Research into the efficacy of Reiki

A Dissertation Presented for the

Philosophy Doctor Degree

Goldsmiths, University of London,

United Kingdom

Deborah E. Bowden, MRes, BSc

2010

Certification of originality

I certify that the work presented in the following dissertation is my own.

Date ……..20th November 2010……..

*

Any sufficiently advanced technology is indistinguishable from magic.

Arthur C. Clarke

*

To my mother

Acknowledgements

This dissertation is the product of the ideas, hard work, support and generosity of the innumerable people who have helped and inspired me, the names of whom are too many to mention.

First and foremost, I wish to thank the two people without whom the following research would not have been possible. Serendipitously, in 2006, my mother Dr Lynette Bowden attended a talk by Prof. John Gruzelier in which he presented the research he had conducted into Johrei and mentioned that there was room in his research group for a PhD student to build upon his earlier research. During a conversation after the talk, my mum suggested me as a candidate for such a venture, and so it began. I would like to thank John for giving me the opportunity to pursue my dream, and for all his help and guidance along the way. I am also no less indebted to my mother who not only provided the research funding, which in the field of energy healing research is extremely scarce, but also supported me creatively, emotionally and energetically.

I would also like to thank Dr Lorna Goddard for her guidance and supervision, Prof. Chris French for trying to turn me into a sceptic and for sharing his ideas about potential study designs, Steve Yesson for building me an incubator, and Ian Hannent for helping me out of many a computer crisis. Very special thanks are owed to Dr Andy Cooper for helping me with my stats.

I am grateful to my officemates, Dr Max Chen and Joe Leach, for accommodating my participants, and also to the rest of my research group and those who have helped me with my research – Tomas Ros, Tony Steffert, Dr Trevor Thompson, Max Neely and Helen Brinson. The participants of the studies themselves also deserve

acknowledgment, as do the Reiki Masters who kindly volunteered to give healing in the final study presented here.

I also wish to thank my family for their support – my sister, Mandy, and Dave, and my Dad and Lynne. I am especially grateful to my Granny and Grandpa, Mary and David, for their generous financial help and for the inspiration that they have given me.

Finally, I would like to express my deepest thanks to my boyfriend, Roy, for spending hours hunched over petri dishes counting germinated seeds, for all the proofreading, all the ideas and all the other ways that he has helped and supported me. I also could not have done this without him.

Abstract

The aim was to contribute to an evidence base for the efficacy of Reiki. Initially in three cases studies chronic fatigue syndrome patients received seven Reiki treatments over eight weeks. All three showed overall health improvements following treatment, although one relapsed at eight-week follow-up. Without a control group the improvements may have been due to expectation, relaxation and practitioner effects.

A randomised controlled trial was next conducted where 35 undergraduates over two-and-a-half to twelve weeks received ten 20-minute Reiki or No-Reiki sessions while their attention was absorbed in self-hypnosis or guided relaxation. The Reiki group showed comparatively greater improvements in illness symptoms and stress, although they had higher baseline scores. A constructive replication was conducted where 40 students - half with high depression and/or anxiety and half with low depression and/or anxiety – were randomised to receive Reiki or a non-Reiki-control. Participants experienced six 25-minute sessions over two to eight weeks, where they underwent a guided-relaxation to facilitate Reiki-blinding. Those with high anxiety and/or depression who received Reiki had significantly better overall mood at five-week follow-up, whereas there was no change in the other controls.

Three double-blind experiments followed involving a total of eight Reiki Masters. In each experiment different Reiki Masters each treated four dishes of gamma-irradiated canary seeds. Germination was monitored daily for 12 days and compared with control dishes. Overall analysis of the three studies found no statistical germination differences between the groups, although the dishes treated third and fourth had higher germination than their controls. However, the controls of the dishes treated first had higher germination than their Reiki dishes, and higher germination than other control dishes, presumably by chance.

In conclusion, while benefits occurred following Reiki in each study, due to limitations of the studies nothing can be concluded with regards to a Reiki effect.

Table of Contents

List of Figures

List of Tables

Chapter 1. Background

1.1. Introduction

In this chapter Reiki will be defined and there will be a discussion of its history, practice and practitioner training. The evidence-base to date of the efficacy of Reiki will then be reviewed, and possible scientific explanations of its purported effectiveness explored. Although in order to place Reiki research in context, some background information about complementary and alternative medicine (CAM) and evidence-based research is first necessary. According to Ernst *et al.* (1998):

"Complementary medicine is diagnosis, treatment and/or prevention which complements mainstream medicine by contributing to a common whole, by satisfying a demand not met by orthodoxy or by diversifying the conceptual frameworks of medicine." (p. 1026)

According to the above definition, CAM incorporates practices and theories not normally upheld by conventional Western medicine. It can also be said that CAM encompasses a large body of systems, therapies and techniques that mainly function outside the conventional Western health-care institutions, and that CAM exists alongside and complements conventional medicine.

Ernst et al. (1998) argued that people are attracted to CAM because they wish to explore all options and look for more natural treatments without adverse effects. Also, because CAM healing methods are generally perceived as being less authoritarian and more empowering, they provide greater patient control. Research conducted by Whelan and Wishnia (2003) on the effects of Reiki on postoperative pain indicates that patients seek treatment and care from CAM practitioners because doctors and nurses process patients too rapidly, and thus do not build meaningful relationships with them.

The National Center for Complementary and Alternative Medicine (NCCAM) classifies CAM approaches into five major domains (Mamtani and Cimino, 2002):

1. **Alternative medical systems** – such as traditional Chinese medicine and acupuncture, Ayurveda, homeopathy and naturopathic medicine.

2. **Mind-body interventions** – such as hypnosis, biofeedback, music and dance therapy, prayer, meditation and relaxation techniques.

3. **Biologically-based therapies** – such as therapies that use herbs, food supplements, and food combining such as macrobiotic diets.

4. **Manipulative and body-based therapies** - such as massage therapy, reflexology, chiropractic and osteopathic therapies.

5. **Energy Therapies** – therapies based on the concept of energy flow and the interaction of energy fields originating either from electromagnetic fields or from biofields produced by living bodies. Electromagnetic based energy therapies promote healing through the application of electric or magnetic fields. Biofield energy[1] based therapies, or biofield therapies, include Reiki, Qigong, Therapeutic Touch and Johrei.

Biofield therapy, the focus of this thesis, is defined as therapy that intends to affect energy fields which advocates believe surround and interpenetrate the human body, or the bodies of animal or plants. These modalities involve touch or the placement of hands in or through purported biofields around a living body, although the mechanisms of how they may work are unclear. Many biofield or energy therapists believe that

[1] The term "energy", as it is understood by biofield therapists, is not to be confused for its meaning in science, but rather refers to some kind of innate "life force energy" that is believed to permeate the Universe.

these energy fields are indistinct from the biomagnetic fields that have been scientifically proven to exist around animals, generated by the currents that flow in the heart, brain and other living tissues of the body.

1.2. Establishing the efficacy of alternative treatments

Since contemporary medicine is strictly subjected to the scientific method in the validation of new treatments and therapies, CAM research must also be stringently validated by evidence-based research in order to facilitate integration into conventional Western medicine of those treatments found to be effective. Archibald Cochrane (1909–88) first conceived of evidence based research as a new perspective on medical interventions. Evidence based research systematically evaluates and judiciously and explicitly makes use of the current best evidence in order to facilitate informed decision making regarding patient care. Evidence based research in the context of medicinal treatment is distinct from medicine based on long-established Western medical conventions, which may be based on limited research that may not necessarily have undergone sufficient scientific validation.

Before evidence based research, there was no systematic method of determining whether a medical treatment was effective above and beyond placebo effects. Placebo can be defined as "any useful effects accompanying some form of treatment that are not directly due to the treatment itself acting on the disease or the patient" (Buckman and Sabbagh, 1993, p. 174). Placebo in itself can be a powerful medicinal agent which in addition to having the power to influence subjective symptoms such as pain, discomfort and distress, has been found to effect objective measures such as blood test results and swelling (Ernst, 1992). The placebo effect is not restricted to ineffective treatments, but rather, "...a genuine medicine offers a benefit that is entirely due to the medicine itself and

partly due to the placebo effect, whereas a fake medicine offers a benefit that is entirely due to the placebo effect." (Singh and Ernst, 2008, p. 57)

While conventional medicine is required to undergo rigorous scientific testing through clinical trials and is only made available to the public if it is demonstrated not only to be more effective than placebo but to have advantages above the current best available treatments, numerous unproven alternative treatments are freely available. While many people feel they benefit from alternative medicines that are not currently proven to be more effective than placebo, and support government spending in this area, some are concerned that there may be health and financial risks associated with the unregulated availability of CAM therapies. In the words of Singh and Ernst (2008):

'...not only do alternative therapists offer us often ineffective and sometimes dangerous treatments, they also charge us heavily for these services and products. The issue of money is problematic at every level. Parents on a limited budget might waste money on alternative medicine in a misguided attempt to improve their child's health. At the other end of the scale, national governments have much larger budgets, but these are also limited, and they also risk wasting money on alternative medicine in a similarly misguided attempt to improve the health of their nations.' (p. 240)

Regarding the potential health risks associated with therapies that have not been sufficiently tested, in addition to possible direct side-effects, if a treatment that is no more effective than placebo is taken in the place of the best available conventional medicine then the patient will not receive the benefits of that conventional medicine. While they may also not receive unpleasant side-effects that medicine may have, in the case of serious illness, being deprived of the superior benefits of conventional treatment could be life-threatening for the patient. It is thus essential that alternative therapies in

popular use, such as Reiki, be subjected to stringent validation through randomised controlled trials in order to separate the effective CAM treatments from those that rely wholly on placebo or that are dangerous. Only through such validation will efficacious therapies be integrated into mainstream medicine, where they will become more readily available to the public.

1.3. The Definition of Reiki

Reiki is a Japanese word comprised of two kanji characters - "Rei", meaning "spiritual," and "ki", which in the Japanese language is the general term used to refer to all of the life energies. It is equivalent to the Chinese term "Chi" which is used in Traditional Chinese Medicine and in Tai Chi. Ki is also analogous to the term Prana from Eastern Indian philosophy. It is believed that Ki is necessary for life, and if accessed and utilised appropriately, can maintain health and alleviate and prevent disease, and bring spiritual, mental and emotional balance (Fernandez, 2000).

There are seven types of Ki in use in the Japanese language, one of which is the term Reiki, which can be translated as "soul force" or "spiritual power". Reiki is the kind of Ki that is believed to organise the correct synergetic application of all the subordinate forms of Ki in a holistic sense, the form of life energy in the material world closest to the divine creative force - the source of all life. Reiki is thought to attune the three archetypal partial personalities - the inner child, the middle self, and the higher self, with one another in one system, so that they do not strive apart due to their different qualities (Lübeck, 2000).

The healing system named Reiki is a system of laying on of hands which advocates believe has the capacity to heal the physical body and mind, and bring emotional and spiritual balance. Although the primary goal of practicing Reiki is to re-balance

disturbances in the energy fields of humans and animals which are thought to manifest as disease and emotional problems, it is also believed that it can heal plants, machines, rooms and situations.

Fundamental and unique to Reiki training is a series of initiations, or "attunements", which are claimed to facilitate the student's connection to the Reiki energy source. A Reiki attunement is a ceremony performed by a Reiki Master on a student, where the Master invokes certain Reiki symbols which purportedly open the energy centres of the student's body so that they may tap into the Universal life source energy and become a channel for its transmission. Once a person has been attuned, it is thought that they can access Reiki at will at any time, regardless of the situation.

The findings of a study by Shiflett et al (2002) provide some weak support to the claim that Reiki attunements may facilitate a student's ability to heal others. A group comprised of 14 nurses and physical and occupational therapists were trained by a Reiki Master in first-degree Reiki[2] although only half of them received attunements. All 14 trainees were blind to whether they had been attuned or not, and those which had been were deemed Reiki practitioners, while those who had not were termed "sham practitioners". As detailed further in Section 1.7, the Reiki Master, practitioners and sham practitioners all gave healing or sham healing to a group of 50 stroke patients. A significant improvement, which was robust to a Bonferroni procedure to correct for multiple tests, was found for one item - "I can't get going" for the patients who received healing from the Reiki Master and practitioners, but not from the sham practitioners. However, given that there was no improvement in the primary measure of the trial, functional dependence, the support provided by this study for the effectiveness of Reiki attunements is extremely tentative.

[2] First-degree Reiki is the first level of Reiki practitioner training, as detailed in Section 1.6.

As explained in greater depth in the section below on the history of Reiki, various kinds of Reiki are practiced today in addition to the type that was introduced by the founder of Reiki, Dr Mikao Usui. When Usui named the healing system he professed to have discovered, Reiki was already a word in use in Japan, and he named the system Usui Reiki Ryoho to demonstrate that it was a unique kind of Reiki (Rand, 2000a). Since Usui, other people have invented or "discovered" other healing techniques similar to Usui Reiki Ryoho, such as Karuna Reiki, Rainbow Reiki, Seichim and Blue Star Reiki. Practitioners claim to sense that these different types of Reiki have different energy vibration effects, believing that each is most useful for treating certain types of conditions. According to Rand, from analysing Usui's Reiki, these techniques and many others can appropriately be described as Reiki, and there are four qualities that define a healing technique as being Reiki (Rand, 2000b):

1. The ability to practice Reiki is believed to come from receiving an attunement, as opposed to developing the ability over time through meditation or other exercises.

2. All Reiki techniques are part of a lineage, passed from teacher to student by means of an attunement process, beginning with the initial person who channelled the technique.

3. It is believed that it is not necessary to guide the Reiki energy with the mind, as it is purportedly guided by a higher power that knows what energy frequency or combination of frequencies are required and how to direct them.

4. It is believed that Reiki cannot cause harm.

Reiki energy is thought to have an innate intelligence, since it is purportedly guided by a power or consciousness that knows precisely where the Reiki is most needed. The appropriate frequency of Reiki energy is said to be drawn through the practitioner, within the practitioner's capacity to conduct the energy, according to the need of the recipient. Thus, it is thought that the practitioner need only consciously decide to channel the Reiki for the highest good of the recipient, and then passively place their hands on the recipient and allow the Reiki to flow without the practitioner's direction. This is how Reiki is practiced at the First level of practitioner training in the West.

However, Second and Third level practitioners may use certain Reiki symbols, which when held in the mind during a treatment are believed to invoke particular frequencies of Reiki energy which are best suited to treating certain conditions, or which facilitate the sending of healing remotely. If a patient presents a particular condition to a Reiki practitioner, the practitioner may employ a Reiki symbol or combination of symbols which they feel are most appropriate for treating particular conditions presented by a patient. In addition, some Reiki practitioners choose to incorporate a particular healing intention into a treatment as they feel that this will help them channel Reiki of a frequency appropriate for treating a certain condition. Reiki energy is believed to be intelligent, and it is thought that if it is left to its own devices it will go where it is most needed. Thus, advocates feel that the Reiki may give the recipient a general holistic healing without targeting a particular ailment or symptom. Some practitioners believe that if the recipient wishes to be healed of a cold, for example, then if the practitioner holds the intention that the Reiki boost the immune system of a recipient, they will channel a frequency of Reiki appropriate for treating the cold, enabling the cold to be healed more quickly. However, all identified Reiki trials have stated that the Reiki practitioners who gave healing in the trials used no specific healing intention, or no

mention was made on the subject (VanderVaart et al, 2009). Thus it would seem that it has not been tested whether incorporating a particular healing intention into a Reiki treatment may produce a different outcome to when a practitioner merely passively places their hands on a patient.

It is believed that the flow of Reiki channelled by a practitioner increases as they learn to become more inwardly still, which can only be achieved through dedicated practice and self-treatment. It is thought that it not possible to overdose on Reiki, since the Reiki flow will cease when the recipient has absorbed enough, and some practitioners profess to sense when the Reiki flow ceases or decreases, prompting them to move to a different hand position (Lübeck, 2000b). Reiki recipients often claim to perceive a vibrational flow during a treatment, sometimes experienced as heat or coolness or waves of relaxation throughout their body – sometimes in regions of their body which are not near the positioning of the practitioner's hands (Miles and True, 2003).

1.4. Reiki History

Reiki was introduced in Japan by Dr Mikao Usui (1865-1926) in the early 20th century. Although Reiki is often described as an ancient Tibetan technique, there is no evidence to support this, and Usui explicitly referred to himself as the founder of the system that was later named Reiki (Rand, 2000a). Usui was a Buddhist monk and a dedicated spiritual aspirant, and studied a wide range of subjects including medicine, psychology, religion and spiritual development.

From a young age Usui practiced Kiko – a Japanese version of Qi Gong, the philosophy of which is based on the development and use of Ki and includes methods of healing through the laying on of hands. However, it is believed that Kiko requires that healing energy be built up inside the healer through exercises before it can be

channelled for healing, and that it can also deplete the healer's own personal energy. Usui sought a method of healing that did not involve these constraints.

In 1914, the year he became a Buddhist monk, he focused his mind on devotional practice and trained intensely. He returned to Mount Kurama where he had studied Buddhism as a boy, and in 1922 he set out on a 21 day retreat in order to fast and meditate. He claimed that towards the end of the 21 days, he experienced a powerful spiritual light enter the top of his head, and he felt his awareness expand greatly. He believed that a great power had entered him which would allow him to heal by the laying on of hands without depleting his own energy. This is said to have been Usui's Reiki attunement - the experience that led to his development of the healing system of Reiki.

After first using Reiki to treat his own ailments and then the aliments of his family, and finding that the Reiki seemed to be effective at treating various conditions, he decided to share Reiki with the public, and founded an organisation called the Usui Shiki Reiki Ryoho, which in English means the "Usui Reiki Healing Society", and this organization still exists in Japan today. In addition, he opened a clinic in Harajuku, Aoyama, Tokyo, where he gave Reiki to many patients, and he also held workshops to teach his system to others.

According to a member of Usui Shiki Reiki Ryoho, Fumio Ogawa, Usui developed six levels of training for Usui Reiki Ryoho (Rand, 2000a) which were numbered in reverse order to the one used now in the West, with the first level being level six and the highest being level one. The highest level was the teacher level, known in the West as the Master degree.

Usui's method was to teach a system of spiritual self-development, and any resultant health benefits were secondary to his aim (Lübeck, 2000b). The first level of teaching was available to all, although students could only progress to higher levels through dedication and disciplined practice, and each student was taught according to their individual accomplishment and nature. For each level of training Usui gave his students detailed manuals to aid their learning (Rand, 2000a).

Usui taught his students to recite five principles, which were the principles of the Meiji Emperor, although since Usui they have appeared in several different versions in the West. He told his students to speak them once every morning and evening and contemplate them in their hearts, with the goal of aiding their spiritual development. Usui taught that these principles will lead to the great tranquil mind of the ancient sages. The original Reiki life principles are as follows (Lübeck, 2000c):

Just for today, don't get angry

Just for today, don't worry

Just for today be grateful

Just for today work hard (meditative practice)

Just for today be kind to others

After the devastating Kanto earthquake struck Japan in 1923, many people were injured or became ill and a majority were emotionally traumatised. The demand for Reiki became enormous and Usui and his students worked solidly to treat as many people as possible. Usui opened a larger clinic in Nakano, Tokyo, in 1925, and travelled over

Japan healing and spreading the word about Reiki. The demand for Reiki remained high, and in total Usui taught Reiki to 2000 students, and trained sixteen teachers.

In 1926, when Usui was 62 years old, he had a fatal stroke. After Usui's death, a retired naval officer and a respected Reiki teacher of the Usui Reiki Ryoho Gakkai called Dr Chujiro Hayashi (1878-1940) broke away from the Gakai and formed his own Reiki association (Rand, 2000a). Hayashi developed his own style of Reiki that included specific hand positions for treating various conditions. Although Hayashi's Reiki system put less emphasis on spiritual practice, the healing system nevertheless remained rooted in spirituality, and he taught his students the five principles of Reiki.

Hayashi opened an eight-bed healing clinic in Tokyo, where 16 Reiki practitioners gave healing, two practitioners at a time to a patient. Like Usui, Hayashi gave class manuals to his students to aid in their learning (Rand, 2000a). In his life Hayashi trained approximately 18 Reiki Masters.

According to the research of Shizuko Akimoto with Mr. Ogawa and other members of the Usui Shiki Reiki Ryoho, there was not a mandatory fee for a Reiki treatment (Rand, 2007a). Dr. Hayashi conducted his business out of a desire to help others, and thus charged patients according to what they could afford to pay and gave healing for free if patients were poor. Additionally, many of his students received their Reiki training in exchange for working at his clinic. Likewise, it seems likely that Usui also did not insist on receiving payments for Reiki, since it states on his memorial that he became popular helping people who suffered from the Tokyo earthquake (Rand, 2007a).

In 1936, a first generation American from Hawaii named Mrs Hawayo Takata (1900-1980) visited Hayashi's clinic in 1936 seeking healing, as she had a lung condition and abdominal complaints and had had a nervous breakdown (Rand, 2000b). She received

two treatments a day for four months, after which she was in excellent health, which was confirmed by tests at a conventional hospital. Attributing her recovery to the Reiki she had received, Takata trained as Hayashi's student and practiced Reiki in his clinic for a year and trained to the fifth level of Reiki.

In 1937 Takata returned home to Hawaii instructed by Hayashi's to bring Reiki to the West. If it had not been for Takata, Reiki may never have left Japan. In 1938 Hayashi visited Hawaii to lecture and teach Reiki, and Takata trained with him until she had reached the Reiki mastery level. Usui had wished for the teachings to be accessible to all and spread round the World, and Hayashi understood this.

Takata established two clinics in Hawaii – one near Hilo and one in Honolulu, where she gave Reiki treatments. She also trained students up to the Reiki level before the mastery level. For many years Takata practiced and taught Reiki in Hawaii. In her Reiki teaching, like Usui and Hayahi, Takata emphasised the importance of regular self-healing. However, Takata did not practice "traditional" Usui Reiki, she practiced a variation developed by Hayashi, but omitting many of the exercises that Hayashi had taught her, which she knew were important components of the Reiki Usui had practiced. Takata introduced a number of changes in the way she presented and taught Reiki. Due to the mostly Christian population of America, and the socio-political climate preceding World War II, Takata chose to present Usui as a Christian minister instead of a Buddhist (Haberley, 1990).

Takata grouped the beginning four levels of Hayashi's Reiki into one beginner's level, which she named First Degree Reiki, so that there were three levels of training instead of six. The level before mastery became Second Degree Reiki, and the third level became the Master degree. Also, unlike Usui and Hayashi who gave their students

detailed manuals for each level, Takata had no manuals and did not permit notes to be taken in her classes (Rand, 2000b). Despite these changes, she called the healing system she taught Usui Reiki. She also told her students that it is necessary for Reiki to be taught exactly in this manner.

In 1970 Takata began to teach Master degree classes, and taught the level over a weekend, whereas Usui's mastery level had involved a full-time apprenticeship of over a year. Also unlike Usui and Hayashi, who charged much lower prices, she charged $10,000 for the class, which restricted the training to only a few and prevented Reiki from spreading very quickly.

In 1973, Takata moved to mainland America, and taught Reiki there until her death in 1980, having initiated 22 Reiki masters. Within 15 years after the death of Takata, Reiki had spread around the world, although despite the rigid instructions of Takata to teach Reiki exactly as she had done, the way in which Reiki came to be practiced and taught after her passing evolved from her teachings. Most Reiki teachers now give their students manuals and permit note taking, and charge more moderate fees. This is more in keeping with Usui's Reiki, since the high fees for the Master level charged by some in the West have never been a requirement of the Usui Shiki Reiki Ryoho (Rand, 2000b). A more accurate history of Reiki also began to emerge in the West and many techniques used by Usui and the Usui Shiki Reiki Ryoho have been discovered and are now practiced by many Western practitioners.

1.5. Reiki Practice

Despite there being a lack of convincing evidence of its efficacy, Reiki has several advantages over many therapies, since it is not intrusive and involves no body manipulations, and it can be practiced without touch if necessary and may be

administered anywhere. Clients can be treated sitting, standing, or lying down, or in the position that is most comfortable, although the preferred position is generally lying down.

