a statistical significance.

In the treatment group the mean difference of the IBS symptom abdominal cramps score were -1,57 with $SD\pm 2,67$ ($p=0,011$).

In the treatment group the mean difference of the IBS symptom borborygmia score were -1,81 with $SD\pm 2,94$ ($p=0,029$).

In the treatment group the mean difference of the IBS symptom diarrhoea score were -1,76 with $SD\pm 2,73$ ($p=0,011$).

In the treatment group the mean difference of the IBS symptom constipation score were -1,22 with $SD\pm 2,64$ ($p=0,009$).

In the control group the median difference of the IBS symptom presence of mucus in feces score were -0,74 with $SD\pm 1,88$ ($p=0,000$).

6.2.4 Difference in IBS symptom VAS score within control group and treatment group.

Nearly all single IBS symptoms did reach a statistical significance either in the control group or the treatment group. It could be in timepoint T0, T1 or T2. Sometimes occasional in either one of them or in all three. The authors were hoping at least for a difference in the treatment group among the IBS symptoms but in the control group there were also significant changes surprisingly.

Abdominal pain: T1 and T2 did reach a significant difference T1 mean 3,10 SD± 2,45 ($p=0,035$) and T2 mean 2,70 with SD± 2,90 ($p=0,000$). Total difference from T0 (mean 4,56) – T2 (mean 2,70) is 1,86. In the control group T0 (mean 4,22) – T2 (mean 4,05) is only 0,17. With the osteopathic treatment the abdominal pain level decreased. Not enough to reach a statistical significance though but there was a difference in the positive manner for all participants in the study.

Abdominal cramps: In the IBS symptom abdominal cramps control group T0 reached a significant difference, T0 median 2,86 with SD± 2,66 ($p=0,011$). In the abdominal cramps treatment group all timepoints T0, T1 and T2 did show a significant difference. T0 mean 4,38 with SD± 2,44 ($p=0,048$), T1 mean 2,78 SD± 2,70 ($p=0,006$) and T2 mean 2,80 with SD± 3,00 ($p=0,000$).

Borborygmia: In the IBS symptom borborygmia in the control group T0 reached a significant difference, T0 mean 3,28 with SD± 2,55 ($p=0,021$). In the borborygmia treatment group T1 and T2 did reach a significant difference. T1 mean 3,58 SD± 2,70 ($p=0,021$) and T2 mean 3,011 with SD± 2,71 ($p=0,001$).

Diarrhoea: In the IBS symptom diarrhoea the control group in all timepoints reached a significant difference, T0 mean 2,79 with SD± 2,83 ($p=0,001$), T1 mean 3,02 SD± 2,79 ($p=0,007$) and T2 mean 3,22 with SD± 2,96 ($p=0,005$). In the diarrhoea treatment group all timepoints reached a significant difference T0 mean 4,08 with SD± 3,15 ($p=0,001$), T1 mean 2,30 SD± 2,62 ($p=0,000$) and T2 mean 2,31 with SD± 2,64 ($p=0,000$).

Constipation: In the IBS symptom constipation control group T1 reached a significant difference. T1 mean 3,47 SD± 3,15 median ($p=0,010$). In the constipation treatment group all timepoints reached a significant difference. T0 mean 3,04 with

SD± 3,18 (p=0,001), T1 mean 2,15 SD± 2,51 (p=0,000) and T2 mean 1,81 with SD± 2,43 (p=0,000).

Bloating: In the IBS symptom bloating control group T0 and T2 reached a significant difference. T0 mean 6,36 with SD± 2,77 (p=0,024) and T2 median 5,45 with SD± 2,93 (p=0,006). In the bloating treatment group T2 reached a significant difference. T2 mean 4,02 with SD± 3,16 (p=0,031).

Flatulence: In the IBS symptom flatulence control group T1 reached a significant difference. T1 mean 5,05 with SD± 2,86 (p=0,050). In the flatulence treatment group T0 and T2 reached a significant difference. T0 mean 6,40 with SD± 2,51 (p=0,001) and T2 mean 4,08 with SD± 3,15 (p=0,011).