A Reiki practitioner places their hands on, or a few inches away from, a recipient and imagines light being drawn from the Universal Source and focused by their hands into the recipient. A full Reiki treatment, as practiced in the West, is intended to enhance general well-being and includes the practitioner placing their hands on twelve positions on the head and on the front and back of the torso, and takes roughly an hour. However, many Reiki practitioners follow their own claimed "inner guidance", or intuition, about where on the recipient is best to place their hands during a treatment. When treating chronic conditions, a minimum of four treatments is usually considered advisable before any clinical benefits are evaluated (Miles and True, 2003).

It is not necessary for the practitioner or recipient to engage in any verbal exchanges during a treatment, and the patient may be unconscious or asleep. Reiki can also be given distantly, and to any age group. Additionally, it is claimed to be effective in the treatment of all kinds of physical and psychological conditions, as well as emotional problems. Given these attractions, Reiki may be appealing to individuals who are anxious or who have received intrusive or painful medical or surgical procedures (Ameling and Nield-Anderson, 2000). Reiki is thusly advertised as a simple, gentle healing method that only requires a trained practitioner to softly lay his or her hands on a recipient. However, it is advisable for a practitioner to ask their clients to complete a form detailing their medical history before they treat them, and in the case of serious illness, to ask the patient to gain the consent of their doctor.

Although the effectiveness of Reiki is unproven, it has been used in lay practices in addition to a variety of medical settings, including hospice care setting, emergency rooms, psychiatric settings, operating rooms, nursing homes, paediatric, rehabilitation and family practice centres, obstetrics, gynaecology, and neonatal care units, HIV/AIDS and organ transplantation care units (Miles and True, 2003).

1.6. Reiki training

The structure of Reiki taught in the West today is generally based on the teachings of Takata - practiced at the First degree, Second degree, and Master level. Reiki is usually taught to a group of students in a classroom setting, although individual tuition is available. At all Reiki levels, self-treatment is considered fundamental to learning Reiki. Unlike the rigid rules of Reiki training promoted by Takata, Reiki is often taught today with more freedom for experimentation and the development of new techniques, although this has resulted in some Reiki Masters teaching Reiki from First degree to Master level in just a day or weekend, so that students acquire a Masters certificate despite having little knowledge and understanding of Reiki (Rand, 2000c).

However, most Reiki Masters teach Reiki over roughly the same time period taught by Takata. Below is an outline of the basic training for the levels of Usui Reiki generally taught in the West. While it is based on the teachings of Takata, Reiki teachers often combine Eastern and Western Reiki methods, for example giving students detailed manuals for each level and permitting note taking. The following paragraphs outline the standard training a student receives when training in levels of Reiki, as proposed by Rand (Rand, 2000c). In all the Reiki degrees, the Reiki Teacher will often teach additional Reiki techniques, exercises and meditations not listed below.

In a First degree Reiki class students receive up to four attunements, and are taught the history of Reiki, details of its philosophy and practice, and the five Reiki principles, and the training is suitable for people of all ages and levels of health. First degree Reiki training, as with Second Degree, is generally conducted over one to two and a half days. Students are taught to perform a basic treatment on others, are instructed in the Reiki hand positions and practice them in class, and are instructed to practice self-healing daily.

In Second Degree training the student is given one or two attunements and taught the theory and use of three Reiki symbols. Purportedly, the Power Intensification Symbol increases the power of a treatment, the Symbol of Freedom purportedly facilitates the healing of emotional and mental issues, and the Transpersonal Contact Symbol allows Reiki to be sent over a distance, as well as to situations in the past or future (Lübeck, 2000d). If the student plans to practice Reiki professionally, then information about conducting a practice and patient confidentiality should also be taught.

Many Reiki Masters teach the Master level of Reiki over two degrees – 3a and 3b, although some only teach the full Master-Teacher training. Reiki 3a - the Master practitioner level - is taught over one to two and a half days. The student receives one Master attunement, although some teachers give more, which supposedly increases the strength of the student's Reiki energy and enhances the other Reiki symbols. Students are taught the theory of the Master Symbol, which represents the Buddha consciousness (Lübeck, 2000d), and sometimes additional symbols, and learn through class practice how to draw and use them confidently.

Reiki 3b, or Master Teacher training, should take a minimum of two days. Students are given the Reiki 3b Master attunement, and sometimes additional Master attunements,

and students may be taught the theory to drawing and use of additional Master symbols. The teacher impresses upon the student what it means to be a Reiki Master and the responsibilities involved. Students learn to give Reiki attunements from first degree to Master teacher level and are usually able to practice them in class. Some teachers also provide teacher training to help Reiki Masters who have not taught a class before.

As with Usui's spiritual system, for all degrees of Reiki, students are taught that it is only possible to progress through dedication, practice and committed self-treatment, and that true mastery of Reiki is more than attending Reiki classes and receiving attunements, but rather is a life committed to practice. The term Reiki Master was introduced by Takata, and was not used by Usui. Usui referred to the highest level of Reiki training as Shinpiden, which means Mystery Teaching (Rand, 2000a), since in spiritual practices the term "Master" refers to someone who has achieved spiritual enlightenment, which he did not consider could be obtained by training in the highest level of Reiki alone. Even Usui did not refer to himself as a Master, because he envisaged a higher state of spiritual development to be possible than the one he felt he had achieved.

1.7. The current evidence base for Reiki

There is some limited evidence that biofield therapies can influence a variety of cellular and other biological systems (Jain and Mills, 2009; Benor, 2001), However, due to the general poor quality of the methodology and reporting of the Reiki interventions conducted, it is not possible to discern whether any therapeutic effects of Reiki are due to a subtle energy exchange, or whether they are caused by other factors. This is because it can only be concluded that a treatment is therapeutically effective if it is shown to produce benefits that are significantly greater than a control group, one that

effectively controls for placebo and other effects such as relaxation, using a double-blind randomised design.

Due to the similarities between Reiki and other biofield therapies, these modalities have sometimes been studied together, although this has hindered the evaluation of their separate effects. The Reiki studies reported in the literature to date consist of a limited number of descriptive studies, case reports and randomized controlled trials (RCTs) conducted with a small sample of participants, although only the clinical trials are reviewed here.

A recent systematic review of trials of the therapeutic effects of Reiki (VanderVaart et al, 2009) found that nine out of the 12 trials included in the review detected a significant therapeutic effect of the Reiki intervention. However, using the Jadad Quality score, the authors ranked 11/12 of the studies as "poor", and all 12 were deficient in a least one of the three key areas of the modified Consort Criteria used in the review; randomization, blinding and accountability of all patients, indicating inadequate reporting. The general poor quality of the trials included in the review and the poor quality of reporting prevented the authors from being able to draw any definite conclusions regarding the therapeutic effectiveness of Reiki.

1.7.1. Trials of the efficacy of Reiki

As previously stated, Reiki research has tended to be of poor quality. For example, Wetzel (1989) investigated whether touch therapies increase oxygen-carrying capabilities as measured through changes in haemoglobin and hematocrit values. Changes were measured in these values over a 24-hour period, during which the intervention group, 48 essentially healthy adults, participated in First Degree Reiki training. The intervention group demonstrated statistically significant changes in both

haemoglobin and hematocrit values, as compared to a small no-treatment control group of 10 healthy medical professionals, which demonstrated no change. However, the benefits seen in the intervention group may have been due to placebo and relaxation, since the control group did not control for these factors. Additionally, the participants were not randomly assigned to the groups which may have introduced bias.

Further claims of the efficacy of Reiki come from a series of studies by Wirth et al. that began in the early 1990s. The effectiveness of Reiki was investigated in combination with several other forms of biofield therapies and distant healing, in relieving pain after the extraction of the third molar (Wirth et al., 1998), obtaining haematological measures (Wirth et al., 1996) and multi-site surface electromyography measurements and autonomic measures (Wirth et al., 1997). Compared to control participants, a statistically significant reduction in pain (Wirth et al., 1998) and blood urea nitrogen and a trend towards normalization of blood glucose for participants that had above normal levels (Wirth et al., 1996) were demonstrated. Although these studies were the first of their kind to employ randomised, double-blind designs, where healing was administered distantly or through a one-way screen, various design limitations were present such as small sample sizes, one consequence of which, given the random assignment of participants to groups, resulted in the intervention groups substantively differing from controls at baseline. Thus, these findings must be interpreted with caution.

In a study limited by its heterogeneous participant sample, Dressen and Singg (1998) evaluated the effects of ten 60-90 minute Reiki treatments on pain and psychological symptoms in 120 chronically ill patients with various illnesses. Participants were randomised to four parallel groups: Reiki, progressive muscle relaxation, sham Reiki

and no treatment, and the intervention lasted five weeks. Following the intervention there were significant reductions of pain, depression and anxiety in the Reiki group compared with all the other groups, although the method of randomisation was not described.

Mansour et al. (1999) conducted an RCT to evaluate whether participants and independent observers could be successfully blinded to 'real' versus 'sham' Reiki. A four-round, crossover experimental design was used with 20 blinded participants (12 college students, four breast cancer survivors, and four observers). Two Reiki practitioners took part, as did two "sham" or placebo practitioners who closely resembled them, who had completed identical First Degree Reiki training but who were not initiated or "attuned" as practitioners. The participants received consecutive treatments from two different practitioners during each round of the intervention, where light touch was used. The following practitioner combinations were used: Reiki plus Reiki, or placebo plus placebo, or Reiki plus placebo, or placebo plus Reiki. The participants evaluated the interventions and guessed which treatments were administered by a real Reiki practitioner and which by a placebo practitioner. Considering only the physical and personality characteristics and method employed by the practitioners, all participants failed to accurately distinguish the Reiki healers from the placebo healers, which the authors concluded indicates that studies using hands-on Reiki can be blinded. This is consistent with the conclusions of Ai et al. (2001), who reported successful blinding of patients and independent observers in the use of placebo versus real Qigong therapy. The Mansour et al. study participants also reported sensations such as tingling and heat, experienced during each round of treatment, to be most intense during the second round of the intervention when they received 'Reiki plus Reiki'. A weakness of the study design is that these data were not used in

determining whether participants could tell the difference between the real and placebo practitioners, for if it had been then the blinding may have been found to have been less effective.

In an RCT employing a similar "sham" Reiki blinding method as Mansour et al. (1999), Shiflett et al. (2002) investigated the effects of 10 Reiki sessions on 30 subacute ischemic stroke patients over a two and a half week period. Ten patients were treated by a Reiki Master, 10 were treated by healers trained in First Degree Reiki, and 10 were treated by "sham" practitioners who had undergone identical Reiki training but had not received Reiki attunements. However, unlike in the Mansour et al. study, both the "real" practitioners and "sham" practitioners were blind to whether they had received attunements, so the experiment was double-blind. An additional 20 historical control subjects identified through hospital records were used as a no-treatment comparison group. The results showed no evidence of short-term benefit in terms of functioning or depression, as measured by standardized instruments, although both Reiki groups showed some statistically significant positive effects on energy not seen in the "sham" Reiki or no-treatment control groups. However, it is possible that the use of historical controls biased the results.

Suggestive evidence that Reiki-like treatment may affect patients with seizures comes from a study by Kumar and Karup (2003), where 15 patients with refractory seizure disorder had a significant reduction in seizure frequency following Reiki treatment. These patients also had significant increases in red blood cell membrane Naþ-Kþ ATPase activity and serum magnesium, and significant reductions in hepatic hydroxymethyl glutaryl coenzyme, A-reductase activity, and digoxin synthesis. However, these results were not compared with a control group who did not receive

Reiki, so the observed changes may have arisen due to patient expectation or natural illness progression. In addition to these findings, the patient-group had significantly less serum tryptophan, quinolinic acid and serotonin and significantly increased concentrations of tyrosine, dopamine and noradrenalin following Reiki treatment compared to a no-treatment control group. However, since the control group was randomly chosen from the general population of Trivandrum city, rather than from seizure patients, the conclusions that can be drawn from these findings are limited.

Olson et al. (2003) investigated the effects of Reiki as an adjunct to standard opioid medication for pain management in advanced cancer patients, where 24 patients were randomly allocated to a Reiki plus opioid group or to a rest plus opioid group. The Reiki plus opioid group received a total of two 90-minute treatment sessions on consecutive days, and they had significantly improved pain control and quality of life compared with the control group following treatment on both days of these days, although there was no overall comparative reduction in opioid use. Although this study was one of the few included in the systematic review conducted by VanderVaart et al. (2009) that described the method of randomization, there was no placebo arm which may have introduced bias.

Further evidence that Reiki may be beneficial in the treatment of cancer comes from a cross-over trial by Tsang et al. (2007), who investigated the therapeutic effects of seven 45-minute sessions of Reiki on fatigue and quality of life in cancer patients. Sixteen patients were randomly assigned to each order of the intervention: Reiki then rest, or rest then Reiki. Following treatment with Reiki there was a significant improvement in quality of life compared with the rest group, but there were no significant differences between the groups for fatigue or pain. However, as with the previous Reiki trial

involving cancer patients (Olson et al., 2003), the conclusions that can be drawn from these findings are weakened by the lack of placebo-control, and the authors of this study also failed to describe their randomisation method.

Various physiological effects of a 30-minute Reiki treatment were investigated by Wardell and Engebretson (2001) in a non-controlled study with 23 healthy participants, employing a single group repeated measure design. Data were collected before, during and after the Reiki session on biological markers related to the stress reduction response, including state anxiety, salivary IgA and cortisol, blood pressure, galvanic skin response, muscle tension, and skin temperature. Biochemical changes in the direction of increased relaxation and immune responsivity were reported, with a statistically significant reduction in state anxiety, drop in systolic blood pressure, and increase in salivary IgA levels, and a non-significant reduction in salivary cortisol. However, due to the lack of a control group the observed effects may have arisen due to expectation, relaxation and receiving the attention of the Reiki Master.

In a controlled trial of the influences of Reiki on the autonomic nervous system, Mackay, Hanson and McFarlane (2004) randomly assigned 45 healthy participants to Reiki or sham-Reiki or no treatment. Following treatment, there were significant decreases in the diastolic blood pressure and heart rate of the Reiki group compared to both of the other groups. Several methodological details of the trial were not adequately reported though, such as the randomisation method and the level of experience of the practitioner.

In addition to the improvement in mood seen in the Reiki group over the controls in the study by Dressen and Singh (1998), suggestive evidence that Reiki may benefit mood comes from a double-blind study by Goldman Shore (2004). 45 participants suffering

from symptoms of depression and stress were randomly assigned to receive six sessions of either hands-on Reiki, absent Reiki, or absent sham-Reiki. After six weeks, the groups that received hands-on Reiki and absent Reiki both had significantly less stress, depression and feelings of hopelessness compared to the control group, and these results were maintained one year after treatment. While neither the method of randomization or details of dropouts were described in this trial and the participant sample size was limited, the positive results - particularly the maintained improvements in the absent healing group compared to the placebo group - warrant further research.

In contrast to the findings of Dressen and Singg (1998) and Goldman Shore (2004), who observed significant improvements in mood following Reiki treatment over controls, Mauro (2001) found that anxiety in pregnant women undergoing amniocentesis was not affected by Reiki. 30 participants were randomly assigned to three parallel groups: Reiki, sham Reiki and no treatment. No difference in measures of anxiety or subjective disturbance were found two weeks following the intervention, although only one 30-minute treatment was administered. While both the participants and the assessors were blind to group allocation, the method of randomisation was not adequately reported, and the trial was reported in an unpublished thesis which had not undergone formal review.

A further study that did not find Reiki to influence mood was conducted by Potter (2007), who investigated the therapeutic effects of Reiki on anxiety and depression in women undergoing breast biopsy. Thirty-five patients were randomised to receive Reiki plus conventional care or conventional care alone, where two 45-50-minute Reiki treatments were given – one within seven days before biopsy and one with seven days following biopsy. No intergroup differences were found following the intervention in

either anxiety or depression. As with the majority of Reiki trials reviewed here, the participants of this trial were not blinded to their group allocation, although the assessors were blinded which reduced the potential for bias to some extent.

Vitale and O'Connor (2006) tested the effectiveness of Reiki for anxiety and pain in 22 women undergoing abdominal hysterectomy, where 30 minutes of Reiki was administered once pre-operatively, then again 24 hours and 48 hours post-operatively. 22 Patients were randomised to Reiki plus traditional nursing care or traditional nursing care only. The Reiki group reported significantly less pain and requested significantly few analgesics compared to the control group 24 hours after the operation. There were no differences between the groups at 48 hours or 72 hours, although at discharge the comparatively greater improvement of the Reiki group was highly significant. However, in accordance with the findings of Mauro (2001) and Potter (2007), no improvement in anxiety was seen in the Reiki group over the controls. Also, while the randomisation method was described, the study was limited by its small sample size, its lack of placebo control, and its failure to report details of dropouts.

In another trial of Reiki which did not find positive results, Gillespie et al. (2007), assessed the effects of Reiki in patients with type 2 diabetes mellitus and painful diabetic neuropathy. 207 participants were randomly allocated to Reiki, sham-Reiki or usual care groups, where the Reiki and sham-Reiki participants received 13 25-minute sessions over a period of 12 weeks. At the end of the intervention there were no differences between the three groups on measures of pain, the 6-minute walk test and quality of life, well-being or diabetes treatment satisfaction. However, while the participant-blinding method of this study was satisfactorily described, the randomisation method was not.

The effects of Reiki on the memory and behaviour deficiencies of patient with mild Alzheimer's disease were evaluated by Crawford et al. (2006), where 24 patients were randomised to Reiki treatment or a no-treatment control. The Reiki group showed significant improvements in both memory and behaviour problems over the control group following four weekly treatments. The lack of blinding in this study means that the greater improvements seen in the Reiki group may have been due to patient and assessor expectation though.

In the first rat experiment conducted with Reiki, Baldwin and Schwartz (2006) sought to determine whether Reiki can significantly reduce microvascular leakage in rats exposed daily to 15 minutes of excessive white noise for a period of three weeks. One group of four rats received both noise and 15 minutes of Reiki daily, while two other groups received 'sham' Reiki and noise or noise alone, and a fourth group received no noise or treatment. A real practitioner trained to Second Degree Reiki and a sham practitioner held their hands a short distance away from the rat's cage so as not to introduce touch as a variable. Images of microvasular leakage were obtained, then coded and analysed by a technician who did not know the code, in order to avoid experimenter bias. The experiment was performed three times to test for reproducibility, and in all three experiments it was found that Reiki statistically significantly reduced the microvascular leakage compared to the other noise groups. By using animals, the design of this study eliminated variables in diet and lifestyle that are present in human studies, and repeatability under constant conditions was also demonstrated. However, the study was limited by the small rat sample used, with only four rats per condition. It is also possible that the rats may have responded to physiological and psychological changes that occurred in the Reiki practitioners, rather than to the Reiki itself.

Using an experimental design that avoided placebo effects, Rubic et al. (2006) conducted an RCT to investigate how Reiki affects the growth of overnight cultures of heat-shocked Escherichia coli K12 bacteria in vitro compared with untreated control cultures, and also whether healing context and practitioner well-being are important factors. Over a period of several months, 14 Reiki practitioners trained to at least Second Degree Reiki each completed three runs (n = 42 runs) without a healing context, and another two runs (n = 28 runs) in which they first treated a pain patient for 30 minutes (healing context). When giving Reiki to the bacteria, the practitioners placed their hands over the boxes roughly 10cm from the cultures. Plate-count assays using an automated colony counter determined the number of viable bacteria. No overall difference was found between the Reiki and control plates in the nonhealing context, although in the healing context the Reiki treated cultures exhibited statistically significantly more bacteria than controls. Practitioner social and emotional well-being were found to correlate with Reiki treatment outcome for the cultures in the nonhealing context, and practitioner social, physical, and emotional well-being correlated with Reiki treatment outcome for the healing context cultures. The authors reported that there was a trend for practitioners who started with diminished well-being to produce control counts that were higher than the Reiki-treated bacterial counts, and for practitioners starting with a higher level of well-being to produce Reiki counts higher than control counts. Based on this, the authors suggested that the well-being of a Reiki practitioner may be important for the effectiveness of Reiki. However, these findings must be interpreted with caution due to the small number of practitioners.

1.7.2. Implications of the Reiki research conducted to date

The majority of the studies described in the above section have substantive design limitations, providing suggestive support at best, and clearly there is a need for

rigorous, controlled research. In addition to the failure of many of the Reiki studies conducted to effectively control for placebo, the vastly differing protocols employed paint an unclear picture of the factors required for efficacy, such as of the importance of touch, duration of interval between sessions and the level of experience of the healer. Furthermore, the majority of trials of the efficacy of Reiki are insufficiently powered, although in practice it is often not possible for researchers of biofield therapies to conduct studies with large samples sizes due to the limited research funding in this field. Well-designed, sufficiently powered, placebo-controlled RCTs are required that build upon the current research on the clinical applications of Reiki, and also studies that investigate the effects of Reiki on specific biological and psychological processes.

1.8. Is there any Plausible Scientific Basis for Reiki?

In addition to the lack of convincing evidence of its efficacy, the philosophy of Reiki and its scientific mechanisms are incompatible with current scientific understanding. However, it has been proposed that the effectiveness of Reiki and other biofield therapies can be scientifically explained by the interaction of electromagnetic (EM) fields around a healer and a recipient, generated by the currents that flow in the living tissues of their bodies (Oschman, 2000). In order to explain the basis of this argument, some background knowledge of the biomagnetic fields that surround living systems is necessary. It is well understood by science that electric currents flow through the body. Currents flowing through the nervous system are one of the ways that the body regulates itself. Currents also flow from the heart through the circulatory system, with over 50,000 miles of blood vessels conducting currents from the heart to each part of the human body. The currents are often coherent, or in phase, so that rhythmic electric currents and fields are created, which affect the biological activity of body tissues.

Over half the cells in the brain are perineural cells, and the perineurium operates on direct current and is controlled by brain signals, and is directly involved in the body's healing process. The body is alerted to injury by an electrical potential generated at the injury site by the perineural system, which directs repair cells to the site, and as the injury heals, the electric potential changes. The perineural system is very sensitive and responsive to externally applied magnetic fields.

When an electric current flows through a conductor it generates a magnetic field around the conductor, and a current flowing through a living body creates a magnetic field called a biomagnetic field which surrounds and penetrates that body. It is possible to measure biomagnetic fields using sensitive magnetometers. Using a very sensitive magnetometer called a Super-conducting Quantum Interference Device (SQUID), Zimmerman and colleagues measured the biomagnetic fields of many parts of the human body, including the heart, brain and many other organs (Cohen et al., 1970). Such biomagnetic readings are useful in the diagnosis of illness, since an organ has a particular range of frequencies when it is healthy, and an organ can be recognised to be unhealthy if its frequencies are not in the healthy range.

Pulsing electromagnetic field (PEMF) therapy has been used in mainstream medicine since 1979 to facilitate healing in a range of human tissues. Since then, research has shown that the application of magnetic fields can jump-start the healing process in different human tissues by applying a magnetic field of the right frequency for the tissue (Oschman, 2000). For example, in bone healing, a device containing coils of wire is placed near the fracture site to induce current flows in the bone. The frequencies for stimulating tissue repair are all in the extremely low frequency (ELF) range - 2 Hz is

effective for nerve regeneration, 7 Hz is optimal for bone growth, 10 Hz is used for ligaments, and somewhat higher frequencies help heal skin and capillaries.

All the organs of the body are surrounded by their own biomagnetic field, with the field around the heart being the strongest, which has been measured with a SQUID to a distance of 15 feet away (Zimmerman, 1990). The fields around each organ all have their own specific frequency, and all the fields interact with one another and add up to form a large aggregate biomagnetic field surrounding the entire body. The fields interact with other fields they come into contact with, such as the fields around other people, through the principle of induction. This interaction induces changes in the field, in addition to altering the frequency and strength of the currents flowing in its conductor. The effect a person's biomagnetic field can have on the field of another person can affect their health.

It is possible to measure the biomagnetic fields around a person's hands, and Zimmerman (Zimmerman, 1990) used a SQUID to measure the biofield that emanated from the hand of a therapeutic touch practitioner. He reported that the biomagnetic field signal from the healer's hand pulsed at a frequency ranging from 0.3 to 30 Hz, with the majority of activity in the 7-8 Hz range, which is comparable to the frequencies used in Pulsing Biomagnetic Field Therapy. Furthermore, he reported that the pulsing of the healer's biofield was significantly greater when the healer adopted a healing state of mind and intentionally "sent" healing.

Further to the findings of Zimmerman, Seto et al. (1992) claimed that the fields around healers' hands were far stronger than those around nonhealers' hands. Using a simple magnetometer consisting of two 80,000 turn coils hooked to an amplifier, Seto et al. measured the biofields around the hands of skilled practitioners of various biofield

therapies and martial arts, and reported field strengths of 0.0002 gauss. This is 1000 times the strength of the strongest field from the body - that of the human heart - and considerably greater than the strength of the fields reported around the hands of non-biofield therapists, or the healers themselves when they were adopting a non-healing state of mind. In accordance with Zimmerman's findings, Seto et al. reported that the frequencies of the fields around the healers' hands pulsed between the ranges of 0.3-30 Hz, with most of the frequencies being in the range of 7-8 Hz, which is the optimal frequency for bone growth. However, even if the results reported by Seto et al. are correct and healers can produce very large magnetic field strengths from their hands, the magnetic fields used in PMFT are of the order of 1000 times greater than those purportedly produced by certain healers. Thus, even if the claims of Zimmerman and Seto et al. were substantiated, they do not by themselves provide an explanation of how the magnetic fields produced by healers could have a healing effect on body tissue comparable to PMFT. There is no convincing evidence that magnetic fields of the strength reported to occur around healers' hands by Seto et al. can significantly affect health.

Nonetheless, while the magnetic fields strengths reported to emanate from healers are not comparable to those used in PMFT, nor have they been shown to influence health, Oschman considers there to be a plausible explanation of how biofield therapists may facilitate healing though their biomagnetic fields (Oschman, 2000). Oschman describes research conducted by Fröhlich (1978) which suggests that if a person is ill, the biomagnetic fields of one or more of their organs will be out of the normal range. An organ or living tissue is an assembly of cells which regulate important biological processes. Frölich reported that such tissue has a certain collective frequency. His research suggests that although these frequencies are normally very stable, if the

frequency of a cell changes, the entrainment frequencies of neighbouring cells tend to return the cell to its correct frequency. However, his findings indicate that if a number of cells shift frequencies then the system can become unstable, due to a loss in the strength of the system's collective frequency, which can lead to the organ or tissue becoming diseased or functioning incorrectly. If this is correct, and if the biomagnetic fields emitted from healers hands were really stronger than those of nonhealers, then if a healer placed their hands near a malfunctioning organ emitting a much weaker field, when the field around the healer's hands was pulsating in the healthy range of frequencies of the organ this may cause the organ to re-balance itself and pulsate in the healthy range. In turn this may re-balance the currents flowing in the cells and nervous system within the organ and in its surrounding area, affecting the biological processes and facilitating healing.

Limited research into the properties of the magnetic fields around healers' hands of the nature conducted by Zimmerman (Zimmerman, 1990) and Seto et al. (1992) has been carried out, since only very skilled healers can purportedly produce biomagnetic field strengths strong enough to be detected by magnetometers less sensitive than SQUIDs (Oschman, 2000). SQUIDS are inaccessible to most researchers, since not only are they very costly, but they also require large magnetically shielded rooms in order for measurements to be taken. However, very sensitive portable magnetic-field signal-strength meters have recently been developed, and one such device – a three-axis ELF gaussmeter with a digital display ranging from 0.1-1999 milligaus – was reportedly used to detect changes in the biomagnetic fields around healers' hands (Schwartz, 2008). While it is not possible to use such a gaussmeter to measure amplitude and frequency changes of biomagnetic fields, it displays moment-to-moment changes in the sums of the magnetic-field signal strength over a wide range of amplitudes and

frequencies. If the gaussmeter is used in an area with low background magnetic activity, less than 1 milligauss, it can detect minute changes in magnetic field strength over time. In his book, *The Energy Healing Experiments (2008)*, Schwartz reports an experiment designed to test the hypothesis that healers can produce significantly more alterations in the magnetic fields coming from their hands when they are intentionally "sending" healing than when they are not. Using the gaussmeter described, Schwartz reported changes in the magnetic field strengths around the hands of 17 Reiki practitioners. Four trials were run per practitioner – two with each of their hands, where in a given trial a practitioner placed a hand next to the meter for a one-minute baseline period where they simply relaxed, and also a one-minute period where they attempted to channel Reiki. Schwartz (2008) reported an average of roughly 30-35 magnetic-field changes per minute in the baseline trials, compared to around 45-50 changes per minute when the practitioners attempted to send Reiki, which was a highly significant difference.

With the intent of replicating the results reported in their experiment with Reiki practitioners, Schwartz and Connor conducted further trials with healers, where 15 expert-level practitioners of various biofield therapies were each tested with a gaussmeter in the same manner as in the first experiment (Schwartz, 2008). As in their previous experiment, Schwartz stated that during the baseline trials the meter detected an average of 30-35 magnetic-field strength changes per minute. Whereas in the trials where the healers attempted to send healing the meter purportedly registered around 60-75 changes per minute, which is a substantively greater difference than in the original trial. These measurements were taken with a handheld gaussmeter, so are not as precise as those that could be obtained with a SQUID in a magnetically shielded laboratory. Also, the experiment has not been replicated by independent researchers, so

the findings must be interpreted with caution. Nonetheless, the significance of the findings reported warrant further research. The magnetic field experiments conducted by Zimmerman (1990), Seto et al (1992), and Schwartz (2008) clearly need to be replicated and extended, preferably involving measurements taken with a SQUID in a magnetically shielded room. The findings reported by these researchers do seem to suggest though that the act of attempting to send healing may have a measurable influence on the biomagnetic fields around the hands of healers. They do not show that the magnetic fields around healers' hands can heal, but they would seem to suggest that healers may be able to generate biomagnetic fields from their hands that pulse in the same range of frequencies used to promote healing in conventional medical practice, albeit of a lower magnetic field strength. Little can be concluded from the reported results of these researchers though due to the small number of studies conducted. Furthermore, even if their findings did provide a rational explanation of the physical healing processes that may occur during hands-on energy healing modalities such as Reiki, they do not explain the mechanisms of how the healers may be influencing their biomagnetic fields when attempting to send healing. Nor do they provide an explanation for distant healing, since magnetic field strengths fall off rapidly with distance.

1.9. Chapter summary

This chapter first defined biofield therapies and it was seen that Reiki is classified as belonging to this domain. The term Reiki was defined as meaning "spiritual life force energy," and fundamental properties of the Reiki healing system were discussed, such as attunements, and the purported innate intelligence of Reiki energy. An account was then given of the history of Reiki, where its discovery by Usui in Japan, the Buddhist spiritual principles on which it is based, and how it was brought to the West by Takata

were described. Next, details of how Reiki is practiced were discussed, and the methods of training in the West outlined, where the teachings of First, Second and Master degree training were described. Scientific studies of Reiki were then reviewed, and it was seen that although there is some suggestive evidence of the efficacy of Reiki, the general poor quality of the research conducted has meant that is not possible to discern whether the benefits often reported to occur in those who receive Reiki are due in part to a Reiki energy exchange, or whether they are wholly due to placebo and other nonspecific effects. Possible explanations for the scientific mechanisms of how Reiki may work were also considered. It was speculated that it may be possible for the interaction between the biomagnetic fields of a healer and a recipient to facilitate healing in damaged tissue, although nothing can currently be concluded on this matter due to the paucity of research in this area.

Chapter 2. Three case studies investigating the treatment of chronic fatigue syndrome with Reiki

2.1. Introduction

Chronic fatigue syndrome (CFS) is an incapacitating illness that the International Centres for Disease Control (CDC, 1994) case definition defines as involving disabling chronic fatigue and characteristic accompanying symptoms such as headaches, muscle pain, sleep disturbances and cognitive difficulties (Fukuda et al., 1994). A patient is classified as having CFS: 1) if they have been fatigued for at least 6-months; 2) if the fatigue severely affects their occupational, educational, social, or recreational activities; 3) if at least 4 CFS defining symptoms are present; and 4) if the patient has no exclusionary medical or psychiatric conditions.

A considerable number of studies have been conducted to investigate the treatment of CFS, using a variety of treatments. Several systematic reviews have been published which assess the efficacy of these interventions (Price and Cooper, 1998; Lloyd et al., 2003, Edmonds et al., 2004), all agreeing that Cognitive Behavioural Therapy (CBT) and Graded Exercise Therapy (GET) are currently the only interventions with proven effectiveness, although recent reviews (Ross et al., 2004; Chambers et al., 2006) have also found rehabilitation to be beneficial, such as occupational therapy inpatient programmes employing the principles of CBT and graded activity. In the majority of studies covered by these systematic reviews, CFS patients were required to travel to a clinic to receive treatment, thus excluding the more severely ill patients from participating. This issue was addressed in the presented case studies.

The case studies were designed to investigate the effects of Reiki healing on a small sample of CFS patients. The case studies were intended as an exploratory and

feasibility study, to be followed - if the patients benefited from the Reiki - by a randomised controlled pilot study with a greater sample size. The experimental hypothesis was that there would be an overall improvement in the patients' health, despite the low power to detect an effect due to few participants.

As discussed in Chapter 1.7, while there is some evidence to support the efficacy of Reiki for the treatment of a variety of conditions, the quality of research in this field has tended to be poor. No validated studies have evaluated the effects of Reiki on CFS, although there is some limited evidence that Reiki may be beneficial for treating symptoms often present in CFS patients. Several RCTs suggest Reiki may reduce pain (Wirth et al., 1998; Dressen and Singg, 1998; Olson et al., 2003; Vitale and O'Connor, 2006). Studies have also found improvements in mood (Dressen and Singg, 1998; Goldman Shore, 2004), quality of life (Olson et al., 2003; Tsang et al., 2007) and memory (Crawford et al., 2006) following Reiki treatment over control groups. While these studies are few in number and have design limitations, they suggest Reiki may be helpful in treating symptoms of CFS, and the presented case studies aimed to test this.

2.2. Methodology

2.2.1. Participants

Three CFS patients were recruited to participate in the case studies through an appeal published in a CFS magazine and by emails sent out by the editor, and also by an advertisement placed in a local newspaper. All participants received a CFS diagnosis two weeks prior to the start of the study by a medical doctor in accordance with the Centres for Disease Control (1994) Fukuda inclusion and exclusion criteria (Fukuda et al., 1994). Participant 1 (P1) was a 46 year old female who had suffered from CFS for 16 years, Participant 2 (P2) was a 54 year old male who had had CFS for 14 years, and

Participant 3 (3) was a 59 year old female who had had CFS for five years. At the start of the study, Participants 1 and 3 had moderate-to-severe CFS severity (severe symptoms with exercise; overall activity reduced by 50%; usually confined to the house; unable to perform strenuous tasks; able to perform desk work two-three hours a day with rest periods). Participant 2 had moderate CFS severity (moderate symptoms at rest; moderate to severe symptoms with exercise or activity; overall activity reduced by 30%; unable to perform strenuous duties, but able to perform desk work for four-five hours a day with rest periods).

The study gained approval from the Goldsmiths Ethics Committee prior to its start, and informed consent was obtained from all participants after they had been given detailed information sheets about the study and Reiki.

2.2.2. Treatment

The three participants were given a weekly one-hour Reiki treatment for a period of seven weeks by the author of this dissertation – Deborah Bowden, whom had Master-Teacher-degree training in Usui Reiki and, at the time that the case studies were conducted, she had been practicing Reiki for two years. Seven treatments were chosen because a minimum of four Reiki sessions is considered advisable when treating chronic illnesses (Miles and True, 2003). Two of the participants were treated in their own homes - P1 while lying on a mat on her living room floor and P3 while she lay in her bed. P2, who had less severe CFS than Participants 1 and 2, offered to travel to Goldsmiths, University of London, to receive his treatments. He was treated in a room decorated to look similar to a therapy room, while he lay on a mat on the floor. Cushions were placed where needed for support, and a blanket was offered for warmth.

Participants 1 and 2 listened to soft music while receiving Reiki, although P3 chose to have no music.

Reiki was administered using a combination of traditional Reiki hand positions and placing the hands intuitively, using Reiki symbols and with the intention of the healing of symptoms and restoration to full health. To supplement the outcome measures below, before each treatment the Reiki Master asked how they had felt over the last week, and after the treatments ascertained how they were feeling and what they had experienced. Notes were made of the participants' comments.

2.2.3. Outcome measures

Screening and pre-post assessments were performed through self-report questionnaires. As recommended by an International CFS Study Group (Reeves et al., 2003), the primary outcome measures used were: the Center for Disease Control and Prevention Symptom Inventory (CDCSI) (Smets et al., 1995) to assess the full range of CFS associated symptoms; the Multidimensional Fatigue Inventory (MFI) (Wagner et al., 2005) to measure general dimensions of fatigue; and the Medical Outcomes Survey Short-Form (SF-36) (Ware and Sherbourne, 1992) to measure functional impairment. In addition, secondary measures were: the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989) and the Epworth Sleepiness Scale (ESS; ref) for measures of sleep; and the Hospital Anxiety and Depression Scale (HADS) (Mykletun et al., 2001) for measures of mood. Each form was formatted as a separate section of a Microsoft Excel file (where the PSQI and the ESS were combined into one Sleep form), although all patients had difficulty completing the forms on the computer, and some requested printed versions. All patients completed the forms at home in their own time, and

reported that they tended to be too tiring to complete in one sitting, particularly in the computerised format.

The Center for Disease Control and Prevention Symptom Inventory (the Symptoms form) collects information about the presence, frequency, and intensity of 19 fatigue and illness-related symptoms during the previous month, including the eight CFS-defining symptoms (Post-Exertional Fatigue, Unrefreshing Sleep, Problems Remembering or Concentrating, Muscle Aches and Pains, Joint Pain, Sore Throat, Tender Lymph Nodes and Swollen Glands, and Headaches). It also catalogs Diarrhea, Fever, Chills, Sleeping Problems, Nausea, Stomach or Abdominal Pain, Sinus or Nasal Problems, Shortness of Breath, Sensitivity to Light, and Depression. Each symptom is scored on a scale of 0-25, where a score of 25 corresponds to maximum possible frequency and severity.

The Multidimensional Fatigue Inventory (the Fatigue form) is a 20-item self-report instrument that measures 5 dimensions of fatigue; General Fatigue, Physical Fatigue, Mental Fatigue, Reduced Motivation and Reduced Activity. The score in each dimension reflects severity of fatigue, and is scored on a scale of 0-20 where higher values indicate higher severity.

The Medical Outcomes Survey Short-Form (the Activities form) was used to assess function and well-being in 8 areas: 1) Limitations in Physical Activities because of Health Problems; 2) Limitations in Social Activities because of Physical or Emotional Problems; 3) Limitations in usual Role Activities because of Physical Health Problems; 4) Bodily Pain; 5) General Mental Health; 6) Limitations in usual Role Activities because of Emotional Problems; 7) Vitality (Energy and Fatigue); and 8) General

Health Perceptions. The items are scored on a scale of 1-100, where 100 represents perfect functioning.

The Sleep form incorporated the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Scale. The PSQI measures eight sleep items: Subjective Sleep Quality, Time to Fall Asleep once in Bed, Sleep Latency, Sleep Duration, Habitual Sleep Efficiency, Sleep Disturbances, use of Sleeping Medication, and Daytime Dysfunction over the last month. Scoring of answers is based on a 0-3 scale, 3 being the worst. A global sum of 5 or greater indicates a poor sleeper. The ESS is a questionnaire that seeks to give a numerical value to the sleepiness scale of patients with sleep disorders.

The global ESS item, the Epworth Sleepiness Index, measures daytime sleepiness on a scale of 0-24, where a score of 0-6 indicates a good sleeper, a score of 7-8 indicates an average sleeper, and a score of 9 or above indicates a clinical problem. The ESS differs from the PSQI item Daytime Dysfunction because in addition to daytime sleepiness, Daytime Dysfunction refers to problems such as a lack of ability to gain enthusiasm for daytime tasks, whereas the ESS refers only to the likelihood of falling asleep in daytime situations.

The Hospital Anxiety and Depression Scale (the Mood form) measures levels of Anxiety and Depression. These items are scored on a scale of 0-21, where a score of 0-7 is considered normal, a score of 8-10 is considered borderline abnormal, and a score of 11-22 is considered abnormal.

2.3. Results

Since only three patients participated in the study, no statistical tests were performed. The scale profiles of each patient were examined individually.

Each patient's scores at pre-intervention (Pre), post intervention (Post 1) and at eight week follow-up (Post 2) for each individual item of the primary outcome measures: CDCSI, the MFI, the SF-36; and the secondary outcome measures: the PSQI, the HADS, and the sum totals for each form (including the ESS), are shown in Tables A1 and A2 in the Appendix respectively. At Post 1, P3 did not communicate her difficulty completing the post-intervention computerised forms for the MFI, the PSQI, the ESS, and the HADS, so these data are not available.

Figures 1-3 summarise the global scores of each patient respectively and individual items in which there was a change of at least 15%, expressed as percentages of the maximum possible scores. The items are ordered from left to right in clusters of items in which there were similar kinds of changes. The first cluster in each figure contains the items that showed the most improvement over the course of the intervention, followed by a cluster of items in which there was an improvement at Post 1 which was not maintained at follow-up, and the final cluster contains items in which there was deterioration.

2.3.1. Participant 1

This patient was the one who showed the most improvement following the course of treatment. Figure 1 shows her scores for each item in which she had a notable improvement over the study, clustered from left to right. While not all her improvements were maintained at follow-up, it can be seen from the first cluster of Figure 1 that three global scores had indeed improved further: Global Symptoms, Global Activities, and her Global Sleep score. Compared with baseline, at follow-up the Global Activities score had improved by 121.3% (I: 253/900, II: 466/900, III: 560/900), the Global Symptoms score had improved by 71.8% (I: 117/475, II: 42/475,

III: 33/475), and the Global Sleep score had improved by 31.2% (I:13/24, II: 10/24, III: 9/24), although she was still in the clinically poor sleeper category. In addition, the Symptom item Fatigue after Exertion had improved by 76% by the end of treatment, an improvement that was maintained at follow-up (I: 25/25, II: 6/25, III: 6/25). Lastly, although there was no change following treatment in the Activities item Role Limitation due to Emotional Problems, by follow-up her score for this item had improved from maximum limitation to perfect functioning (I: 0/100, II: 0/100, III: 100/100).

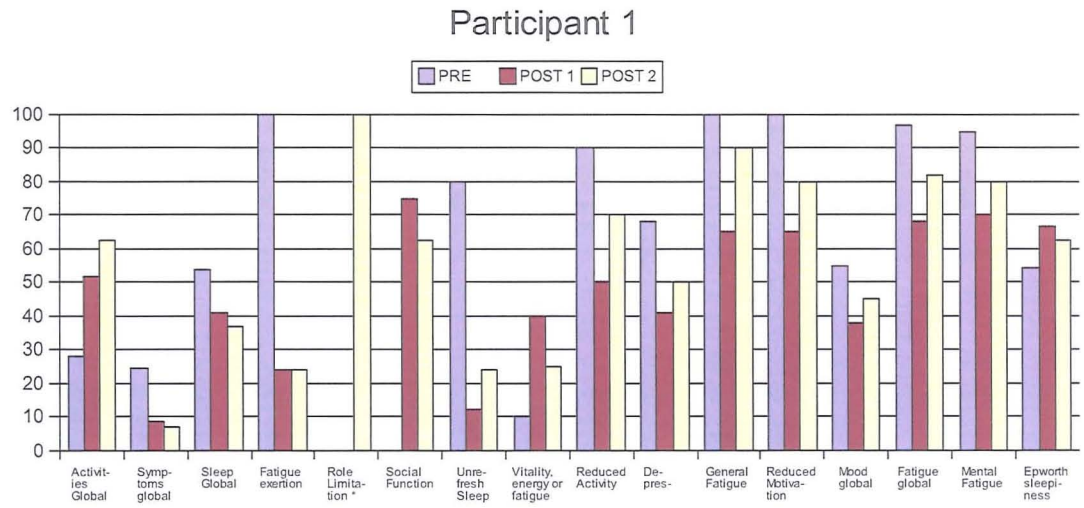

*Figure 1. Participant 1's global scores and individual items in which there was a substantive change. *: Role limitations due to emotional problems.*

Those items in the second cluster, where following improvement with treatment there was some degree of deterioration at follow-up, were as follows. Improvements in excess of 70% were seen in the reduction in Unrefreshing Sleep (I: 20/25, II: 3/25, III: 6/25), Social Function (I: 0/100, II: 75/100, III: 62.5/100) and Vitality, Energy or Fatigue (I: 10/100, II: 40/100, III: 25/100), where in all except the last instance the deterioration at follow-up was slight. The more typical profile was an improvement of around 30% of her baseline score and a reduction of around 15%. Global Fatigue

improved by 29.9% after treatment, falling to a 15.5% improvement at follow-up (I: 97/100, II: 68/100, III: 82/100). This was due to increases in General Fatigue, Reduced Activity, Reduced Motivation, and Mental Fatigue, but without deterioration in Physical Fatigue. Likewise, although her Global Mood score had improved by 30.4% at Post 1 this was not maintained (I: 23/44, II: 16/44, III: 19/44), mainly due to her depression increasing to pathological levels again (I: 15/22, II: 9/22, III: 11/22).

However, contrary to the general trend of improvement seen in P2 and despite her Global Sleep score improving, while being clinically high at Pre, her Epworth Sleepiness Index had increased by 23.1% at Post 1, although had reduced at follow-up to an increase of 15.4% compared with baseline. (I: 13/24, II: 16/24, III: 15/24).

2.3.2. Participant 2.

While of the three patients P2 had made the least overall improvement at Post 1, by follow-up he had improved overall almost as substantively as P1. As can be seen from the first cluster of Figure 2, a number of his items improved progressively from the start of the intervention to follow-up. This incorporated a 79.5% improvement from baseline to follow-up in his Global Symptoms score (I: 132/475, II: 57/475, III: 27/475) and a 27.1% improvement in his Global Activities score (I: 353/900, II: 388.8/900, III: 448.5/900). In addition, there were progressive improvements from baseline to follow-up of around 90% in his scores for the Symptoms items Sensitivity to Light (I: 25/25. II: 15/25, III: 2/25) and Memory Problems (I: 15/25, II: 9/25, III: 2/25), with his Sleeping Problems score decreasing from maximum severity at baseline to zero severity (I: 25/25, II: 2/25, III: 0/25). Lastly, progressive improvements of around 20% were seen for his scores for the Mood item Depression (I: 15/24, II: 16/24, III: 18/24) and the Fatigue item General Fatigue (I: 20/20, 1I: 19/20, III: 15/20).