Feeling of incomplete evacuation: In all timepoints T0, T1 and T2 in the control group and treatment group there were a significant difference. In the control group T0 mean 2,48 with SD± 3,05 (p=0,000), T1 mean 1,89 SD± 2,75 (p=0,000) and T2 mean 1,74 with SD± 2,65 (p=0,000). In the treatment group T0 mean 2,91 with SD± 3,09 (p=0,000), T1 mean 1,35 SD± 2,04 (p=0,000) and T2 mean 1,23 with SD± 2,18 (p=0,000).

Presence of mucus in feces: In the IBS symptom feeling of incomplete evacuation treatment group all timepoints T0, T1 and T2 reached a significant difference. T0 mean 5,91 with SD± 2,99 (p=0,002), T1 mean 3,72 SD± 2,79 (p=0,028) and T2 mean 2,83 with SD± 2,72 (p=0,003).

6.2.5 Mean ranks and VAS score difference in T2-T0 between the two treatment centers.

The authors wanted to know if there were a difference in between the results comparing the two treatment centers. The results were based on the participants difference in IBS symptoms and not the 2 treating therapists. Only one single IBS symptom stood out. In the control group there were a significant difference in the IBS symptom constipation. In the „center Maria“ the mean ranks were 16,47 and in the „center Mattias“ the mean ranks were 8,45. T2-T0 VAS difference (p=0,005). Why the outcome in the control group and single IBS symptom constipation did reach a statistical significance was difficult for the author to know. There can be several things that could affect the constipation symptom ie quality of food, stress,

changes in physical activity and many more things. It is also normal for IBS patients to have a variation of their symptoms which is following the illness pattern for IBS.

6.2.6 Previous IBS studies

Up to date there are not much research done of the IBS subject, but the author found three very interesting previous published IBS articles. The result of the Master thesis are encouraging that osteopathy can be very helpful to people with the functional disorder IBS. The result from the RCT study from Hundscheid *et al* (2007) the enrolled participants were randomised to osteopathy (n=20) or standard care (n=19). The difference of change in overall symptomatic improvement were statistically significant in favor of the osteopathic treatment ($p < 0,006$). Also, a significant decrease were noted in the standard care ($p < 0,0001$). However, the decrease in the group which were treated with osteopathy were significantly higher compared with the standard treatment ($p = 0,02$). At the 6 month follow-up, the score in the osteopathy group were significantly lower (6.8 vs 10 $p = 0,02$). The quality of life score increased in the osteopathy group with 111 vs 129, ($p < 0,009$). In the standard care group an increase were also noted, but that was not statistically significant (109 vs 121). The authors of the study came to the conclusion that osteopathic therapy can be a promising alternative in the treatment of patients with IBS. Patients treated with osteopathy overall did better in regard to symptom score and quality of life. The pilot randomised sham-controlled study from Florance *et al* (2012) came to the conclusion that osteopathy improve the severity of IBS symptoms and the impact on quality of life. Osteopathy should therefore be considered for future research as an effective complementary alternative medicine in the management of IBS symptoms. The authors had 30 participants diagnosed with IBS fulfilling the Rome III criteria which were randomised to osteopathy (n=20) or sham treatment (n=10). The result in the severity of IBS decreased in both groups at day 7 and 28. At day 7 the decrease were significantly more marked in the patients who received osteopathy ($p < 0,01$) compared with the sham osteopathy procedure. At day 28 the result were ($p < 0,01$) in the osteopathy group. The sham osteopathy group also reduced the severity of IBS ($p = 0,04$) and no significant improvement at day 28 ($p = 0,07$). The study from Attali *et al* (2013) which claims with

treatment that visceral osteopathy were associated with a significant improvement of self-reported diarrhoea, abdominal distension and abdominal pain. The symptom constipation did not change significantly. It was also associated with decreased rectal sensitivity, presenting as an increase in threshold volume, constant sensation volume and maximum tolerable volume ($p < 0.001$). However, no significant change of rectal sensitivity were observed when patients underwent sham manipulations. Improvements of depression were not observed. At the 1 year follow-up symptom scores of diarrhoea, abdominal distension and abdominal pain was significant lower than the initial part at enrollment ($p < 0.05$). Attali *et al* (2013) came to the conclusion that visceral osteopathy improve short-term and long-term abdominal distension and pain and decreases rectal sensitivity in IBS patients.