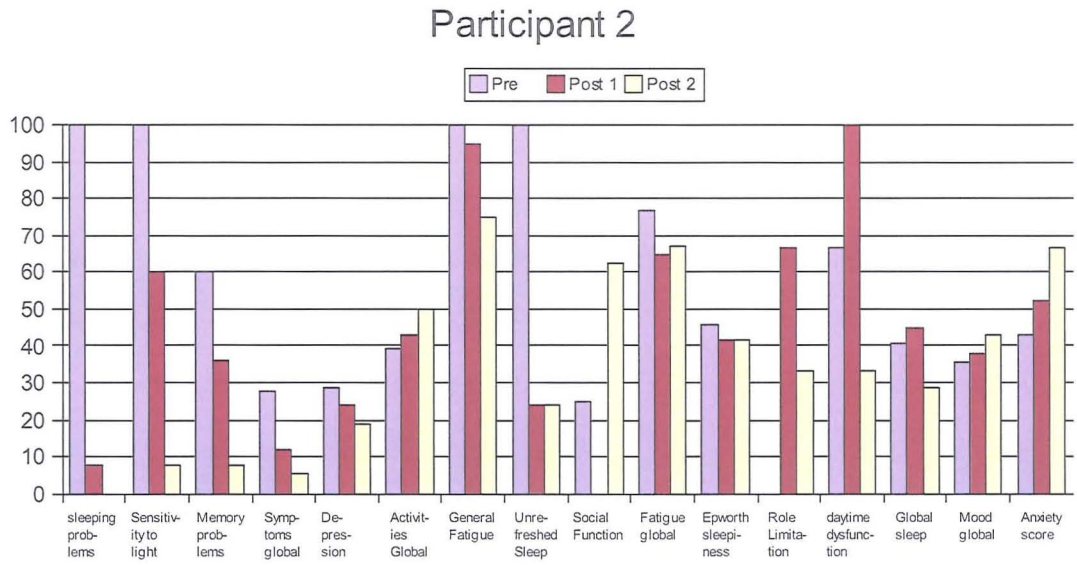

*Figure 2. Participant 2's global scores and individual items in which there was a substantive change. *: Role limitations due to emotional problems.*

As can be seen from the second cluster of Figure 2, several items had improved at Post 1 and had been approximately maintained at follow-up, including his Global Fatigue Score, which had improved by 15.6% at Post 1 (I: 77/100, II: 65/100, III: 67/100). Also, a 76% improvement was seen at Post 1 in his score for the Symptom item Unrefreshing Sleep and was maintained (I: 25/20, II: 6/20, III: 6/20). Additionally, although P2's score for the SF-36 item Social Function was worse at Post 1, at follow-up it was more than twice as high as his Pre score (I: 25/100, II: 0/100, III: 62.5/100).

The third cluster of Figure 2, which shows the items in which Participant 2 grew worse, begins with an additional item score of P2's - the SF-36 item Role Limitation due to Emotional Problems – which had improved substantively following the course of treatment, but had deteriorated somewhat at follow-up (I: 0/100, II: 66.7/100, III: 33.3/100). Also, while his Global Sleep score was worse at Post 1, at follow-up it had

improved so that it was 29.7% lower than at baseline (I: 9.8/24, II: 10.8/24, III: 6.9/24), although he still qualified as a clinically poor sleeper. Additionally, although his score for the PSQI item Daytime Dysfunction was worse at Post 1, at follow-up it was also lower than his baseline score (I: 2/3, II: 3/3, III: 1/3).

However, the final cluster shows that contrary to the improvement seen in most scale items P2 completed, his Global Mood score grew progressively worse, so that his follow-up score was 20% worse than at baseline (I: 15/44, II: 16/44, III: 18/44). This was due to a 55.6% increase in his anxiety score (I: 9/22, II: 11/22, III: 14/22), which progressed from being borderline abnormal to being well into the abnormal category, and was despite his depression reducing progressively.

2.3.3. Participant 3

Although P3 showed considerable improvement in the global scores of the two scales she completed at Post 1 - the CDCSI and the SF-36 - of the three patients she improved least overall in the study due to deterioration in her health between Post 1 and follow-up. As can be seen to the left of Figure 1, her score for the SF-36 item Role Limitation due to Emotional Problems had improved by 50% at Post 1 to perfect functioning and was maintained (I: 66.7/100, II: 100/100, III: 100/100). However, this was the only improvement made that had not relapsed at follow-up.

In the cluster to the right of Role Limitation due to Emotional Problems, it can be seen that a number of items had improved substantively at Post 1 although had deteriorated at follow-up. There was an absolute reduction following the course of treatment in the score of the Symptoms item Sensitivity to Light (I: 16/25, II: 0/25, III: 16/25), although

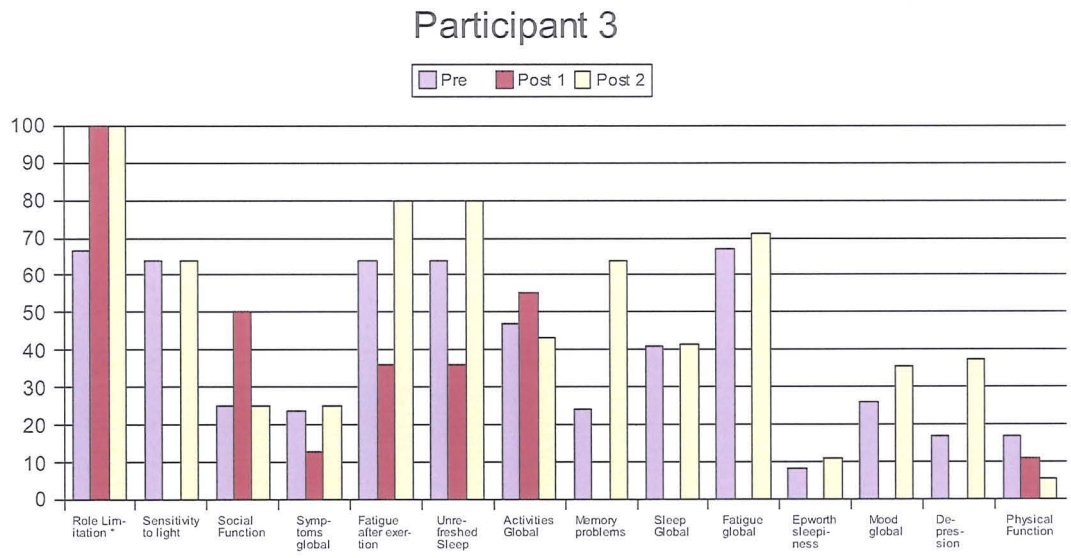

Figure 3. Participant 2's global scores and individual items in which there was a substantive change: Role limitation due to emotional problems.*

at follow-up this symptom had returned to its former severity. Several more items had made improvements at Post 1 of around 50%, including her Global Symptoms score which reduced by 45.5% (I: 112/475, II: 61/475, III: 119/475) and the Activities item Social Function score which improved by 50% (I: 25/100, II: 50/100, III: 25/100), although these had both relapsed to their former levels at follow-up. Improvements of 43.8% were seen in the Symptoms items Fatigue after Exertion score (I: 16/25, II: 9/25, III: 20/25) and Unrefreshing Sleep score (I: 16/25, II: 9/25, III: 20/25), although these symptoms were 25% worse at follow-up than at baseline. In addition, while P3's Global Activities score had improved by 18.3% at Post 1 (I: 421.4/900, II: 498.1/900, III: 389.1), it had also relapsed at follow-up, so that it was slightly worse than at baseline. Finally, despite the reduction to zero severity of the Symptoms item Memory Problems at Post 1, at follow-up this item score had deteriorated to 167.7% higher than her baseline score (I: 6/25, II: 0/25, III: 16/25).

The third cluster shows the items that were the same or worse at follow-up as they were at baseline, where P3's Post 1 data for the Fatigue, Sleep, and Mood forms were unavailable. It can be seen that her Global Sleep score at Post 2 was approximately the same as her clinically poor Pre score (I: 9.8/24, III: 9.94/24), as was her score for Global Fatigue (I: 67/100, III: 71/100). However, increases were seen in her scores for the Epworth Sleepiness Index, which increased by 37.5% from that of an average sleeper to a clinically poor one (I: 8/24, III: 11/24), and Global Mood which increased by 27.3% (I: 11/44, III: 15/44), due to her Depression rising from a normal level by 125% so that it was borderline abnormal (I: 4/22, III: 9/22).

However, where Post 1 data were available for S1, she grew progressively worse only in her score for the SF-36 item Physical Functioning, which was 66.6% lower at follow-up than at baseline (I: 16.67/100, II: 11.11/100, III: 5.56/100).

2.4. Discussion

Since only three CFS patients participated in the case studies, and no statistical analysis was performed, there is very low power to reject the null hypothesis. However, as predicted, all three participants were overall in better health a week after the intervention than at its start. This was also the case for Participants 1 and 2 at eight-week follow-up, although Participant 3's health was worse than at baseline. Nonetheless, the overall improvements observed suggest Reiki may be helpful in treating CFS, and further research is warranted to investigate this.

All participants had made overall improvements at Post 1 on all primary scales - the CDCSI, the MFI and the SF-36 (although Participant 3 only completed the CDCSI and the SF-36 at Post 1). Regarding secondary scales, Participant 1 had also improved in her global PSQI and HADS scores, although her Epworth Sleepiness Index was higher.

Conversely, Participant 2's global PSQI and HADS scores were slightly worse, although his Epworth Sleepiness Index was lower.

At eight-week follow-up, Participants 1 and 2 were in substantively better health than at the start of the intervention in all primary global scores, and also all secondary global scores except for the HADS, for which Participant 2 was worse, and Participant 1's Epworth Sleepiness Index was higher. However, at Post 2 Participant 3's health had relapsed, so that all her primary global scores were slightly worse than at the start of the intervention. Additionally, her Global Sleep score was marginally worse than at pre-intervention, and her Epworth Sleepiness Index and her global HADS score were substantively worse. She attributed her worsened health to be the result of severe life stresses that had occurred since the start of the intervention.

The increase in Participant 1's energy levels as evidenced by her reduced Fatigue scores, especially at Post 1, was supported by her comments to the Reiki Master expressed at her fifth, sixth and seventh treatment sessions that she had more energy. Also in support of the improvements observed were her comments that she had been able to cope with life stresses better, and that she had been feeling warmer. The fact that the level of improvement in P1's energy levels seen at Post 1 was not maintained at follow-up suggests that a series of seven Reiki treatments may not be enough, and that a weekly Reiki treatment on a longer-term basis may be beneficial to CFS patients.

Despite the improvements seen at Post 1 in Participant 2's global scores for Symptoms, Fatigue and Activities, he commented throughout the treatments that there was nothing to report and that his health was unchanged. This may have been due to the small negative changes in his Global Mood and Sleep scores. It is interesting that P2, who was the only patient who had not made global improvement in every scale completed at

Post 1, was the participant who received Reiki in Goldsmiths, and who journeyed for over an hour by public transport each way. It is possible that the stress and energy this journey demanded may have counteracted positive effects the Reiki may have had, or it may be that this travelling delayed the manifestation of the substantive improvements seen at Post 2 in all his global scores except Mood.

Throughout her course of treatment, Participant 3 communicated verbally to the Reiki Master at treatment sessions that she felt the Reiki had helped her posture, so that she could lie flatter on her back during yoga and carry her backpack better. She also said that Reiki had helped her mood, and had helped her to "move into herself and away from having to defend herself". She also said that at times she felt "connected" to the Reiki Master during the treatments. She commented that the benefits she had gained from the Reiki would probably not be detected by the forms, since they asked the wrong kinds of questions.

Throughout the treatments and at Post 1 P3 also commented that many severe life stresses had by chance occurred since the start of the intervention, such as building work being done on her house and a dispute with the contractors, and a tooth infection caused by dental work conducted roughly six months before that had only recently been detected by the dentist. However, despite these factors, she showed overall improvements in the two forms she completed following the course of treatment. She communicated to the Reiki Master that she felt the Reiki was helping her to cope with these stresses, which perhaps explains these improvements

However, after Post 1, these life stresses and her tooth infection continued to increase in severity, and she attributed this to be the cause of the decline in her health reflected in her follow-up scores. So, while it seems that Participant 3 benefited from receiving a

weekly Reiki treatment, the intervention did not appear to have any longer lasting benefits of the kind detectable by the forms used. This again suggests that regular Reiki treatments on a longer-term basis would be helpful for CFS patients. Although at follow-up she felt that she had maintained the positive changes of the nature of moving "into herself", mentioned above, and communicated that she was keen to continue with Reiki, and had booked a place on a Reiki level 1 training course so that she could learn to give herself Reiki treatments.

Assuming that the overall improvements observed were due to the intervention and not chance, then since the study employed no control group, the improvements may have been due to expectation rather than a Reiki energy exchange. It is also possible that the benefits observed were the result of lying down and relaxing and receiving the attention of the Reiki Master for an hour, and in the case of Participants 1 and 2, listening to soft music. Participant 3 also chatted to the Reiki Master at length before and after each treatment, which may have contributed to the benefits she gained from the intervention seen at Post 1. There is a need for a placebo-controlled RCT with a sufficient sample of CFS patients to further investigate the efficacy of treating CFS with Reiki.

Difficulties were encountered in recruiting CFS patients to participate in the case study, and especially those living in the local area, so a study involving a greater sample size would require a more effective method of recruitment to be found. Reiki given to the treatment group in a larger study would also ideally be administered by more than one Reiki practitioner. This would certainly be necessary if the practitioner were required to travel to the participants' homes to give Reiki, due to time constraints. Additionally, all three case study participants had problems filling in the computerised forms, although Participants 1 and 2 attributed this to the Excel file not working properly on their

computers. Participant 3 commented that she did not think CFS patients should be expected to fill in computerised forms, as this causes a lot of stress and is very tiring, and she had great difficulty doing this, and this needs to be considered in the design of future studies with patients who have severe CFS.

Chapter 3. A randomised controlled trial of the effects of Reiki and positive imagery on the immune system and well-being

3.1. Introduction

Various studies have found Reiki to have a beneficial effect on well-being when compared to controls who received no Reiki (Miles and True, 2003; VanderVaart et al., 2009). However, no randomized controlled trials have evaluated the effects of Reiki on well-being and health in conjunction with immune function.

Importantly Johrei, which is a Reiki-like procedure, has produced reproducible beneficial effects on the immune system, effects which translated to well being (Naito et al., 2003; Laidlaw et al., 2003). Notably in one study Johrei was given to medical students experiencing exam-time stress (Naito et al., 2003). The effects of stress were moderated in participants who learned Johrei, with 11/12 showing increases in $CD3^{-}$ $CD56^{+}$ natural killer cell percentages with decreased percentages of $CD3^{+}CD4$. Benefits for mood were evinced in reduced anxiety, depression, anger, and loss of vigour and confusion (Laidlaw et al., 2003). Furthermore while evidence for specific physical benefits for health have yet to be demonstrated from Johrei practice, improved well-being in women with late stage breast cancer has been documented (Laidlaw et al., 2005; Bennett et al., 2006).

Here we set out to examine in a controlled study in normally healthy participants exposed to putatively enduring stress, the possible benefits of Reiki for health, mood and an immunological marker (Bowden et al, 2010). Establishing effects of Reiki in the three domains of measurement – health, mood and immunology – especially health, is important in order to convey *significance* in the case of mood change, and at the same time to provide *validity* for immunological change, whose direction is ambiguous

given such a tightly controlled, multiply determined system (Gruzelier, 2002). Our participants were mostly university freshers; attending university in the first year has been shown to be an ecologically valid stressor (Whitehouse et al., 1996). The dependent variables included immune system functioning as measured by salivary cortisol, while mood, health and sleep were assessed by self-report questionnaires.

In order to control for expectation, the participants of the study were blinded as to whether or not they were receiving Reiki, where a practitioner sat behind each participant and sent non-contact Reiki to those in the Reiki group. The participants were not aware of whether Reiki was being administered as their attention was absorbed in one of three visualisation/relaxation procedures as described in the Methods.

While healing studies have blinded participants to treatment by sending healing from behind a screen (Wirth et al., 1998), the method used here allowed closer contact between the practitioner and participant. Although the presented method of blinding participants to Reiki did not permit the physical contact that is often used in Reiki therapy, this blinding method has advantages over the "sham" Reiki method (Mansour et al., 1999). As discussed in Chapter 1.7., sham Reiki consists of someone whom has not been initiated into Reiki, or received an "attunement", mimicking a Reiki practitioner giving a Reiki treatment. A sham practitioner may have undergone identical training to a genuine Reiki practitioner, except for being initiated, which the sham and genuine practitioners may be blinded to in order to make a study double-blind (Shiflett et al., 2002). However, the effectiveness of the sham Reiki method relies on the assumption that any therapeutic effects of Reiki that are not due to expectation and relaxation must arise due to purported healing abilities bestowed on a training

practitioner when they receive an attunement. If indeed the observed effectiveness of Reiki is not solely attributable to placebo and relaxation effects, it is possible that other aspects of a Reiki practitioner's training which may be shared by a sham practitioner - such as meditation and visualisation exercises or natural healing abilities possessed prior to training in Reiki - may be factors in its efficacy.

The effectiveness of the blinding technique employed in the present study was monitored by a questionnaire completed mid-way through the intervention and again at post-assessment, designed to evaluate whether participants believed themselves to be in a Reiki group or not. The questionnaire also assessed belief regarding the impact of the intervention on well-being, in order to take account of expectation effects.

In summary, the study was designed to determine whether Reiki could influence, above and beyond placebo and relaxation effects, a participant's health, well-being and the stress hormone cortisol. If this were found to be the case then, assuming that conditions could be held constant in the present single-blind design, the possibility that the reported effectiveness of Reiki may be partly attributable to a subtle energy exchange would be worth exploring further.

The study was conducted in conjunction with an independent experiment examining the effects of types of hypnotic relaxation/visualisation on immune function and mood, the details of which are outlined in the Methodology section.

3.2. Methodology

3.2.1. Participants

Following approval from the Goldsmiths Ethics Committee, 41 healthy Psychology undergraduates were recruited to participate, of whom 40 were in their first year of study. However, only 35 participants completed the study due to six drop-outs (1 Reiki; 5 non-Reiki). The age of the participants ranged from 18-30 years (27 female; 7 male). Participants were given information sheets and then, once informed consent had been obtained, were randomly allocated to the intervention groups. The students were awarded course credits or £30 on completion of the study.

3.2.2. Design and procedure

The participants were randomly assigned to six groups – three hypnotic/relaxation groups as for the adjunct study, each subdivided by Reiki or No-Reiki. The three hypnotic/relaxation groups were:

1. conventional self-hypnotic relaxation coupled with visualization of healthy immune function based on Gruzelier et al. (2001),
2. the same self-hypnosis procedure with the verbal immune instructions replaced by an animated scenario of healthy immune function (Thompson et al, 2009),
3. verbal instructions of deep relaxation, designed to control for any beneficial effects of the self-hypnosis due to relaxation and expectation. Each of the three groups were randomised to Reiki or No-Reiki groups with six participants in each subgroup, except for the No-Reiki relaxation subgroup which had five participants due to a drop out. Thus there were 18 Reiki and 17 No-Reiki participants.

The participants belonging to each group are shown in Table 1 as well as those that withdrew from the study. There was very little difference in the mean ages of the Reiki and No-Reiki groups (Reiki: 23, SD = 3.1; No-Reiki: 22, SD = 3.9), nor in the sexes of the groups (Reiki: 14 female, 4 male; No-Reiki: 14 female, 3 male).

Table 1. Numbers of female (F) and male (M) participants in each of the six subgroups*

	Animation-Group			Verbal-Group			Relaxation-Group			Total		
	F	**M**	**Total**	**F**	**M**	**Total**	**F**	**M**	**Total**	**F**	**M**	**Total**
Reiki	5 (0)*	1 (0)	6 (0)	6 (1)	0 (0)	6 (1)	4 (0)	2 (0)	6 (0)	15 (1)	3 (0)	18 (1)
No-Reiki	5 (0)	1 (0)	6 (0)	5 (2)	1 (0)	6 (2)	4 (2)	1 (1)	5 (3)	14 (4)	3 (1)	17 (5)
Total	10 (0)	2 (0)		11 (3)	1 (0)		8 (2)	3 (1)		29 (5)	6 (1)	

**Numbers of participants in each of the subgroups who withdrew from the study are shown in parentheses.*

It was calculated using G-Power that the numbers of participants in the Reiki and No-Reiki groups were sufficient for a significant difference between two independent samples of equal size to be observed. The predication was that there would be a very large effect size, since statistically significant effects have been observed in energy healing studies employing similar or smaller sample sizes (Jain and Mills, 1999). Thus, with an effect size of 1, an error probability of 0.05, and an allocation ratio of 1, the necessary sample size was calculated to be 17 in each group. Therefore the study had the minimum power necessary for an effect of the predicted magnitude to be detected. While it would have been preferable to employ a larger sample size to increase statistical power, it was regretfully not possible to recruit a larger number of participants due to limited research funding.

A total of 41 students were recruited and five participants dropped-out early on when there were less than 6 participants per subgroup. Our randomisation procedure consisted of an experimenter tossing a six-sided die to assign the first six recruits to each of the six subgroups as indicated by the die throw, so that there was one in each group. This procedure was repeated with each subsequent six recruits until there were six in each subgroup. When participants dropped out new recruits continued to be randomly assigned to the six subgroups by the method described, ensuring that there were equal numbers in each group, until we reached our target of 36. However, one of these 36 – a member of the No-Reiki relaxation group - dropped-out at a stage when it was too late to replace them, which is why this subgroup had only five participants. The experimenter who conducted the randomisation had not met the participants and was naive to the scores of their pre-assessment measures.

In order to control for expectation regarding receiving Reiki, all participants were blinded as to whether or not they were in a Reiki group and were told prior to the start of the intervention that they may or may not receive non-contact Reiki. The experimenter, who was a Reiki Master and administered the Reiki in the study, was present throughout all sessions for all groups and sat several feet behind each student whilst they experienced self-hypnosis or relaxation control. During the sessions with the participants in the Reiki group the experimenter directed Reiki towards the student by holding her hands 3-30 inches above their head or towards their back, through their chair. During the sessions with the No-Reiki participants the experimenter did not send Reiki and sat impassively. The participants had little sensory input of the experimenter, as in addition to being absorbed in the self-hypnosis or guided relaxation, the participants wore headphones and those in the verbal imagery hypnosis and control groups were blindfolded, while those in the Animation group wore a headset which

served the purpose of a blindfold due to its size. The effectiveness of the blinding technique was monitored by a questionnaire completed mid-way through the intervention and again at post-assessment, designed to evaluate whether participants believed themselves to be in a Reiki group or not. The questionnaire also assessed belief regarding the impact of the intervention on well-being, in order to take account of expectation effects.

In order to promote relaxation, testing sessions were conducted in a quiet testing room with dimmed lights, and participants were seated in a comfortable chair with a foot rest. Conditions in the room such as lighting and temperature were kept as constant as possible, as was the interaction between the participants and experimenter.

3.2.3. Reiki method

The Reiki in the present study was administered by the experimenter who conducted the intervention sessions with participants. The experimenter, Deborah Bowden, trained in Usui Reiki to Master-Teacher level, and had practiced Reiki for three years. In addition to having received attunements for Seichim and Violet Flame Reiki, she had also been initiated into Ascension Reiki, which was developed by Grahame Wyllie in 1998 and involves using Ascension Reiki symbols (Wyllie and Mackenzie, 2003). She employed a combination of Reiki techniques, in particular Ascension Reiki, where she used the techniques and symbols which she intuitively felt to be the most appropriate for each participant. Since, the aim of the study was not to test the effectiveness of a particular healing technique, but rather its aim was to test whether an energy-healing effect can be observed in human participants once placebo and relaxation effects have been controlled for.

3.2.4. Psychological measures

Psychological measures were taken prior to the intervention, and again at a post-assessment session after the 10 intervention sessions had been completed.

1. Illness Symptoms Questionnaire. The ISQ is a simple 20-item questionnaire that was used in the study to assess the presence of illness symptoms (fever, chills, general malaise, loss of appetite, muscle ache, cough, headache, skin rash, dizziness, shortness in breath/ difficulty in breathing, phlegm, night sweat, diarrhoea, runny nose, nausea, vomiting, abdominal pain, cold sores, painful lymph nodes). Participants stated how many days in the previous two weeks each symptom had been experienced. The absence of a symptom corresponded to a score of 0, a symptom present for 1-2 days corresponded to a score of 1, a symptom present for 3-4 days warranted a score of 2, a symptom experienced for 4-6 days received a score of 3, and a symptom present for 7-14 days corresponded to a score of 4. The severity score of each symptom was then summed to form a Total Illness score for each participant.

2. Depression, Anxiety and Stress Scale (DASS) (Timothy et al., 1997). The DASS21 Mood questionnaire is a 21 item questionnaire scale designed to measure negative emotional states of depression, anxiety and stress. Participants answer from 0 (Not at all) to 3 (Most of the time) on the series of 21 statements.

3. *Activation-Deactivation Adjective Check List* (Thayer, 1970). In addition to the scales completed at the pre and post assessment sessions, participants completed the AD-ACL immediately before and after each of the 10 intervention sessions. The AD-ACL is a multidimensional self-rating test intended to measure four arousal states of General Activation, Deactivation-Sleep, High Activation and General Deactivation. Respondents rate how well a list of 26 adjectives (e.g. tense) describe how they

currently feel on a scale of 1 (definitely do not feel) to 4 (definitely feel). The four sub-scale scores are computed by summing scores on each of the corresponding sub-scales.

4. Pittsburgh Sleep Quality Index (Buysse et al., 1989). The Pittsburgh Sleep Quality Index (PSQI) is a multi-item questionnaire which was used in the current study to measure several sleep components over the previous month including: sleep quality, sleep disturbances, medication use, tiredness and apathy. The post-assessment version of the scale also assessed sleep over the previous week in order to detect any effects of the self-hypnosis.

5. *Reiki blinding and Expectation Questionnaire.* Participants completed a short questionnaire, designed for the purposes of the study, before their sixth intervention session and again at Post-assessment which asked whether they believed they were receiving Reiki and whether the intervention was positively affecting their well-being. An answer of "no" corresponded to a score of 0, the answer "don't know" corresponded to a score 1, and the answer "yes" received a score of 2.

3.2.5. Cortisol measure

Measures of salivary cortisol were taken at pre-post-assessment. Cortisol is understood to be a stress hormone and also to play a role in immunological defence, and salivary cortisol has been demonstrated to provide an accurate index of blood cortisol (Castro et al., 2000).

It was predicted that Reiki would affect cortisol levels, since Naito et al. (2003) found Johrei to buffer the decline of immune markers in students experiencing exam-time stress and benefit well-being. However, there were no predictions regarding the direction of any effects that Reiki may have on cortisol levels, for Reiki may bring

about a dissociation of the negative effects of cortisol on mood, as has been observed in hypnosis studies (Gruzelier, 2002). Studies have found that the raised cortisol levels of hypnosis participants did not correlate with raised tiredness and anxiety, which was the trend seen in controls, but instead correlated positively with increases in NKC and helper T-lymphocytes (Gruzelier et al., 2001a, 2001b), .

Cortisol levels (nmol/l) were assessed through saliva samples, where participants were required to chew Sarstedt salivettes containing a cotton wool swab for 1-2 minutes. All samples were stored in a 1°C fridge until the end of the study, when cortisol was extracted and sent to The Freeman Hospital to be analysed using ELISA assay kits. Steps were taken to maximise the reliability of cortisol readings, incorporating the collection of two saliva samples at both pre- and post-assessment. The first sample was collected 10 minutes after the participant's arrival at the laboratory, then the second sample 40 minutes into a pre-assessment or 20 minutes into a post-assessment. Additionally, saliva was collected between 11am & 3pm, during which times cortisol levels are relatively stable, with pre-assessment collection times matched to post-assessment collection times. Finally, participants were requested to abstain from caffeine, alcohol, food and exercise 2 hours prior to assessment to minimise the potential influence of these variables on cortisol readings (Lovallo et al., 2006). Although not physiologically validated, all participants completed a short check-list reporting compliance with restrictions. Sleep time and level were also assessed by a check-list.

3.2.6. Statistics

The primary method of data analysis used was mixed ANOVA, which was the intended method of analysis at the time of the planning of the experiment. Mixed ANOVAs were

used to compare the differences between the scores of participants who received Reiki and those who did not for each of the measures completed at both pre (Pre) and post (Post) assessment (the DASS, the ISQ, the PSQI and also for the salivary cortisol). The between-subjects factor was Reiki-Group (Reiki or No-Reiki) and the within-subjects factor was Session^{A} (Pre and Post). In addition to mixed ANOVA, paired t-tests were carried out to compare the Pre and Post intervention scores of the Reiki and No-Reiki groups separately for each of the measures completed, as is standard procedure.

For the AD-ACL which was completed before and after each of the 10 sessions, mixed ANOVAs were performed as with the other scales, but with the within-subjects factor of Session^{B} (Total Pre-Session and Total Post-Session), where Total corresponds to the sum of the AD-ACL scores of all 10 sessions.

The main consideration here was the comparative effects of Reiki versus non-Reiki; the comparative effects of the visualisation imagery procedures were planned as the subject of a separate report.

3.3. Results

Roughly half of the participants had heard of Reiki before taking part in the study, and there were no statistical differences between the Reiki and No-Reiki groups in this respect as was disclosed by a Chi-Squared test (12/18 Reiki, 7/17 No-Reiki; $X^2 = 2.289$, $P = 0.13$). Very small percentages of participants in both groups had previously experienced Reiki (4/18 Reiki, 1/17 No-Reiki; $X^2 = 1.906$, $P = 0.167$) or hypnosis (2/18 Reiki, 2/17 No-Reiki; $X^2 = 0.004$, $P = 0.952$).

While not anticipated, the possibility of additive or synergistic effects of Reiki and hypnotic/relaxation were nevertheless examined. Specifically mixed ANOVAs were

conducted for each of the pre-post assessment measures, where the within-subjects factor was Session[A] (Pre and Post) and the between-subjects factors were Reiki-Group (Reiki or No-Reiki) and Imagery-Group (Animation, Verbal and Relaxation). However, no significant Session x Reiki-Group x Imagery-Group interactions were found.

3.3.1. The Illness Symptoms Questionnaire

Table 2 displays the means and standard deviations of the Pre and Post intervention total and subscale scores of the ISQ for the total group, the Reiki group, and the No-Reiki group. The outlying data of two participants were excluded from the ISQ analysis: a No-Reiki participant who's Pre Total Illness score was 3.123 standard deviations above the sample mean and a Reiki participant who's Post Total Illness score was 2.727 standard deviations above the sample mean. These were mild levels of illness severity as students were fit enough to be attending university.

Table 2. Means and standard deviations* of the Pre and Post scores of the sum total of the ISQ items Total Illness**

	Pre	Post
Reiki	10 (5.5)**	7.353 (4.227)
No Reiki	3.875 (3.981)	9.5 (7.941)
Total	7.03 (5.676)	8.394 (6.3)

**Standard deviations are shown in parentheses.*

***Lower scores indicate lower symptom severity.*

A mixed ANOVA found there to be no main effect of Session for the mean Total Illness score ($F(1,31) = 0.817$, ns). However, there was a significant interaction between Session[A] and Reiki-Group ($F(1,33) = 12.439$, $P = 0.001$). As can be seen in Figure 4, and corroborated by paired t-tests, while the mean Total Illness score of the Reiki participants had somewhat improved ($t = -3.051$; $P = 0.091$), the mean No-Reiki

score was substantively worse following the intervention ($t = 1.797$; $P = 0.008$), leading to the highly significant advantage to the Reiki group ($P = 0.001$).

At baseline, however, an independent samples t-test found the Reiki group's mean score was significantly higher than the No-Reiki group's ($t(31) = -3.644$, $P = 0.001$). This allowed them a greater degree of improvement, and while this may have accounted for the marginal improvement of the Reiki participants, it may not necessarily explain the highly significant increase in the Total Illness score of the No-Reiki group. A significant Pearson's correlation was found between the Reiki group's baseline Total Illness scores and the degree of change that occurred, where the higher the score at baseline the greater was the improvement ($r = -0.737$, $P = 0.001$). However, there was no correlation between the baseline Total Illness scores of the No-Reiki group and the subsequent change ($r = -0.122$, $P = 0.653$), with participants with both high and low baseline scores tending to have an increase in illness symptoms.

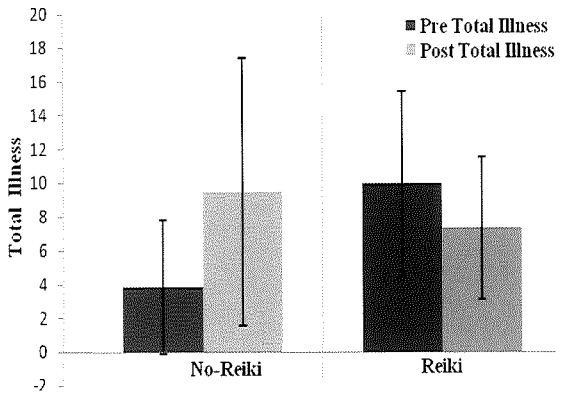

Figure 4. Means (SD) Pre and Post scores for the sum total of ISQ items, Total Illness, of the Reiki and No-Reiki participants.

Additionally, an analysis of covariance was conducted where the dependant variable was Post Total Illness, the fixed factor was Reiki-Group (Reiki or No-Reiki) and the covariate was Pre-Total Illness, in order to take the differing baseline scores of the Reiki and No-Reiki groups into account. As expected, a comparatively greater improvement in the Reiki Group was found, which reached 1-tailed significance ($F(1, 33) = 2.97$, $P < 0.05$)

3.3.2. The Depression, Anxiety and Stress Scale

Table 3 displays the means and standard deviations of the Pre and Post intervention total and subscale scores of the DASS for the total group, the Reiki group, and the No-Reiki group.

Table 3. Means and standard deviations* of the Pre and Post DASS scores**

	Stress		Depression		Anxiety		Total DASS	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Reiki	9.06 (3.56)**	5.65 (2.98)	6.06 (3.82)	4.35 (3.59)	3.59 (2.74)	2.41 (2.21)	18.71 (8.46)	12.41 (6.51)
No-Reiki	4.82 (3.21)	3.88 (2.89)	3.06 (2.84)	2.94 (2.77)	2.53 (3.78)	1.82 (2.53)	10.41 (7.81)	8.65 (6.74)
Total	6.94 (3.97)	4.76 (3.03)	4.56 (3.64)	3.65 (3.24)	3.06 (3.29)	2.12 (2.36)	14.56 (9.06)	10.53 (6.8)

**Standard deviations are shown below means in parentheses. **Lower scores indicate better mood.*

In a mixed ANOVA there was a significant main effect of Session ($F(1, 32) = 10.079$, $P = 0.003$); the mean Total DASS score (the sum total of DASS items) was substantively lower after the intervention. Separate ANOVAs on the DASS subscales found statistically significant within-subject decreases in the mean scores for both Stress ($F(1,32) = 12.068$, $P = 0.001$) and Anxiety ($F(1,32) = 4.724$, $P = 0.037$), while

Depression scores were in the same direction but the difference fell short of significance ($F(1,32) = 2.833$, $P = 0.102$).

Regarding differential effects of training group shown by Reiki-Group x Session[A] effects, there was a slight trend for there to be a greater comparative improvement in the mean Total DASS score of the Reiki participants ($F(1,32) = 3.184$, $P = 0.084$), as is shown in Figure 5. Consideration of the three DASS subscales separately also indicated a near significant interaction with Stress ($F(1,32) = 3.88$, $P = 0.057$). The differential patterns of change for the Stress subscale between the Reiki and No-Reiki groups are shown in Figure 6. While only one Reiki participant had an increase in Stress over the course of the intervention, the Stress scores of seven No-Reiki participants increased ($\chi^2(1,33) = 5.885$, $P = 0.015$). Although the Reiki Group also showed comparatively greater mean improvement in the other two subscales, these effects did not reach significance - (Depression: $F(1,32) = 2.149$, $P = 0.152$; Anxiety: $F(1,32) = 0.295$, ns). However, as was found to be the case with the Illness Symptoms Questionnaire, independent samples t-tests found the mean Stress score of the Reiki participants at baseline (Pre-Stress) to be significantly greater than that of the No-Reiki participants ($t(1,32) = -3.644$, $P = 0.001$), as was their mean Total DASS score ($t(1,32) = -2.970$, $P = 0.006$).

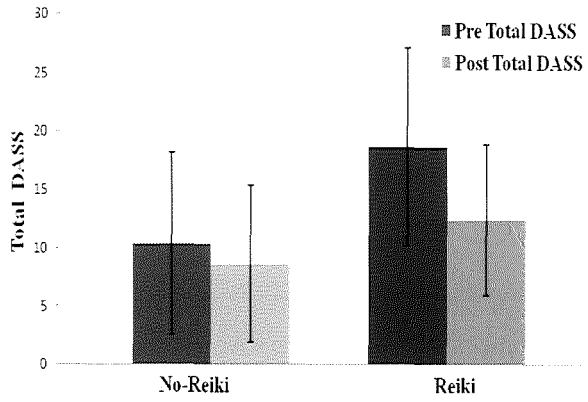

Figure 5. Mean (SD) Pre and Post scores for the sum total of DASS items Total DASS for the Reiki and No-Reiki Groups.

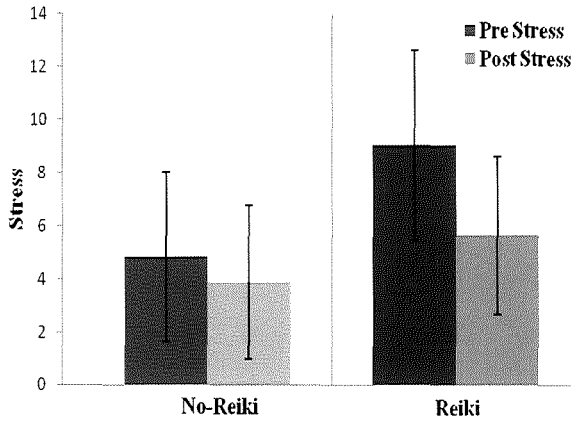

Figure 6. Mean (SD) Pre and Post scores for the DASS subscale Stress for the Reiki and No-Reiki Groups.

In order to ascertain whether there was a correlation between participant's Pre-Stress scores and the level of improvement that occurred, a Pearson's correlation was obtained between the two variables Pre-Stress and Stress-Change (the mean Post-Stress – Pre-

Stress score). A highly significant correlation was found (r = -0.698, $P < 0.001$), so that on average the higher the Stress score at baseline, the greater the reduction over the course of the intervention. This correlation is shown in Figure 7 and can be seen to be consistent for Reiki and No-Reiki participants, suggesting that a higher mean Pre-Stress score likely contributed to the greater comparative improvement of the Reiki Group. Unlike the Illness Symptom scale there was no worsening of mood in the No-Reiki group.

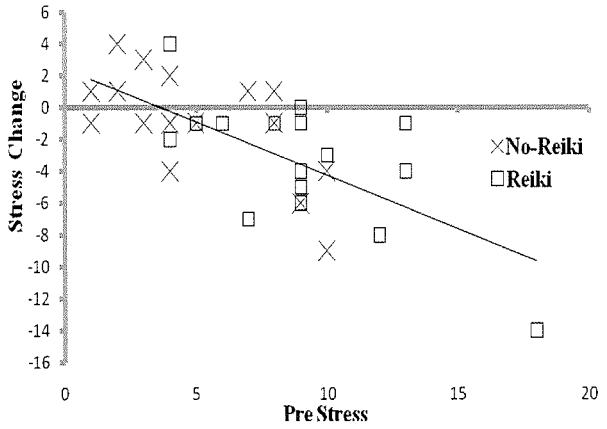

Figure 7. Scatter plot showing the correlation between the mean Pre-Stress score (x-axis) and mean Stress-Change score (y-axis) of the Reiki and No-Reiki participants, where a negative change in Stress corresponds to a Stress reduction.

3.3.3. The Activation-Deactivation Adjective Check List (AD-ACL)

Table 4 displays the means and standard deviations of the Pre and Post intervention total and subscale scores of the AD-ACL for the total group and the Reiki and No-Reiki groups.

Table 4. Means and standard deviations* of the Pre and Post subscale scores of the AD-ACL**								
	Tension		Calmness		Energy		Tiredness	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Reiki	85.78 (24.73)	71.06 (16.57)	110.72 (22.29)	149.39 (26.81)	123.06 (28.89)	100.39 (27.23)	97.17 (20.25)	117.22 (30.34)
No-Reiki	74.35 (17.67)	63.35 (11.55)	102.18 (21.56)	137.12 (20.53)	109.18 (18.78)	94.59 (25.84)	106.76 (16.81)	118.29 (33.33)
Total	80.23 (22.05)	67.31 (14.67)	106.57 (22.05)	143.43 (24.42)	116.31 (25.16)	97.57 (26.34)	101.83 (19.02)	117.74 (31.36)
**Standard deviations are shown below means in parentheses. **Higher scores indicate the increased presence of a symptom.*								

Separate mixed ANOVAs for the AD-ACL subscales disclosed highly significant effects of Session[B] (Total Pre-Intervention-Session and Total Post-Intervention-Session) for all four subscales, with reductions in Tension (F (2, 33) = 27.024, $P < 0.001$) and Energy ($F(2, 33) = 19.027$, $P < 0.001$), increases in Calmness ($F(2, 33) = 74.492$, $P < 0.001$), but also increases in Tiredness ($F(2, 33) = 8.464$, $P = 0.006$). The subscales yielded no significant interactions between Reiki-Group and Session[B].

3.3.4. The Pittsburgh Sleep Quality Index

Comparisons of the Reiki and No-Reiki groups disclosed no significant effects, and in terms of the participants as a whole there was a tendency to more tiredness after the intervention than at its start (Tiredness: $F(1,32) = 3.892$, $P = 0.057$). The pre and post mean Tiredness scores of the participants are shown in Table 5.

Table 5. Mean Pre and Post scores and standard deviations* of the PSQI item Tiredness**		
	Pre	**Post**
Reiki	0.524 (0.992)	0.944 (1.662)
No-Reiki	0.514 (0.992)	1.118 (1.409)
Total	0.52 (0.977)	1.029 (1.524)
**Standard deviations are shown in parentheses. **Higher scores indicate greater tiredness.*		

3.3.5. Salivary cortisol

A mixed ANOVA found no main effect of Session for salivary cortisol ($F(1, 32) = 0.842$, $P = 0.367$), and the Reiki-Group x Session interaction was non-significant ($F(1, 32) = 0.123$, $P = 0.728$). There were no correlations between cortisol change and mood and illness scores

3.3.6. The Reiki-Blinding and Expectation Questionnaire

Reiki and No-Reiki participants on average, both mid-way through the intervention and at post-assessment, tended towards the belief that they were not in a Reiki group, mostly stating either that they did not think that they were receiving Reiki (10/18 Reiki; 11/17 No-Reiki participants asserted this) or that they did not know (6/18 Reiki; 5/17 No-Reiki participants). Using a Chi-Square test to assess whether the groups differed in their beliefs regarding this, after five intervention sessions very little difference was found between the two groups ($\chi^2(2,31) = 0.444$, $P = 0.801$). When the questionnaire was administered again at post-assessment, while more Reiki participants tended more towards the belief that they were in a Reiki group (4/17 Reiki; 0/16 No-Reiki participants believed this to be the case), the groups did not differ statistically ($\chi^2(2,31) = 4.285$, $P = 0.117$).

There was also no significant difference mid-intervention in the Reiki and No-Reiki Groups' Expectations Questionnaire administered to participants regarding whether

they believed the intervention was having a positive effect on their well-being ($F(2,33) = 1.973$, $P = 0.373$). At post-assessment, while the groups did not differ statistically ($F(2,31) = 3.162$, $P = 0.206$), the Reiki Group on average believed more than the No-Reiki Group that the intervention had been more beneficial (8/17 Reiki; 3/16 No-Reiki felt the intervention had benefitted their well-being), in line with the outcomes of the DASS and the ISQ.

3.3.7. The effect of Intersession Interval

Due to the variation in the period over which participants completed the intervention, mixed ANOVAs were conducted to ascertain whether the effects of the intervention varied with average intersession interval. The mean intersession interval of each participant was calculated, then participants were divided at the median (3.4 days) into those with mean intersession intervals that were high (High-Interval – 8 Reiki; 9 No-Reiki) and low (Low-Interval – 10 Reiki; 8 No-Reiki). The time over which the Low-Interval participants completed the intervention ranged from 2.4-4.4 weeks, while that of the high-Interval group ranged from 7.3-12.1weeks. The intersession intervals of participants are detailed in Table 6, showing the numbers of participants in each intersession-interval range in days for the Reiki and No-Reiki groups.

Table 6. Numbers of participants in each intersession-interval range in days

Group	Low-intersession interval			High-intersession interval					Total
	1 to 2	2 to 3	3 to 4	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	
Reiki	0	7	3	1	2	2	3	1	18
No-Reiki	1	4	3	0	2	3	3	0	17
Total	1	11	6	1	4	5	6	1	35

Mixed ANOVAs with a between-subjects factor of Interval (High and Low) were conducted for each of the scales completed, finding there to be no significant Interval x

Session interactions for any of the scales completed at pre-post assessment ($F < 1.5$; $P > 0.24$). Furthermore, an independent samples t-test found that mean intersession interval did not differ between the Reiki and No-Reiki groups ($t = 0.72$, ns).

3.4. Discussion

Participants as a whole benefited by improvements in mood over the course of the study. These benefits took the form of improvements on self-report scales of stress, anxiety, tension, energy and calmness, and with a tendency towards reduced depression. But in contrast there was an increase in tiredness as indexed by both the Thayer (1997) and Pittsburg (Buysse et al., 1989) scales, perhaps attributable to the rigors of the academic year (Whitehouse et al., 2006). Indeed for some the trial lasted several months. This was due to the slow recruitment and varying availability of participants, but fortunately this range in participation from two and a half to 12 weeks did not disclose statistical differences when comparisons were made between those with high and low intersession intervals.

In the study there were no changes in salivary cortisol nor correlations between cortisol and mood and health changes. This may be due to possible bidirectional changes in cortisol, as was shown in a comparison of self-hypnosis and relaxation training (Gruzelier et al., 2001a, 2001b). For while cortisol is commonly regarded as a stress hormone, an optimal level is necessary for everyday function, as evinced by its surge on waking (Schmidt-Reinwald et al. 1999).

Reiki's main advantage was found in a tendency towards an improvement in health as shown by the reduction in symptoms of illness, albeit symptoms being at mild levels in students attending university. This contrasted with the symptoms of the No-Reiki group whose total Illness Symptoms Questionnaire scores disclosed a substantive and reliable

increase in symptoms ($P = 0.008$). These differential effects led to a highly significant distinction between the training groups ($P = 0.001$). In addition, following Reiki there were persuasive reductions in the total Depression, Anxiety and Stress Scale, especially the Stress subscale, which were greater than in the No-Reiki group.

Despite random allocation, baseline differences between the groups showed higher Illness Symptom scores in the Reiki participants, and accordingly this left more room for potential improvement in the Reiki group. This baseline disadvantage was also seen in the Total DASS and Stress Scale scores, where for the sample as a whole there was a correlation between degree of stress reduction and baseline stress level ($r = 0.487$, $P < 0.001$). Due to the unequal baseline scores, it is possible to interpret the differential changes of the groups as convergence towards the mean. On the other hand, the baseline disadvantage for the Reiki group may not necessarily explain why there was such a pervasive increase in illness symptoms in the No-Reiki group. It is possible that this change too may reflect a shift towards the mean, but while there was a correlation between the Reiki groups' baseline illness symptom scores and the degree of change, no such correlation was found for the No-Reiki group, with the health of all participants in the latter group tending to decline irrespective of their baseline scores. The results are thus inconclusive with regards to an effect of Reiki on symptoms of illness, and the matching of groups at baseline would be essential in a constructive replication study.

Another goal of the study was to access the efficacy of the untested method of blinding participants to Reiki, whereby non-contact Reiki was given to students whose attention was occupied by undergoing self-hypnosis or guided relaxation. Upon analysis of the Expectation questionnaire completed by students mid-way through the intervention, very little difference was found between the Reiki and No-Reiki groups in their beliefs

as to whether or not they were in a Reiki group. At post-assessment the groups also did not differ statistically, although the Reiki participants were on average less sure than the No-Reiki participants that they were not in a Reiki group, but these numbers were small (4/17 Reiki versus 0/16 No-Reiki participants believed that they had received Reiki). Thus considering the previously mentioned comparative advantages of the applied method to the sham Reiki method, and also the fact that participants in double-blind drug trials have been found to often correctly guess which condition they are in (Shapiro and Shapiro, 1997), replication of the presented blinding technique seems justified.