6.2.7 Discussion of outcomes

The first thing worth to mention when the author read the other three IBS studies the IBS Master thesis participants involved in the study were almost twice as many ($n=53$) as in the other three studies. Attali *et al* (2013) had ($n=31$) participants, Hundscheid *et al* (2006) had ($n=49$) participants and Florance *et al* (2012) had ($n=30$) participants.

Attali *et al* (2013) only measured self-reported typical IBS symptoms like diarrhoea, constipation, abdominal pain and bloating. The participants used VAS scale to record the result. The authors were also interested in presence of depression, rectal sensitivity and transit time for the colon. Diarrhoea, abdominal distension and abdominal pain while constipation did not change significant after the therapy. The similarity with the study and the Master thesis were that some of the typical IBS symptoms were recorded with the VAS scale. Depression, rectal sensitivity and transit time for the colon were not registered in the Master thesis. The follow-up for the participants in the Attali *et al* (2013) were one year later and the Master thesis follow-up were after 4 weeks after the last osteopathic session was performed. Selfreported abdominal pain VAS score showed in the study from Attali *et al* (2013) in the treatment group mean 2,49 $SD \pm 0,44$ ($p=0,003$).

Diarrhoea mean 0,59 SD± 0,24 (p=0,036) and constipation mean 1,37 SD± 0,48 (p=not significant). The Master thesis selfreported abdominal pain mean were -1,85 with SD± 2,27 (p=0,486). Diarrhoea mean -1,76 with SD± 2,73 (p=0,011) and constipation in the treatment group mean difference was -1,22 with SD± 2,64 (p=0,009). It was not easy to compare the results between the studies since the different studies used different measurements. The questionnaires used to record the results are different between the studies since the Master thesis only used the VAS scale and the Attali *et al* (2013) used several accepted more specific and informative questionnaires. There were some similarities that could be compared. The three IBS symptoms abdominal pain, diarrhoea and constipation. All the results reached a statistical significans which could be positive since more alternative therapies are being evaluated for IBS patients.

Florance *et al* (2012) performed two osteopathic treatments on day 0 and day 7. The follow up were already on day 28 and the result from day 7 did not persist at day 28. The primary outcome was to measure any differences in symptoms using the IBS severity score. Secondary outcomes were recording level of depression, fatigue, quality of life and bowel habits. The severity of IBS decreased in both groups at days 7 and 28. At day 7 the decrease were significantly more marked in patients who received osteopathy compared with those who received the sham procedure. Both anxiety and depression scores decreased without difference between groups. Stool frequency and consistency were not significantly modified. The Mater thesis and the study from Florance *et al* (2012) have several similarities, the recordings of IBS symptom severity were registered through questionnaires, both were "short in time", ie 4 weeks and 8 weeks in total, aproximately the same interval in between the treatments (1 week and 2 weeks) and amount of treatments (2 and 3 respectively). All treatments were performed by trained osteopaths in both of the studies. On forehand the authors in both of the studies had decided what techniques to be used during the OMT sessions. That is not so "osteopathically" to do since osteopathy has a holistic philosophy but it was interesesting to see what the final result ended up in.

The study from Hundscheid *et al* (2007) used the black box method which means that the osteopath never tell the reader what techniques were used during the OMT session. The treating osteopath performed 5 OMT sessions once a week for

2-3 weeks. The follow up period were at 1, 3 and 6 months after the last OMT session. There were no sham treatment procedure since the standard care treatment for IBS are an accepted method treating IBS in medical terms. The outcome were recorded using the FBDSI (Functional Bowel Disorder Severity Index) questionnaire and the symptom score of IBS. The symptoms measured were abdominal pain, abdominal cramps, borborygmia, diarrhoea, constipation, flatulence, presence of mucus, feeling of incomplete evacuation. At each follow up the quality of life were recorded to see any changes in that. The Master thesis primary outcome were the same as in the study from Hundscheid *et al* (2007) to see if there were a difference in the 9 IBS symptoms. The largest difference were though that the treatment protocol were completely different from each other. The authors writing the Master thesis decided on forehand and even have pictures on which OMT techniques that were used during the sessions. The osteopath who performed the black box sequence treated what the findings were, but the reader never find out what the findings are. It is though interesting that the authors from both studies come to the same conclusion that osteopathy can be a promising therapy to use when treating patients with IBS.