While the method of blinding participants to Reiki was found to be successful, a potential disadvantage of using self-hypnosis or guided relaxation as a control group is that in order to demonstrate efficacy, the Reiki group must be shown to benefit from the intervention above and beyond the benefits of these modalities. Self hypnosis and guided relaxation produce altered states of consciousness and the beneficial effects of both of these practices on mood and well-being are well-documented (Gruzelier, 2002), so to aim to achieve a significantly greater improvement in these parameters in the Reiki group was perhaps setting the ceiling too high. The intervention would have been strengthened by the inclusion of a third group of participants whom received no treatment, whose pre and post-intervention assessment scores could be compared with those of the other groups. The inclusion of a third group was regretfully not possible though due to a shortage of participants.

A further shortcoming of the trial was that the investigator whom was present throughout all intervention sessions also administered the Reiki, and so knew the groups of participants. Thus, the study was not double-blind. While the investigator

endeavoured to interact in an identical manner with the Reiki and No-Reiki participants, it is possible that there may have been unintentional verbal or physical clues which may have lead to differential treatment of the groups, which could have influenced the outcome of the trial. Importantly this was not the case for the co-experimenter whose role was to conduct the majority of the pre and post assessments, as he was blind to group allocation. A possible way to reduce the chances of experimenter bias would be for the experimenter to quietly leave the room after seating and blindfolding the participants and starting the audio file, whereupon a separate Reiki practitioner would enter the room to administer the Reiki or just be present in the case of the No-Reiki participants. The experimenter would then return at the end of the session once the Reiki Master had left. If the Reiki practitioner had no contact with the participants or experimenter - to avoid unintentional clues - then the experimenter would be blind to the groups of the participants and thus not behave differently towards them. Regrettably, this was not possible to implement in the current study, as no additional experimenter was available to fulfil this role.

Notwithstanding the aforementioned limitations of the trial, the 350 treatment sessions, the comprehensive pre and post assessments and the relatively large sample size for this research field constitute a substantive study. While no effects could be demonstrated on salivary cortisol, there were differential effects on health in the form of mild everyday illnesses. These advantages took the form of a tendency for the Reiki group to improve whereas the health of the No-Reiki group declined. Furthermore this advantage was accompanied by comparatively greater mood benefits for the Reiki group. Although the study is inconclusive due to the unequal baseline scores, in the light of the highly significant results and the wider context, further controlled studies on the efficacy of biofield therapies are clearly warranted.

Chapter 4. A randomised controlled single-blind trial of the efficacy of Reiki at benefitting mood and well-being

4.1. Introduction

As was seen in Chapter 1.7, the majority of scientific investigations of Reiki have suffered from design limitations. However, there is some suggestive evidence that Reiki can influence mood (Dressen and Singg, 1998; Goldman Shore, 2004; Bowden et al., 2010) and induce physiological change in humans (Wetzel, 1989; Wirth et al. 1996, 1998; Wardell and Engebretson, 2001; Kumar and Karup, 2003; Mackay et al. 2004) and animals (Baldwin and Schwartz, 2006).

The present study employed a similar design to the RCT detailed in Chapter 3 (Bowden et al., 2010), where 35 first year undergraduates underwent ten 20-minute sessions of Reiki or no-Reiki in conjunction with self-hypnosis/guided relaxation over a period of two and half to twelve weeks. While the Reiki group had a tendency towards a reduction of symptoms of illness following the intervention, a substantive increase in symptoms was seen in the no-Reiki group - leading to a highly significant distinction between them. There was also a trend for the Reiki group to have a greater improvement in overall mood than the no-Reiki group, accompanied by a near-significant comparative reduction in stress. However, the Reiki group had significantly higher baseline illness symptoms and mood scores than the no-Reiki group. The current study sought to replicate the comparatively greater mood and health benefits of the Reiki group in the previous study, while employing a design that ensured that the mean scores of the groups did not differ at baseline. In addition, the inclusion of participants with high depression and/or anxiety permitted the possibility that a greater degree of

improvement could occur than was the case with the normally healthy participants of the first study.

4.2. Subjects and methods

4.2.1. Participants

The study received approval from the Goldsmiths Ethics Committee prior to the recruitment of participants. 43 university students of ages ranging from 18-31 (except for one student aged 43) were recruited, of whom 32 were Psychology freshers. Only 40 students completed the study (37 female; 4 male) due to three drop-outs (all Reiki participants). Of these 40 participants, 20 had high depression and/or anxiety with a Hospital Anxiety and Depression Scale (HADS) Anxiety or Depression subscale score of at least 10/20 or if the sum of these scores equalled 12/40 or more, and 20 had low depression and/or anxiety with HADS Anxiety and Depression scores both below 7/20 and a total score below 12/40. Following the distribution of information sheets to participants and obtaining their informed consent, participants were randomly assigned to the intervention groups. The students were awarded course credits or £10, and a Reiki session at the end of the study if participants were not in the Reiki group. Students taking medication for depression were not included.

4.2.2. Design and procedure

The students with high depression and/or anxiety (High-Mood) and the participants with low depression and/or anxiety (Low-Mood) were randomly assigned to the Reiki or Control groups giving four subgroups: 1) High-Mood Reiki; 2) Low-Mood Reiki; 3) High-Mood Control; 4) Low-Mood Control.

Participants were recruited over a period of four months. The randomisation procedure consisted of the tossing of an unbiased coin to assign each new pair of High-Mood or Low-Mood participants to be recruited to the Reiki or Control groups, to ensure there were equal numbers of participants in each group. If, for example, the first High-Mood participant to be recruited was randomly assigned to the Reiki group then the next High-Mood participant was assigned to the Control group, and likewise with the Low-Mood participants until there were 10 participants in each of the four subgroups.

G-Power was used to calculate the numbers of participants in the Reiki and Control groups needed to observe a significant difference between two independent samples of equal size. As with the study detailed in the previous chapter, it was predicted that the effect size would be of high magnitude, since similar or smaller sample sizes have been used in energy healing studies that have found significant effects (Jain and Mills, 1999). Therefore, with an effect size of 1, an error probability of 0.05, and an allocation ratio of 1, the necessary sample size was calculated to be 17 in each group. Thus, the 20 participants overall in each of the Reiki and Control groups was sufficient for an effect size of the predicted magnitude to be observed, although the 10 participants in each of the High and Low-Mood subgroups was underpowered. While the study would have been strengthened by employing a larger sample size in order to increase statistical power, as with the study detailed in the previous chapter, it was unfortunately not possible to recruit more participants.

After completing questionnaires, as detailed in Section 4.2.4 Psychological Measures, participants attended six half-hour treatment sessions. Due to the differing availability of participants, the period over which the six sessions were completed ranged from two to eight weeks, with one participant completing their sessions over 14 weeks. During

each session both the Reiki and Control groups underwent a guided relaxation, where they listened to a 25-minute long audio file on headphones. The file consisted of 17-minutes of instructions designed to precipitate deep relaxation, followed by five minutes of peaceful nature sounds and music, concluded by instructions aimed to return participants to alertness. In addition to facilitating the blinding of participants to whether Reiki was being sent, the guided relaxation provided a control for the relaxation component of Reiki.

Questionnaires were again administered to participants approximately one week after the trial and again at five-week follow-up.

To aid relaxation, the treatment sessions were conducted in a dimly lit room where the participants reclined in comfortable chair with a foot rest. The conditions in the room and the interaction between the experimenter and participants were kept as constant as possible.

4.2.3. Reiki method and blinding

The Reiki in the present study was delivered by the experimenter, Deborah Bowden, who conducted the experimental sessions with participants. As was the case in the study detailed in Chapter 3 (Bowden et al., 2010), the experimenter trained in Master-Teacher level Usui Reiki and had also received attunements for Seichim, Violet Flame and Ascension Reiki. When the current study was conducted she had been practicing Reiki for four years. The experimenter used a combination of Reiki techniques, especially Ascension Reiki which was developed in 1998 by Grahame Wyllie (Wyllie and Mackenzie, 2003) where she used the Reiki symbols and techniques that she felt were most suitable for each participant.

A Reiki blinding technique was used that was successfully employed by the authors previously (Bowden et al., 2010), where the experimenter sat behind participants and sent non-contact Reiki to those in the Reiki group, whilst the participants' attention was absorbed in a task, here guided relaxation. All participants were informed at the outset that they may or may not receive non-contact Reiki. The experimenter sat roughly a metre behind each Reiki and Control participant during all experimental sessions. She sent non-contact Reiki to those in the Reiki group, where her palms where positioned 3-30 inches above the participant's head or behind their back. In addition to the headphones worn by participants which blocked background sounds, the participants were blindfolded in order to prevent them noticing any shadows that may have been cast by the experimenter's hands.

4.2.4. Psychological measures

1 Depression, Anxiety and Stress Scale (DASS) (Timothy et al., 1997). The DASS21 is a 21-item mood questionnaire designed to measure negative emotional states of depression, anxiety and stress, where respondents answer from 0 (Not at all) to 3 (Most of the time).

2. The Hospital Anxiety and Stress Scale (HADS) (Mykletun et al., 2001). The HADS is a 14-item self-report measure designed to assess levels of Anxiety and Depression, where each item is scored on a scale of 0-21. Unlike the DASS, which was designed for use with both normal and clinical populations, the HADS was designed to assess the mood of hospital General Medical Outpatients, although it has been extensively used in Primary Care (Wilkinson and Barczak, 1988).

3. Pittsburgh Quality of Sleep Index (PSQI) (Buysse et al., 1989). The PQSI is a multi-item questionnaire that was used to assess several sleep components over the previous

month including sleep disturbances, medication use, tiredness and apathy. The post-assessment version of the scale assessed sleep over the previous week in order for any effects of the intervention to manifest.

4. *Illness Symptoms Questionnaire.* The ISQ was used to measure the presence of 20 illness symptoms such as fever, headache and runny nose. Respondents stated the number of days in the past two weeks each symptom had been experienced. A score of 0 was assigned to a symptom present for zero days, a score of 1 for 1-2 days, a score of 2 for 3-4 days, a score of 3 for 5-6 days and a score of 4 for 7-14 days.

5. Activation-Deactivation Adjective Check List (AD-ACL) (Thayer, 1970). The AD-ACL measures items corresponding to Tension, Calmness, Energy and Calmness. Participants rate how well a list of 26 adjectives (e.g., calm) describe how they are presently feeling on a scale of 1 (definitely do not feel) to 4 (definitely feel).

6. The Reiki blinding and Expectation Questionnaire. A short questionnaire used previously by the authors (Bowden et al., 2010) was completed before participants' fourth intervention session and again at Post-Treatment to assess participants' beliefs regarding group membership and whether the intervention was benefitting their well-being. An answer of "no" received a score of 0, the answer "don't know" received a score of 1, and the answer "yes" corresponded to a score of 2.

4.2.5. Statistics

Mixed ANOVAs were used to compare the mean scores of the Reiki and Control participants for each of the measures completed pre-intervention (Baseline) and one-week (Post-Treatment) and five weeks (Follow-up) following the intervention, as was proposed at the study outset. The within-subjects factor was Session[A] (Baseline, Post-

Treatment and Follow-up) and the between-subjects factors were Reiki-Group (Reiki or Control) and Mood-Group (High and Low). Then paired t-tests were conducted for each of the scales, comparing Baseline mean scores of the Reiki and Control groups separately with mean scores at Post-Treatment and Follow-up. Two participants failed to return their Follow-up questionnaires, and were not included.

For the AD-ACL which was completed before and after each of the six sessions, mixed ANOVAs were performed as with the other scales, but with the within-subjects factor of Session[B] (Total Pre-Session and Total Post-Session), where Total corresponds to the sum of the AD-ACL scores of all six sessions.

4.3. Results

Before the intervention, only roughly half of the participants had heard of Reiki and only very small percentages had experienced Reiki before, and there were no statistical differences between the groups in these respects.

4.3.1. Depression, Anxiety and Stress Scale

Table 7 shows the means and standard deviations for the sum total of DASS items, Total DASS, and for the subscales Depression, Anxiety and Stress. The outlying data of two participants were excluded from the DASS analysis – one Reiki participant had a Pre Total DASS score that was 2.256 SDs above the sample mean and one Control participant had a Pre Total DASS score that was 2.168 SDs above the sample mean.

For the sample as a whole, as can be seen from the total group means in Table 7, there was little change over the course of the study in the Total DASS. Accordingly, no significant main effect of Session was found with mixed ANOVA for the mean Total

DASS score, or for Depression, Anxiety or Stress, nor were there any Session x Reiki-Group effects ($F \leq 0.502$, ns).

Table 7. Means (SD)* of Total DASS, Depression, Anxiety and Stress**

		Reiki			Control			Total
		Total	High-Mood	Low-Mood	Total	High-Mood	Low-Mood	
Total DASS	Baseline	17 (10.7)*	25.9 (6.4)	8.9 (6.5)	14.4 (9.6)	19.4 (9.8)	10.5 (7.8)	15.7 (10.1)
	Post-Treatment	14.4 (10.2)	18.7 (10.8)	10.5 (8.2)	15.1 (10)	21.1 (8.3)	10.3 (8.4)	14.7 (10)
	Follow-up	14.4 (9.1)	17.8 (8.1)	11.4 (9.3)	14.2 (12.1)	22.1 (14.1)	7.8 (4.6)	14.3 (10.5)
Depression	Baseline	5.1 (4.2)	7.4 (5.7)	2.9 (2.3)	5.7 (4.8)	6.5 (6.2)	5 (3.6)	5.4 (4.4)
	Post-Treatment	4.3 (4.1)	5.3 (4.7)	3.3 (3.5)	5.7 (4.9)	7.9 (4)	4.3 (5.3)	5.1 (4.6)
	Follow-up	3.6 (3.5)	4.7 (4.1)	2.7 (2.9)	5 (4.4)	6.8 (5.3)	3.6 (3.1)	4.3 (4)
Anxiety	Baseline	4.6 (3.7)	7.2 (3.2)	2.3 (2.3)	3.2 (3.1)	5 (3.5)	1.7 (1.8)	3.9 (3.5)
	Post-Treatment	3.5 (3.5)	5 (3.5)	2.2 (3)	3.1 (3.3)	5 (3.7)	1.6 (2.3)	3.3 (3.4)
	Follow-up	4.2 (3.2)	5.4 (2.8)	3.5 (3.4)	4 (4.8)	7.3 (5.7)	1.4 (1.3)	4.2 (4.1)
Stress	Baseline	7.3 (5)	11.2 (3.1)	3.7 (3.5)	6.5 (4.8)	7.9 (5.1)	3.8 (3.3)	6.5 (4.8)
	Post-Treatment	6.3 (4)	8 (4.2)	4.8 (3.3)	6.3 (3.8)	8.3 (4.1)	4.8 (2.7)	6.3 (3.8)
	Follow-up	6.4 (3.6)	7.7 (3)	5.2 (3.8)	5.8 (4)	8.1 (4.7)	2.7 (2.2)	5.8 (4)

**Standard deviations are shown in parentheses. **A lower score indicates better mood.*

However, taking Reiki and Mood into account the mixed ANOVA showed significant three-way interactions between Session, Reiki-Group and Mood-Group for Total DASS ($F = 3.497$, $P = 0.036$) and Anxiety ($F = 3.149$, $P = 0.049$) and Stress ($F = 3.143$, $P = 0.05$), while the interaction for Depression was nonsignificant ($F = 1.651$, *ns*). Before considering Post-Treatment and Follow-up separately, importantly no statistical differences with independent samples t-tests were found between the Reiki and Control groups at Baseline, either overall or between the Reiki and Control participants of the

High or Low-Mood Groups ($t < 1.702$, $P > 0.108$). It was thus reasonable to compare the changes in the mean DASS scores of the groups.

Figure 8 shows the changes in the mean Total DASS scores that occurred over Baseline to Post-Treatment and Baseline to Follow-up for the Reiki and Control participants of the High- and Low-Mood groups separately, where a negative change indicates an improvement in mood.

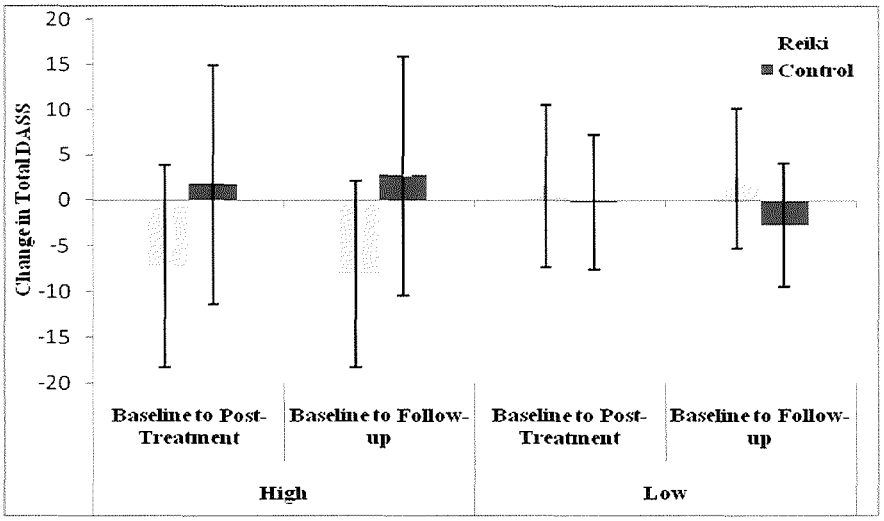

Figure 8. The Baseline to Post-Treatment and Baseline to Follow-up changes in the mean Total DASS scores of the Reiki and Control participants of the High-Mood and Low-Mood groups, where a negative change corresponds to an improvement in mood.

4.3.1.1. Post-Treatment

Mixed ANOVA contrast analyses comparing Total DASS scores at Baseline and Post-Treatment disclosed a tendency towards a Session x Reiki-Group x Mood-Group interaction ($F = 3.166$, $P = 0.084$). Separate mixed ANOVAs for the High- and Low-Mood groups showed for High-Mood participants a slight tendency towards a Session x Reiki-Group interaction ($F = 3.285$, $P = 0.09$) whereas Low-Mood participants did not differ ($F = 1.03$, ns). Paired t-tests with the High Mood groups indicated this was due to

a greater improvement in Total DASS in the Reiki group, which was not seen in the control group (Reiki group mean change: 7.2/63, t = 2.217, P = 0.054; Control group mean change: 1.6/63; t = -0.033, ns). This can be seen in Figure 8.

4.3.1.2. Follow-up

Contrast analyses comparing the Total DASS scores at Baseline and Follow-up disclosed a significant Session x Reiki-Group x Mood-Group interaction (F = 6.509, P = 0.016). As can be seen in Figure 8, there was a further reduction at Follow-up in the mean Total DASS score of the High-Mood Reiki participants, so that the mean was substantively lower than baseline (mean change: -8.1/63; Session x Group: F = 3.662, P = 0.075). This was verified by paired t-tests, which found a significant mean improvement in the Reiki group (t = 2.376, P = 0.045), which was not seen in the Controls.

Analysis of Anxiety in High-Mood participants also indicated a tendency towards a Session x Reiki-Group interaction (F = 3.423, P = 0.084), such that whereas with Reiki improvement was maintained at follow-up (Baseline: 7.2/21, Post-Treatment: 5/21, Follow-up: 5.4/21), controls disclosed an increase in anxiety (Baseline: 5/21, Post-Treatment: 5/21, Follow-up: 7.3/21). This can be observed in Figure 9.

The greatest improvements in the High-Mood Reiki group at follow-up, however, were seen in the Stress subscale. As shown in Figure 10, there was a progressive improvement in the High-Mood Reiki participants, and at Follow-up their score was on average substantively lower than at Baseline (Baseline: 11.2/21, Follow-up: 7.7/21), (t = 2.223, P = 0.057). As can be seen from the mean scores shown in Figure 10 the High-Mood Control group was marginally worse at Follow-up compared to baseline, where

only two participants had improved, while 5/8 had increased Stress scores. In contrast, 8/9 of the High-Mood Reiki group had reduced Stress.

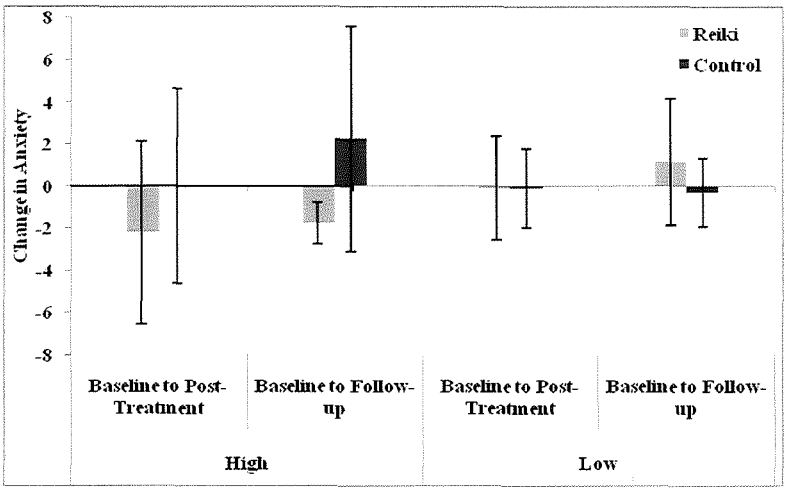

Figure 9. The Baseline to Post-Treatment and Baseline to Follow-up changes in the mean Anxiety scores of the Reiki and Control participants of the High-Mood and Low-Mood groups, where a negative change indicates a reduction in anxiety.

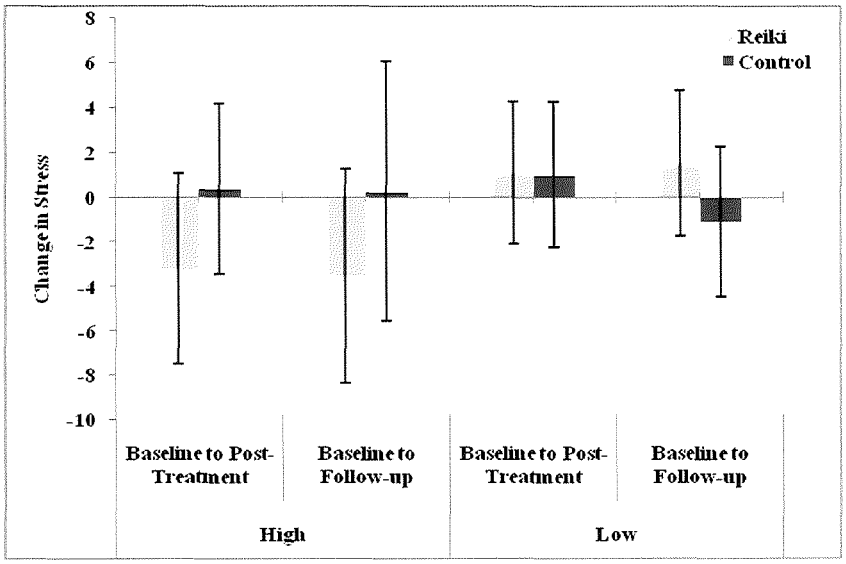

Figure 10. The Baseline to Post-Treatment and Baseline to Follow-up changes in the mean Stress scores of the Reiki and Control participants of the High-Mood and Low-Mood groups, where a negative change corresponds to a decrease in Stress.

A Chi-squared test disclosed that the Reiki and Control groups differed significantly (χ^2 = 7.137, P = 0.008). The differential patterns of change of the two groups can be seen in Figure 11, which is a scatter plot showing the Baseline to Follow-up Stress changes of each of the High-Mood participants plotted against their Baseline scores, where a negative change corresponds to a decrease in Stress.

Regarding Depression, as can be seen from the group means in Table 7, there was a three scale point improvement in the mean Depression score of the High-Mood Reiki group, so that it was markedly lower at Follow-up than at Baseline (Baseline: 7.4/21, Follow-up: 4.7/21), (t = 2.253, P = 0.054). Whereas no change was seen in the High-Mood Control group.

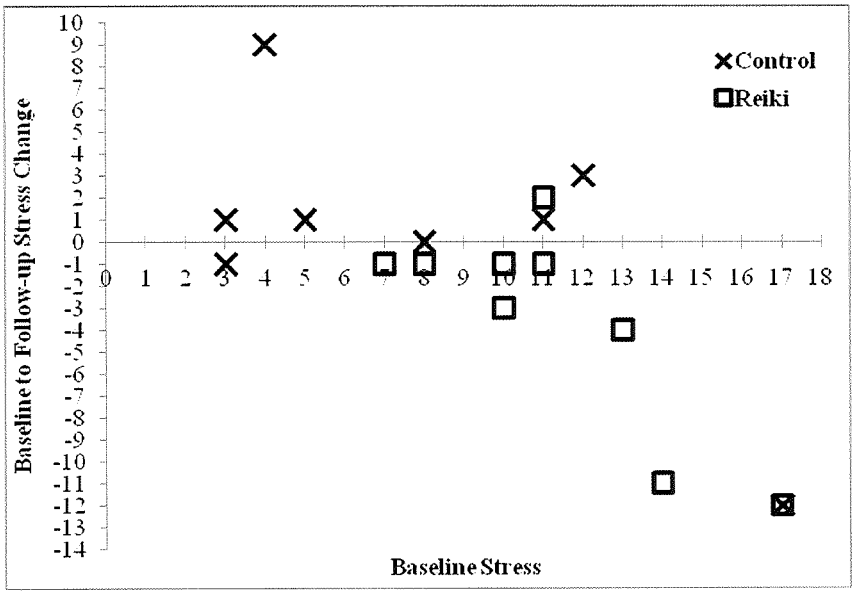

Figure 11. Scatter plot showing the Baseline to Follow-up Stress changes of the High-Mood Reiki and Control participants plotted against their Baseline scores, where a negative change indicates an improvement.

4.3.2. The HADS, the PSQI and the ISQ

The means and standard deviations for the sum total of items for the HADS (Total HADS), PSQI (Total PSQI) and ISQ (Total ISQ) are shown in Table 8. One Control participant with outlying data was excluded from the HADS analysis with a Post-Treatment Anxiety score that was 3.25 standard deviations above the sample mean.

Table 8. Means and standard deviations* of Total HADS, Total PSQI and Total ISQ**

		Reiki	Control	Total
Total HADS	Baseline	9.56 (6.14)*	11.79 (6.72)	10.7 (6.54)
	Post-Treatment	8.28 (4.48)	10.2 (6.14)	9.29 (5.44)
	Follow-up	9.72 (4.74)	12.11 (6.19)	10.95 (5.56)
Total PSQI	Baseline	10.7 (2.71)	9.63 (3.24)	10.15 (3)
	Post-Treatment	9.32 (3.03)	9.56 (3.16)	9.44 (3.06)
	Follow-up	10.5 (2.97)	10.16 (3.01)	10.33 (2.95)
Total ISQ	Baseline	11.47 (6.68)	10.67 (9.59)	11.08 (8.12)
	Post-Treatment	10.95 (9.96)	10.53 (10.16)	10.74 (9.92)
	Follow-up	12.16 (10.87)	9.94 (7.49)	11.08 (9.32)

**Standard deviations are shown in parentheses. **A lower score indicates better mood.*

As can be seen from the group means in Table 8, there was an improvement Post-Treatment in Total HADS for the group as a whole (Session: F = 3.223, P = 0.046; Post-Treatment contrast analyses: F = 4.757, P = 0.036). This was due to a reduction in the Anxiety subscale (Session: F = 4.618, P = 0.013; Post-Treatment contrast analyses: F = 7.516, P = 0.01). However, contrast analyses indicated that these improvements had not been maintained at Follow-up (Total HADS: F = 0.005, ns; Anxiety: F = 0.029, ns). No effect of Session was found for Depression (F = 0.715, ns).

Table 8 also shows an improvement in Global Sleep for the cohort as a whole (Session: F = 3.155, P = 0.049). However the trend for an improvement at Post-Treatment, as indicated by contrast analyses (F = 3.51, P = 0.07), was not maintained at Follow-up. There was no change in the Total ISQ, however (Session: F = 0.028, ns).

Turning to the effects of Reiki, here there were no Session x Reiki-Group effects for Total HADS or for Anxiety or Depression, nor were there effects for the Total PSQI or Total ISQ (F ≤ 1.402, ns). There were also no significant interactions between Session, Reiki-Group and Mood-Group (F ≤ 1.033, ns).

4.3.3. Activation-Deactivation Adjective Check List

The means and standard deviations for the subscales of the AD-ACL are shown in Table 9.

Table 9. Mean and standard-deviation* Pre and Post-Session scores of the AD-ACL subscales**

	Tension		Calmness		Energy		Tiredness	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Reiki	55.50 (18.00)*	44.85 (15.93)	75.45 (11.91)	90.10 (9.60)	75.15 (17.41)	69.15 (14.90)	69.80 (16.41)	67.60 (14.41)
Control	54.75 (13.47)	40.75 (8.26)	72.00 (13.83)	85.80 (11.64)	67.55 (16.69)	94.59 (25.84)	73.25 (15.32)	70.30 (18.99)
Total	55.13 (15.70)	42.80 (12.69)	73.72 (12.86)	87.95 (10.74)	71.35 (17.27)	97.57 (26.34)	71.52 (15.77)	68.95 (16.73)

**Standard deviations are shown in parentheses. **A higher score corresponds to the greater presence of a symptom.*

Separate mixed ANOVAs were conducted for each of the AD-ACL subscales, finding for two of the subscales highly significant main effects of Session[B] (Total Pre-Intervention-Session and Total Post-Intervention-Session). There was a reduction in Tension (F = 42.017, P < 0.001) and an increase in Calmness (F = 34.781, P < 0.001). However, there was also a reduction in Energy (F = 4.03, P = 0.052), while no effect was found for the Tiredness subscale (F = 0.604, ns).

There were no Session x Reiki-Group or Session x Reiki-Group x Mood-Group effects for any of the AD-ACL subscales ($F \leq 0.776$, ns).

4.3.4. Intersession Interval

In order to examine whether the time-length of the trial had an effect on its results, mixed ANOVAs were conducted with participants divided into groups of low (Low-Interval) and high (High-Interval) mean-intersession interval (MII). The distribution of MIIs of the Reiki and Control participants to the nearest day is shown in Table 10. As can be seen, 21/40 had a MII ranging from 3-5 days (mean: 4 days), which was taken to be the Low-Interval group (10 Reiki; 11 Control). Of the remaining 19/40 - the High-Interval Group (11 Reiki; 9 Control) - 18/19 had a MII ranging from 6-13 days (mean: 8.5 days), while that of the nineteenth member was 20 days.

Table 10. Distribution of the mean intersession-intervals of participants in days

Group	Low-Interval			High-Interval								Total
	3	4	5	6	7	9	10	11	12	13	20	
Reiki	5	3	2	3	2	0	1	2	0	0	0	20
Control	2	6	3	1	2	1	3	0	2	1	1	20
Total	7	9	5	4	4	1	4	2	2	1	1	40

Mixed ANOVAs were performed for each pre-post-assessment measure, where the between-subjects factors were Interval (High and Low) and Reiki-Group (Reiki and Control). No Session x Interval effects were found for any of the scales ($F \leq 1.7$; ns). An independent samples t-test found that there was also very little difference between the MIIs of the Reiki and Control groups ($t = -0.432$, ns).

4.3.5. Reiki Blinding and Expectation Questionnaire

The Reiki and Control groups were very similar mid-intervention in their beliefs regarding their group-membership, as was confirmed by a Chi-Square test (χ^2 (2, 40) = 1,783, $P = 0.41$). At Post-Treatment though, while equal numbers believed they had

received Reiki (6/20 Reiki; 6/19 Control), more Controls believed they had not (6/20 Reiki; 11/19 Control), and more Reiki participants were unsure of their group (8/20 Reiki; 2/19 Control). This lead to a tendency for the groups to differ ($\chi^2(2,39) = 5.048$, $P = 0.08$). However, since the majority of Reiki participants either believed they were not in the Reiki group or were uncertain of their group, it seems they could not detect the experimenter sending Reiki.

There was a substantive difference mid-intervention in the groups' beliefs about whether the trial was benefitting their well-being, where far more Reiki (14/20) than Control (3/30) participants were uncertain of this. Also, no Reiki participants believed the intervention was benefiting them compared to 7/20 of the Controls, although conversely, more Control (10/10) than Reiki (6/10) participants were certain that it was not, leading to a significant distinction between the groups ($\chi^2(2,40) = 15.12$, $P = 0.001$). There was no difference between the groups when participants completed the questionnaire at Post-Treatment, however ($\chi^2(2,40) = 1.642$, $P = 0.44$).

4.4. Discussion

Beneficial effects following Reiki were found in this study for those participants with initially high levels of anxiety/depression, as evinced by the total Depression, Anxiety and Stress Scale (Mykletun et al., 2001), the scale used as our primary assessment of mood in our previous study (Bowden et al., 2010). There the Reiki group demonstrated comparatively greater overall mood and stress benefits than the controls who did not receive Reiki, accompanied by a buffering of the increase in symptoms of illness seen in the controls.

Here the benefits were specific to those with high negative mood and were not found in the corresponding high negative mood control group. Post-treatment the total DASS

score had improved with Reiki, and this was sustained over five weeks at follow–up. The main benefit was for the Stress subscale, which showed a mean four scale points improvement at follow-up, where all but one of the Reiki participants had improved, whereas 5/8 control subjects showed an increase. These improvements were accompanied by reduced Anxiety of the order of two scale points post–treatment and at follow-up, whereas the high negative mood controls showed an increase in Anxiety at follow-up (mean: two scale points). For Depression, the mean score had dropped at Follow-up by three scale points since baseline in the Reiki participants, while there was no change in the controls. These results are in accord with the previous study of the authors, in which there were greater improvements in the total DASS and stress scores following Reiki (Bowden et al., 2010). However, while here there were no baseline group differences favoring those who received Reiki as there were in the previous study, the results of the current study must be interpreted with caution due to the small number of participants in the high negative affect group.

The preferential effects of Reiki on the high negative affect group were not found on the Hospital Anxiety and Depression scale (Mykletun et al., 2001), which focuses mainly on anhedonic depression (Bjelland et al., 2002). Nor was there any preferential benefit of Reiki for quality or quantity of sleep as measured by the Pittsburg scale (Buysse et al., 1989), nor on the Activation-Deactivation mood adjective check-list (Thayer, 1970). Furthermore there was no benefit for Reiki nor for the trial as a whole on Illness Symptoms, as found previously (Bowden et al., 2010)

For the cohort as a whole improvements were found on the Hospital Anxiety and Depression Scale, and this was seen with Anxiety and not with Depression, although Depression was higher on average in the sample at baseline (Depression mean: 5.4/21;

Anxiety mean: 3.9/21). Perhaps consonant with this was the finding on the Activation-Deactivation checklist that Tiredness did not improve, while Energy was significantly reduced. This contrasted with the increase in Calmness and reduction in Tension, experienced by the participants as a whole. At the same time the Global Sleep score did improve for the cohort. This would be in keeping with the guided relaxation that the participants received to divert their attention away from the Reiki. However neither improvement in mood or sleep had been maintained at five-week follow-up.

The Reiki-blinding method employed appeared to be successful. The majority of Reiki and Control participants both mid and post-intervention either believed that they were not in the Reiki group (6/20 Reiki; 11/19 Control) or were not sure (8/20 Reiki; 2/19 Control), suggesting that participants were unable to detect the experimenter sending Reiki. While the study was limited by its lack of double-blinding, as the Reiki was administered by the experimenter who conducted the treatment sessions and in doing so interacted with participants, the experimenter was careful not to exert bias in her treatment of the Reiki and Control groups. The questionnaire replies suggested that this had been successful.

Despite the limitations of the current and earlier studies, the results are in keeping with the mood benefits observed in student populations following Johrei training whose healing practice is similar to Reiki, though does not require attunement (Naito et al., 2003; Laidlaw et. al., 2003). In one study the effects of stress were moderated in medical students who were randomised to groups who learned Johrei, self-hypnosis/visualisation or relaxation training (Naito et al., 2003). Whereas in the hypnosis and relaxation groups any decline with exam stress was buffered for the groups as a whole, with Johrei all but one out of 12 participants showed an actual increases in CD3-CD+ natural killer cell percentages with decreased percentages of

CD3+CD4. Benefits to mood in the form of reduced anxiety, depression, anger and loss of vigour and confusion also followed Johrei training. The mood benefits observed in the current and previous studies also support the findings of a systematic review of those biofield therapies which are practiced proximally (Jain and Mills, 2009). While there were insufficient numbers of studies included in the review to conduct an evidence-based synthesis of healthy participant populations or populations with mood disorders, moderate evidence was found that biofield therapies decrease anxiety in hospitalised populations. Although despite the growing body of evidence to support the efficacy of Reiki and other biofield therapies, many of the studies conducted to date have failed to effectively control for placebo. In addition, the vastly differing protocols employed paint an unclear picture of the factors required for efficacy, such as of the importance of touch, duration of interval between sessions and the level of experience of the practitioner. Clearly there is a need for rigorous, controlled research in to the efficacy of biofield therapies that builds upon the current best evidence of clinical applications, as well as studies that investigate the effects of biofield therapies on specific biological and psychological processes.

Chapter 5. A Double-blind Randomised Controlled Trial of the Effects of Reiki on the Germination of Gamma-irradiated Canary Seeds

5.1. Introduction

The effects of energy-healing modalities on the germination of seeds have been investigated by a number of researchers (Grad, 1967, 1965, 1963, 1964; Scofield and Hodges, 1991; Haid and Hubricar, 2001; Teixeira et al., 2001; Roney-Dougal and Solfvin, 2002; Creath and Schwartz, 2004). Most notably, Grad (1967, 1965, 1963, 1964) conducted a series of double-blind RCTs which explored the recovery of barley seeds from the stress caused by a 1% saline solution, where the effects of a bottle of saline solution treated for 15 minutes by a healer were compared with those of an untreated control bottle of saline. Significant differences were reported in four out of six experiments, where a greater number of the seeds watered with the solution held by the healer were found to germinate, and the seedlings also tended to be taller than the control seedlings. In a study involving treated water, Haid and Hubricar (2001) found that pea seeds watered with water that had received meditation to improve their germination sprouted nearly 20% faster than control seeds watered with untreated water. They also found that wheat seeds watered with water that had received meditation with the intention of inhibiting germination sprouted roughly 8% slower than the control seeds.

The effects of a relatively new biofield therapy known as Vortex Healing (Weinman, 2000) on the germination of okra and zucchini seeds were investigated by Creath and Schwartz (2004). Healing was administered for 15-20 minutes twice a day for three days, where the practitioner held the intention that the treated seeds would germinate faster than the untreated seeds, and germination was monitored every 12 hours. Two

robust experiments with the same replicable design were conducted and in both the treated seeds germinated statistically significantly faster than the untreated control seeds.

In a double-blind RCT conducted by Teixeira et al. (2001), Johrei - a healing modality similar to Reiki - was administered to gamma-irradiated canary seeds in petri dishes for 15 minutes per dish, whereupon the seeds that received Johrei were found to have germinated significantly faster overall than irradiated control seeds. It was considered necessary to irradiate the seeds because preliminary unpublished experiments conducted by Gomes et al. indicated that Johrei only increased the germination of radiation-damaged seeds. Gamma radiation both decreases the percentage of seeds that achieve germination and decreases the rate of germination of those that do.

In the current study we investigated the effects of 15-minutes of Reiki on the germination of radiation-damaged seeds, where our hypothesis was that the seeds given healing would be found to germinate faster overall than untreated control seeds, as found by Teixera et al. (2001). Three separate rigorous experiments were conducted in constant, controlled, double-blind conditions, so that if the overall germinations of the Reiki and Control seeds were found to differ then it would be fair to infer that this may been due to an energy-healing effect.

5.2. Methods and Materials

5.2.1. Design

Three experiments were conducted in 2009 – the first during May, the second during June and the Third during July. In the first experiment three different Reiki practitioners – one male and two females, aged 30 to 45 years - simultaneously gave Reiki to separate petri dishes containing gamma-irradiated canary seeds, whilst they

were either in different rooms or separated from one another by a screen. Each practitioner gave Reiki consecutively to four petri dishes of canary seeds for 15 minutes per dish, which is the time that Johrei was given to each petri dish of seeds in the Gomes et al. study (2001). Following treatment with Reiki, the dishes from each of the three practitioners, along with control dishes of gamma-irradiated canary seeds that did not receive Reiki, were incubated together for the duration of the experiment. Experiments 2 and 3 were replications of Experiment 1, where Experiment 3 had an identical design, although with three female practitioners aged 40 to 65 years. Experiment 2 was alike in design to Experiments 1 and 3, although only two different practitioners took part – one male aged 47 and one female aged 54.

While it would have been preferable to conduct one experiment where all eight practitioners gave healing simultaneously and where the seeds of all eight practitioners were incubated together, this was not logistically possible. The practitioners were available at different times and it was only possible to fit the dishes of three practitioners in the incubator. While the incubator maintained constant and identical conditions for the dishes of each experiment, the monitoring of the germination of the seeds was performed at room temperature. The room temperature differed for the three experiments, as the weather was substantively hotter in May 2009 when the first experiment was conducted, so the conditions of the experiments were thus not identical.

5.2.2. Reiki practitioners

A total of eight Reiki practitioners volunteered to take part in the study, recruited through appeals emailed to members of the Reiki Research Federation and the Reiki Alliance. The practitioners were all trained to Reiki Master Level in Western Usui

Reiki and had been practicing Reiki for a period ranging from 2-14 years. The practitioners received detailed information sheets before participating in the study and were informed that they may withdraw at any time without providing a reason, and then signed consent forms.

5.2.3. Seed source and gamma irradiation

Approximately 0.5 kg of Canary (Phalaris canariensis) seeds were sent to Isotron Sterilisation Laboratories to be irradiated with a 2.25 ±0.25 KGy dose of gamma radiation, so that the seeds would receive a maximum dose or 2.5 KGy, which was the dose used by Gomes et al. (2001). A 2.25 KGy dose was chosen to ensure that the seeds would not receive a dose larger 2.5 KGy, which would over-damage the seeds. Gomes et al. found that a 2.5 KGy dose of radiation reduced the number of Canary seeds that germinated by 43%, so that 57% of irradiated seeds achieved germination compared to approximately 100% of non-irradiated Canary seeds. This dosage was used in order to optimise the evaluation of healing effects over the irradiated seeds, while keeping the percentage unable to germinate as low as possible. The irradiated seeds were also found to take an average of 22 hours longer to reach germination. However, while roughly the same dosage of gamma radiation was applied to the seeds used in the current study, a different protocol was observed. In the Gomes et al. study the seeds were dissected and only the embryo half was used for the germination experiments. This both enhanced the water diffusion towards the embryonic tissue and enabled the radical irruption through the coleorhyza of a seed to be viewed with a microscope, and the first emergence of the radical irruption was taken to be the moment of germination. It was unfortunately not possible to dissect the seeds in the current study, which increased the length of a germination experiment as the seeds not only

took longer to germinate than in the Gomes et al. study, but germination could not be detected as quickly.

5.2.4. Seed sowing and germination

The Seeds were first sorted to remove cracked and discoloured seeds as well as those of irregular sizes. To prepare the petri dishes for the sowing of the seeds, a piece of filter paper, cut to the dimensions of a petri dish (12 cm by 12 cm), was placed inside each dish. Using forceps, 48 seeds were placed one by one into each petri dish and arranged into four separate quadrants, each containing 12 seeds – North-East, North-West, South-West and South-East, as is shown in Figure 12. While the seeds tended to roll around so that they did not have a fixed orientation, the seeds retained their positions in their quadrants and the seeds in the different quadrants remained separate throughout each experiment. The wetting of the seeds, where 20ml of water was dropped into each petri dish using a pipette after the seeds had been sown, acted as the germination trigger, and occurred 24 hours before Reiki was administered.

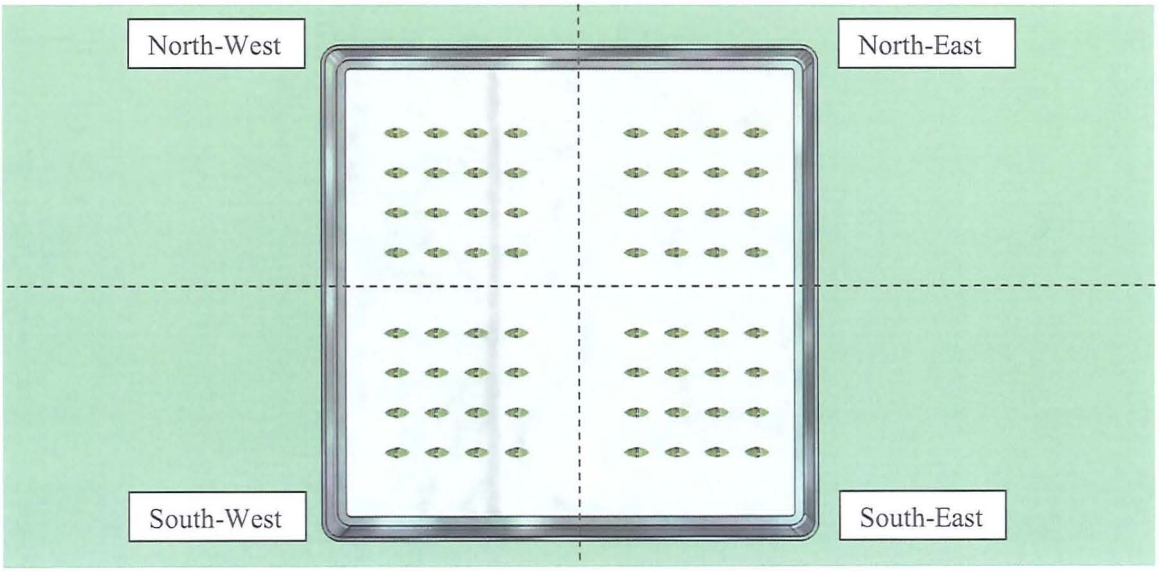

Figure 12. Seed layout in the four quadrants of a petri dish.

After the seed wetting, the petri dishes were covered and incubated at a temperature of $24 \pm 0.5^{\circ}C$ for the duration of the experiment, with the exception of the time spent delivering Reiki treatment and the daily germination count, both of which were conducted at room temperature. The daily germination count took approximately two hours in the first experiment and roughly an hour and a quarter in the latter two experiments, when the experimenters were more experienced at judging seed germination. Each petri dish was watered daily with 10ml of water at the same time of day from Day 1 onwards.

In the manner of Amjad et al. (2003), the germination of a seed was defined by the emergence of its radicle by at least 2mm. The number of germinated seeds was counted by two independent scorers daily for 12 days, starting from the day following the seed sowing. By Day 12 no further germination – defined here by there having been no more than two new germinated seeds since the previous day over the entire sample – was observed by either scorer. Only the seed count data from Day 0 to Day 11 of each experiment was thus included in the analyses presented in the Results.