6.2.8 Stressors affecting IBS.

Serotonin and other neurotransmitters are plausible candidates in the pain and stress related pathogeneses and/or pathophysiology in IBS (Fukudo, 2013). In the modern western society adult women are working outside the home and women tend to be in majority with the IBS diagnosis (Elsenbruch, 2011). Double work and high standards are factors that create chronic stress to the body. Both internal and external stress can cause the nervous system to go on full speed (Konturek, *et al* 2011). IBS is repeatedly reported as a stress related disorder. Symptoms related to stress are high in IBS patients, but not in normal subjects (Fukudo, 2013). When there is to little or no time in between stressful timeperiods when you can rest and recover the body starts to slowly break down. According to Knight *et al* (2015) children who grow up in families with a history of alcohol abuse or psychiatric illness has a higher tendency to get IBS. Not only drugabuse but also the environment that the child is exposed to can contribute to stress. In early life anxiety and fear can create low self esteem in the child. A recently swedish study by

Grodsinsky *et al* (2015) recorded individuals with IBS and came to the conclusion that they have certain personality traits concerning lower self-esteem and inferior coping strategies than patients without any present or previous GI complaints. In the study they found that IBS cases had higher levels of negative self-esteem and lower levels of positive self-esteem. Women with low self-esteem have a higher tendency to get IBS. As well as poor diet and hypersensitivity to specific nutrients like gluten, wheat and dairy products. It is not clear that gluten triggers the symptoms in non-celiac gluten sensitivity (NCGS) persons, but there is strong evidence that carbohydrates like fructans and galactans in wheat does (El-Sahly *et al* 2015).

7 Conclusion (1+2)

The authors were able to prove the first alternative hypothesis to be true. There were a statistical significant difference in all 9 IBS symptoms within the treatment group.

The authors were able to prove the second alternative hypothesis to be true in 4 out of 9 specific IBS symptoms: abdominal cramps, borborygmia, diarrhoea and constipation. The other 5 IBS symptoms did not reach statistical significans however they improved compared to the initial measurement in T0.

The statistical analyses reached no statistical significant difference between the two treatment centers in the treatment group hence the third null hypothesis were proven to be true.

When comparing all the symptoms merged together in general between control group and treatment group the result showed an improvement on the VAS scale with -0,13 in the control group. In the treatment group the difference were – 2,04 between timepoints T2-T0. However this did not reach statistical significans in the control group ($p=0,200$) and in the treatment group ($p=0,200$).

The authors agreed on forehand which specific OMT techniques that should be used for the study. Looking at other RCT studies on the IBS subject several of them never told the reader what and how they performed the treatment and techniques used. In this study the reader gets all information on how the procedure of the interventions went along. The techniques were not adapted for the specific individual, despite this the results in this RCT were encouraging.

This RCT study demonstrates the efficacy of osteopathic manipulation treatment techniques in the amelioration of irritable bowel syndrom (IBS) and its symptoms like abdominal cramps, borborygmia, diarrhoea and constipation. The results are encouraging since osteopathic treatment can provide an important means of helping patients to cope in their daily life despite their illness.

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9 Appendix

9.1 Information and questions to interested participants

Information till intresserade av att delta i vår studie om "osteopatisk behandling vid IBS".

Vi vill börja med att säga TACK för att du hör av dig till oss. Vi ska sammanfatta vad tanken med studien är o.s.v. nedan.

Vi kommer att behöva 30 personer vardera, totalt 60 personer med IBS till vår D-uppsatsstudie för att erhålla en "Master of Science" i osteopati och det är Dresden International University i samarbete med Osteopatie-Schule Deutschland som är det examinerande universitetet i Tyskland. I första hand ska du ha blivit diagnostiserad av en läkare som uteslutit andra sjukdomar men om patientunderlaget med de kriterierna inte är tillräckligt så kan vi inkludera personer som vi utifrån IBS-symptom kan diagnostisera genom att besvara ROME III (3) formuläret. Korrekt utfört stämmer detta med hög sannolikhet.

När vi har fått tag på korrekt antal deltagare så kommer det ske en urvalsprocess. Du kommer slumpvis hamna i en behandlingsgrupp eller kontrollgrupp om du är en passande kandidat till studien. Du kommer att få besvara olika formulär med frågor vid 3 tillfällen under studiens gång som kommer pågå mellan april-juni 2015. De deltagare som kommer i behandlingsgruppen kommer att få 3 osteopatiska behandlingar under 4 veckor. Därefter är det ett uppehåll på 4 veckor och sedan gör vi en uppföljning där det inte blir någon behandling men du fyller i det sista formuläret med frågor. Formuläret i sig består av 9 mätskalor där du graderar olika IBS-symptom. Detta borde inte ta mer än ca 5-10 min per gång.

Behandlingen i sig kommer att ta ca 20min och består av lugna, behagliga tekniker vars syfte är att påverka de områden i ryggraden där nerver har sitt utflöde till de olika delarna av magen och tarmarna. Osteopati är en alternativ behandlingsform och behandlingarna i denna studie är riktade mot att mäta eventuella skillnader i symptom mellan kontrollgrupp och behandlingsgrupp, det är alltså inte troligt att med endast 3 behandlingar utformade på detta sätt bota IBS, dock är möjligheten stor för flera positiva förändringar av både magvanor och exempelvis ryggproblem.

De deltagare som hamnar i kontrollgruppen kommer inte få någon osteopatisk behandling men kommer efter den avslutade studien att tillhandahålla ett presentkort på 2 behandlin-

gar som är giltigt efter studiens avslut fram till och med årsskiftet 2015/2016 som tack för deltagande i vår pilot studie.

Besvara de följande 6 frågorna:

1. Har du blivit diagnostiserad med IBS av en läkare och vilket år?
2. Hur gammal är du?
3. Är du gravid?
4. Har läkare diagnostiserat att du har någon lever- eller njursjukdom, pågående alkoholism, hjärtsvikt, magsår, inflammatorisk tarmsjukdom, psykisk ohälsa eller har du gjort någon tidigare bukoperation med undantag för blindtarmen, ljumsk-bräck, livmodern eller hemorrojder?
5. Har du tidigare sökt hjälp hos osteopat för dina besvär och isåfall när?
6. Kan du lite kortfattat beskriva dina symptom:

Tack för att du tog dig tid att besvara frågorna och att du kontaktade oss.

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Mattias Särnbäck Osteopat BSc verksam i Borås och Kinna osteopaten@hotmail.com

9.2 IBS symptomscale

Namn: _____

Datum: _____

Sätt ett kort lodrätt streck på skalan där du tycker att ditt symptom befunnit sig i genomsnitt senaste månaden där 0=inget symptom och 10=värsta tänkbara symptom

Magsmärta (Abdominal pain)



Magkramper (Abdominal cramps)



Borborygmi = "magkurr" (Borborygmia)



Diarré (Diarrhoea)



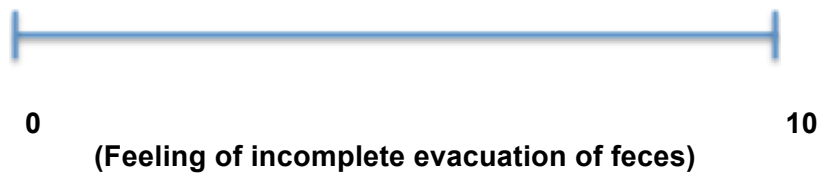
Förstoppning (Constipation)



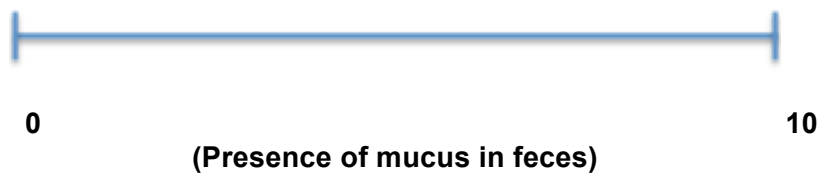
Svullen mage (Bloating)



Flatulens = Gaser i magen (Flatulence)



Känsla av att ej kunna tömma tarmen fullständigt



Förekomst av slem i avföringen



9.3 Patient declaration of consent

Mattias Särnbäck Osteopat D.O BSc

Patient information regarding the survey

“Does OMT of the autonomic nervous system outflow areas affect IBS-symptoms”

Dear Patient,

we are pleased to note that you have declared yourself to comply with the abovementioned survey.

The points mentioned below should help you to understand, why and how this survey is conducted

1. Scientific background

IBS is caused by many factors and one of them is a dysfunction of a part of the nervous system that is called the autonomic nervous system (ANS). This part has nerves that extends from different parts of the spinal cord to the gut. Osteopathic practitioners claims that the ANS can be affected with osteopathic manual treatment (OMT).

2. The aim of the survey is therefore:

To evaluate how OMT of the relevant parts of the spine connected to the ANS affects IBS symptoms.

3. Survey implementation

The patients will be randomised into two different groups, one treatment group and one control group. The treatment group will get three treatments in a period of approximately one month. They will fill a form of 9 symptom scales with different symptoms of IBS, before the first treatment after the third treatment and one month after the last treatment. The control group will not get any treatment but they will fill the same form as the treatment group three times with the same time interval as the treatment group.

The treatment will take approximately 20 minutes and the techniques used are calm and non-invasive. The same kind of treatment will be applied to all patients in the treatment group.

4. Risks and side effects

Because of the noninvasive nature of the techniques used, the risk of tissue damage is minimal. Normal treatment reactions like headache, tiredness and soreness for a few days may occur. Because of the effect on the ANS the IBS symptoms can possibly be affected negatively in a few days after the treatment .

5. Emergency number in case of undesired results

Should problems occur contrary to expectations in the context of the overall survey, you may immediately and at all times ask for aid under the following number: **0703-383933**

6. Confirmation of confidentiality

The personal data gathered in the context of this survey according to the declaration of consent, in particular findings, are subject to confidentiality and the medical data protection terms.

The information is recorded in hard copy and on data stored devices and is saved in Mattias office.

The usage of the data is done in a pseudonymised way (which means in an encrypted fashion. The gathered data are not stored under your name, but under a numerical code).

Your name and the corresponding numerical code are documented in a separately managed list. Access to this code list has solely Mattias ¹.

The transfer of the gathered data for research purposes only takes place in a pseudonymised fashion. The same applies for the publication of results of this survey

You have the right to demand disclosure about data regarding your person and to be or not to be informed about possibly accruing results of the survey regarding your person.

The head of the survey might ask for your decision.

The recording and storage takes place for the duration of 10 years

In case of a recall of your statement of agreement, the already existing data will be either deleted or anonymised (this means it will be made irrerecognisable in such a way that reassembling it will be very hard or impossible) and further used in this format.

¹ Pseudonymisation Is the exchange of the name and other identifying attributes through an indicator with the purpose of eliminating or at least hampering the identification of a person significantly.

Patient declaration of consent for the survey “Does OMT of the autonomic nervous system outflow areas affect IBS-symptoms”

Surname:

Name:

Date of birth:

I, _____, have been informed by my doctor/therapist about the essence, relevance and scope of the abovementioned survey. I have read and understood the information text. I had the opportunity to ask questions and have understood the answers and accepted them. My doctor informed me about the risks and benefits involved within this study

I had enough time to decide whether to take part in this survey or not and know that participation is voluntary. I know that I can revoke this decision at any time without the need of any justification. This will not influence later treatment from my doctor in an unfavorable way.

I am aware of the fact that my personal data will be saved in a pseudonymised fashion.

With my consent to participate in this survey, I do also agree with the recording of my medical data.

I have received a copy of the patient information and of this declaration of consent.

I herewith affirm that I participate voluntarily in this survey.

Place and date

Signature of the patient

Place and date

Signature of the informing osteopath

10 Declaration of Conformity

I hereby declare on oath, that I have written this thesis independently and that I have only used the sources and aids above mentioned. I have neither submitted this nor any other work elsewhere. Moreover, there is no conflict of interest between this work and other people and/or institutions.

Signature

Maria Mikkonen

Mattias Särnbäck