5.2.5. Incubation

An incubator was designed and built for the study in order to maintain equal and constant lighting and temperature conditioners for all petri dishes in each experiment. The outside incubator dimensions were 1 m (length) by 0.5 m (width) by 0.5 m (height). It was constructed from 6 mm thick MDF wood, apart from the base which was 8 mm thick. Figure 13 shows the layout of the incubator, where its components are labelled from (a) to (h). The roof was supported by a vertical beam (a) positioned under the midpoint (b) of the incubator roof. A shelf - an aluminium grid (c) raised 3.3 cm above the incubator floor - covered the horizontal cross-section of the incubator and

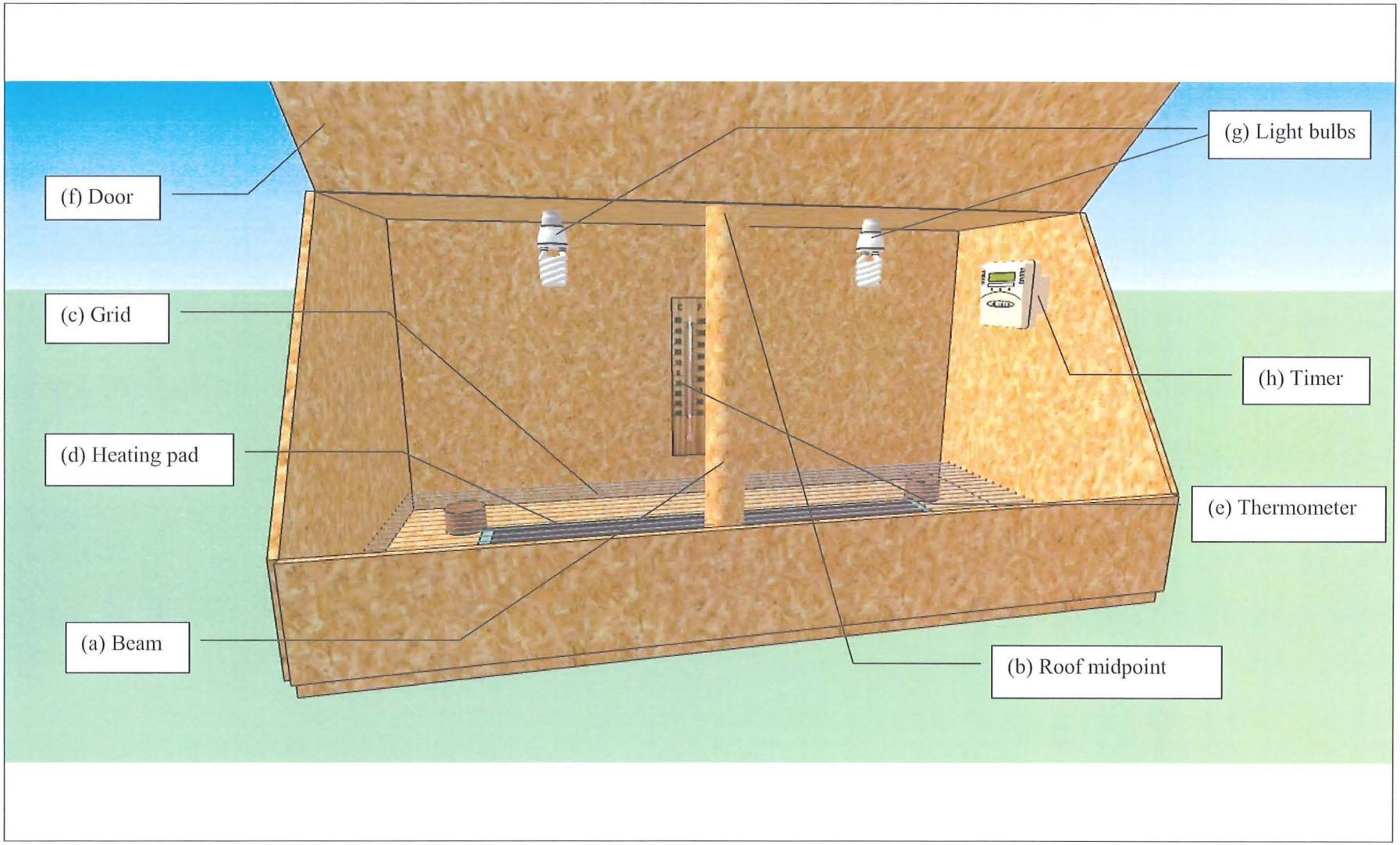

Figure 13. The layout of the incubator, where its components are labelled from (a) to (h).

supported the petri dishes. Beneath the shelf was a heating pad (d) which controlled temperature, monitored by a High-Low thermometer (e) attached to the back wall of the incubator above the shelf. The front wall of the incubator acted as a door (f). Two 15 Watt full-spectrum bulbs (g) were attached to the roof; one placed either side the roof midpoint equidistance from the centre of the roof and the left and right walls respectively, and equidistance from the back and front wall. A timer (h) turned the bulbs on at 8am for 12 hours of daylight and off at 8pm for 12 hours of darkness for the duration of each experiment.

5.2.6. Blinding procedure

At the start of the study, an independent experimenter who was not otherwise involved in the study tossed a coin in order to determine which of the letters A or B would correspond to the Reiki dishes and which would correspond to the Control dishes. This experimenter wrote the outcome on a piece of paper and concealed it in an envelope (Group-Blinding Envelope), which was not opened by the experimenters who monitored seed germination until the end of the study.

The selection of the order in which the dishes in the Reiki group would receive Reiki was performed randomly. The four dishes in each condition (Reiki and Control) for each practitioner in each experiment were each assigned a number (Dish-Number) and were labelled Dish 1, Dish 2, Dish 3 and Dish 4. Each Reiki practitioner was given a six sided die and asked to toss the die four times, and the order in which the numbers one to four were thrown was the order that the four Reiki dishes were given Reiki (if any fives, sixes or repetitions were obtained they were ignored and the die thrown again). Each practitioner wrote on a sheet of paper the order in which their dishes were to be treated, along with their practitioner number, and sealed the paper in an envelope

to be opened at the end of the study, so as to keep this information secret. No experimenters were present during the selection of the order of the dishes or the administering of the Reiki.

5.2.7. Reiki administration

At the start of each experiment, each practitioner opened the Group-Blinding Envelope which informed them whether to give Reiki to dishes A or B. For each practitioner, four Reiki dishes (labelled 1A, 2A, 3A and 4A) were arranged on a surface in a line next to four Control dishes (labelled 1B, 2B, 3B, 4B), although the experimenter did not know which were which. Each practitioner was given a tray and asked to carefully carry the four Reiki dishes into the room where they would administer the Reiki. Each practitioner sat and gave Reiki to the appropriate dishes of seeds with their palms raised a few inches above the dish being treated, which was placed on a table in front of them. After each practitioner had given 15 minutes of Reiki to each of their four dishes, they carefully carried them back and rearranged them into a line next to the Control dishes. The practitioner was asked to move both the Reiki and Control dishes out of place slightly so that the experimenter would not be able to guess which dishes had received Reiki.

The experimenter then returned and arranged the Reiki and Control dishes in the incubator. The positioning of the light bulbs in the incubator provided a roughly equal distribution of light to all parts of the shelf. However, each Reiki dish was placed in the same position in the incubator as its matching Control dish, but at the opposite end, to ensure that the Reiki and Control dishes would receive equal light. The incubator arrangement of the Reiki and Control dishes of Practitioners 1, 2 and 3 in Experiment 1 is illustrated in Figure 14. The dishes in Experiment 3 were arranged in the same

manner as in Experiment 1 except that the positions of dishes A and B were swapped over, in case of unanticipated differences in the incubator conditions at its two ends. In Experiment 2 the dishes were arranged as in Experiment 1, although without Practitioner 3 and with the positions of dishes A and B swapped over.

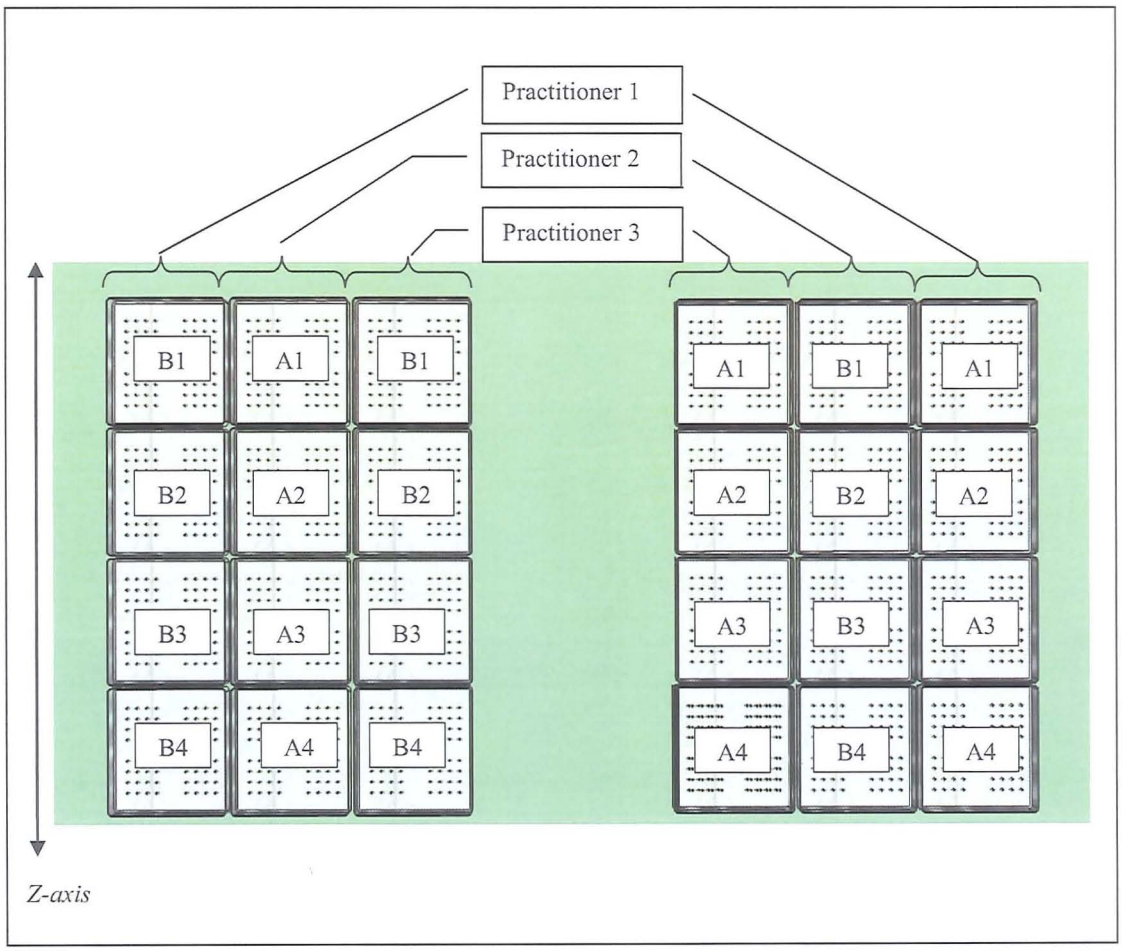

Figure 14. The incubator arrangement of the Reiki and Control dishes of the three practitioners in Experiment 1.

5.2.8. Hypothesis regarding Dish-Order

It was anticipated that the order in which the dishes of seeds received Reiki (First, Second, Third or Fourth) may influence the extent to which Reiki affected their germination. Since, there is some evidence that suggests that Reiki is more effective

when administered by a practitioner immediately after they have given a treatment than when the practitioner has not recently given Reiki. Rubic et al. (2006) conducted a double-blind RCT where 14 Reiki practitioners gave healing to overnight cultures of heat-shocked Escherichia coli K12 bacteria in vitro and the growth of the Reiki-treated cultures compared to untreated control cultures. No overall difference was found between the growth of the Reiki-treated plates and the controls plates when the Reiki was administered in a non-healing context, when the practitioners had not recently administered Reiki. However, when Reiki was administered to the cultures immediately after the practitioners had treated a patient with chronic pain, the Reiki treated cultures exhibited statistically significantly more bacteria than the controls. It was thus predicted that the dishes of seeds treated first would not have as high germination compared to their control dishes as the dishes of seeds treated last.

5.2.9. Data scoring and analysis

In order to minimise human error and provide greater data reliability, two independent scorers blind to the conditions inspected the seeds each day at the same time for the duration of each experiment in order to determine which seeds had germinated. The first seed count was performed on Day 1, the day following the sowing of the seeds (Day 0). The scorers both separately examined each seed using forceps, and privately logged the number of germinated seeds out of the 12 seeds in each dish quadrant that had germinated.

When judging the length of a seed radical, the experimenters did not refer to their seed-count data from previous days in order to prevent bias, and the experimenters occasionally judged there to be fewer seeds germinated in a dish than they had counted on previous days. Thus, before the seed-count data was analysed, an experimenter who

was blind to which dish-quadrants had received Reiki cleansed the data where it seemed appropriate. For example, if an experimenter counted 1/12 germinated seeds in a quadrant on Day 1 of an experiment, then 3/12 in the same quadrant on Day 2, 4/12 on day 5, then just 2/12 on Day 6, followed by 5/12 on Day 7, then the experimenter would change the count on Day 6 from 2/12 to 4/12.

Since the incubator maintained equal and constant lighting, temperature and moisture for all dishes, it was considered reasonable to treat each dish quadrant as an independent subject, so that there were 16 independent subjects per condition per practitioner. Thus, there were a total of 48 subjects per condition in both Experiment 1 and Experiment 3, and 32 subjects per condition in Experiment 2. A total of 1152 seeds were included in the data analysis for both Experiments 1 and 3, and 768 seeds in Experiment 2, making a total of 3072 seeds overall in the three experiments.

G-Power was used to calculate the numbers of Reiki and Control seeds needed in each experiment for a significant difference between two independent samples of equal size to be found. As with the RCTs detailed in Chapters 3 and 4, the prediction was that the effect size would be of high magnitude, since similar sample sizes have been used in other studies where seeds or plants received energy healing and significant results were found (Grad, 1967, 1965, 1963, 1964; Haid and Hubricar, 2001; Teixeira et al., 2001; Creath and Schwartz, 2004). Thus, with an effect size of 1, an error probability of 0.05, and an allocation ratio of 1, a sample size of at least 17 subjects per condition is needed. Therefore, the 48 subjects per condition in Experiments 1 and 3, and the 32 subjects per condition in Experiment 2, were sufficient. However, the 16 subjects per condition per practitioner were slightly underpowered for an effect to be detected.

An overall analysis of the seed-count data from the three experiments was first conducted. A four-way mixed ANOVA was used with a within-subjects factor of Time (Day 0, Day 1, Day 2, ...Day 11) and between-group factors of Group (Reiki and Control), Dish-Order (First, Second, Third and Fourth) and Practitioner (1-8).[3] The number of germinated seeds for a single quadrant of seeds (12 seeds = 1 subject) on each day was compared for each of the between-subjects factors, from Day 0. Where statistically significant Time x Group interactions were found, independent samples t-tests were carried out to compare the numbers of Reiki and Control seeds that had germinated on each day of the experiment, in order to understand the nature of the effect (although t-tests could not be conducted for Day 0, as no seeds had germinated).

Two-way mixed ANOVA with a within-subjects factor of Time (Day 0, Day 1, Day 2, ...Day 11) and a between-group factor of Dish-Number (1-4) was used to assess whether the position of dishes along the z-axis of the incubator (as shown in Figure 14) affected the results. To measure any dish-quadrant effects, a three-way mixed ANOVA was used with a within-subjects factor of Time (Day 0, Day 1, Day 2, ...Day 11) and between-group factors of Dish-Quadrant (North-East, North-West, South-West, South-East) and Group (Reiki and Control).

Since the mixed ANOVA analyses conducted with the 12-level repeated-measures factor of Time (Day 0, Day 1, Day 2, ...Day 11) did not satisfy Mauchly's test of sphericity ($P < 0.001$), the Greenhouse-Geisser method was used and the corresponding results reported.

[3] For the analyses of the experiments the practitioners were renumbered, such that Practitioners 1 and 2 from Experiment 2 became Practitioners 4 and 5, and Practitioners 1, 2 and 3 from Experiment 3 became Practitioners 6, 7 and 8.

Next, in order to ascertain whether the overall mean germinations of the three individual experiments differed, a two-way mixed ANOVA with a within-subjects factor of Time (Day 0, Day 1, Day 2, ...Day 11) and a between-group factor of Experiment (1-3) was conducted. The three individual experiments were subsequently analysed individually, using the same method of analysis as was used in the overall analysis, but with the confidence level adjusted to 1% instead of 5% to reduce the chance of Type I errors occurring.

5.3. Results

5.3.1. Overall analysis of the three experiments

Taking all eight practitioners from the three experiments into account yielded highly significant Pearson's correlations between the two scorers' counts during each day of an experiment (Day 1: r = 0.722, $P < 0.001$; Day 2: r = 0. 56, $P < 0.001$; Day 3: r = 0.804, $P < 0.001$; Day 4: r = 0.736, $P = 0.001$; Day 5: r = 0.8, $P < 0.001$; Day 6: r = 0.924, $P < 0.001$; Day 7: r = 0.931, $P < 0.001$; Day 8: r = 0.921, $P < 0.001$; Day 9: r = 0.917, Day 10: r = 0.932, $P < 0.001$; Day 11: r = 0.924, $P < 0.001$). For greater data reliability, the mean of the two scorers' counts was thus used in the overall analysis of the experiments.

5.3.1.1. Dish Number

To assess whether the position of dishes in the incubator along the z axis influenced the results of the three experiments overall, a two-way Mixed ANOVA with a within-subjects factor of Time (Day 0, Day 1, Day 2, ...Day11) and a between-subjects factor of Dish-Number (1-4) was conducted. No Time x Dish-Number interaction was found (F = 0.74, ns), indicating that the position of the dishes along the z-axis of the incubator did not affect seed germination.

5.3.1.2. Dish Quadrant

To assess whether Dish-Quadrant influenced germination for the sample as a whole for all three experiments and also whether Reiki affected different quadrants differently, a three-way mixed ANOVA with a within-subjects factor of Time (Day 0, Day 1, Day 2, ...Day11) and between-subjects factors of Group (Reiki and Control), and Dish-Quadrant (North-East, North-West, South-West, South-East) was conducted. No overall Time x Dish-Quadrant interaction ($F = 0.418$, ns) nor Time x Group x Quadrant-Number interaction ($F = 0.208$, ns) was found.

5.3.1.3. Group

Table 11 shows the mean (and standard deviation) numbers of germinated seeds in a quadrant overall on each day of Experiments 1, 2 and 3 for the Total sample and the Reiki and Control groups.

Table 11. The mean (SD)* numbers of germinated seeds on each day of the three experiments overall

	Reiki	Control	Total
Day 0	0(0)	0(0)	0(0)
Day 1	0.52(0.59)	0.57(0.68)	0.55(0.64)
Day 2	1.43(1.16)	1.36(1.24)	1.39(1.19)
Day 3	2.37(1.67)	2.16(1.49)	2.26(1.58)
Day 4	3.3(2.1)	2.91(1.93)	3.1(2.02)
Day 5	3.82(2.23)	3.59(2.36)	3.7(2.3)
Day 6	4.16(2.42)	3.96(2.46)	4.06(2.44)
Day 7	4.36(2.36)	4.22(2.45)	4.29(2.40)
Day 8	4.55(2.47)	4.44(2.48)	4.49(2.47)
Day 9	4.79(2.43)	4.65(2.42)	4.72(2.42)
Day 10	4.96(2.44)	4.81(2.35)	4.89(2.39)
Day 11	5.07(2.38)	5(2.3)	5.03(2.34)

**Standard deviations are shown in parenthesis.*

As expected, the overall number of germinated seeds increased with time. A four-level mixed ANOVA with a within-subjects factor of Time (Day 0, Day 1, Day2, ...Day 11)

and between-subjects factors of Group (Reiki and Control), Dish-Order (First, Second, Third and Fourth) and Practitioner (1-8) found a highly significant main effect of Time ($F = 1258$, $P < 0.001$). However, the Time x Group interaction was nonsignificant ($F = 1.339$, ns). The mean numbers of germinated Reiki and Control seeds per dish-quadrant for each day of Experiments 1, 2 and 3 overall are shown in Figure 15. It can be seen in Table 11 that only an average of 5.03/12 seeds had germinated in a quadrant overall for the whole sample on Day 11. This means that only 41.29% of seeds used in the study achieved germination, which is notably less than the 57% of irradiated seeds found to germinate in the Teixeira et al. (2001) study.

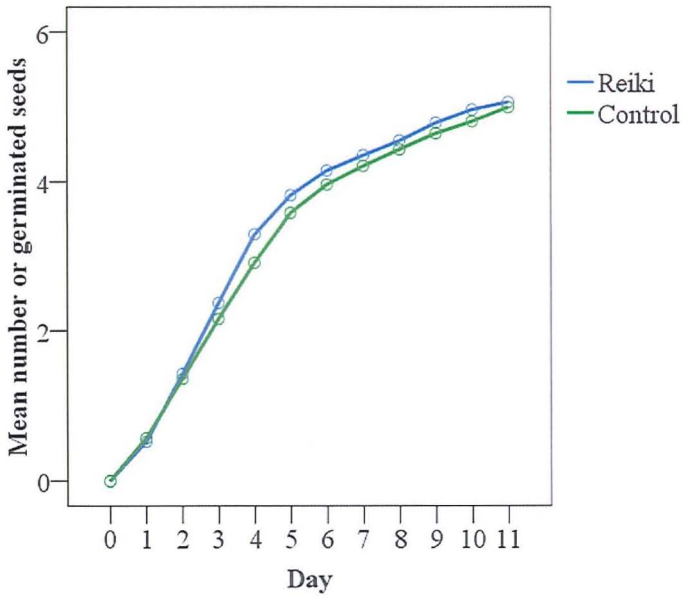

Figure 15. The mean numbers of Reiki and Control seeds germinated in a dish-quadrant for each day of an experiment overall for Experiments 1, 2 and 3.

5.3.1.4. Dish Order

The mean (and standard deviation) numbers of germinated seeds in a quadrant for the dishes given Reiki First, Second, Third and Fourth, and their Controls, on each day of Experiments 1, 2 and 3 overall are shown in Table A3 in the Appendix.

The four-way mixed ANOVA for the whole sample for the three experiments found no Time x Dish-Order interaction (F = 0.732, ns). However, there was a significant Time x Group x Dish-Order interaction (F = 3.533, *P* = 0.001). Conducting the ANOVA with the dataset restricted to each Dish-Order separately found a significant Time x Group interaction for the dishes treated First (F = 6.263, *P* = 0.001). It can be seen in Figure 16, which shows the mean number of germinated Reiki and Control seeds in a quadrant for the dishes treated First for each day of an experiment, that the Control seeds had higher germination on each day from Day 5 onwards. Independent samples t-tests did not find that the higher germination of the Control group was statistically significant any individual day though, although there was a trend in this direction on Day 11 (Day 1: t = -0.285, *ns*; Day 2: t = 0.926, *ns*; Day 3: t = 0.36, *ns*; Day 4: t = -0.064, *ns*; Day 5: t = -0.719, *ns*; Day 6: t = -1.1, *ns*; Day 7: t = -1.221, *ns*; Day 8: t = -1.448, *ns*; Day 9: t = -1.449, *ns*; Day 10: t = -1.359, *ns*; Day 11: t = -1.781, *P* = 0.08).

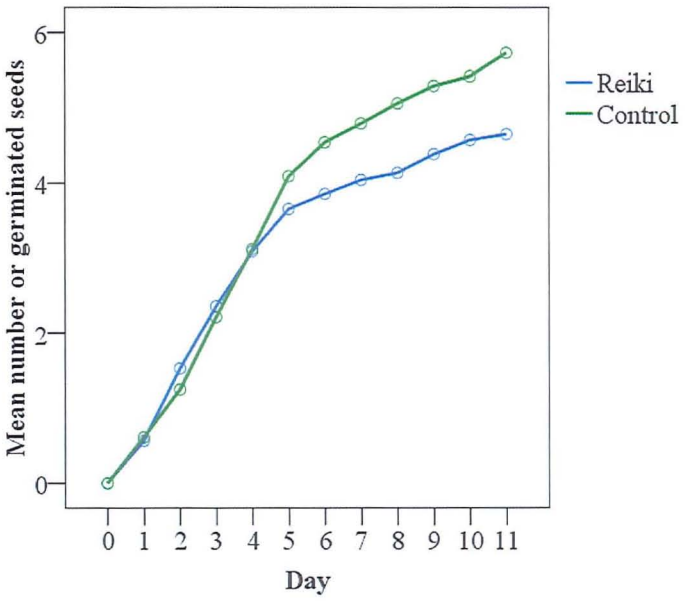

Figure 16. The mean numbers of germinated Reiki and Control seeds in a dish-quadrant for the dishes treated First on each day of an experiment overall for

Experiments 1, 2 and 3.

For the dishes treated Second, no overall Time x Group interaction was found (F = 0.46, ns). However, for the dishes treated both Third and Fourth the Reiki seeds had comparatively greater germination than their Control dishes of seeds. The mixed ANOVA found a trend for the Reiki seeds to have higher overall germination than their controls for the dishes treated Third (F = 2.574, *P* = 0.074), where as can be seen in Figure 17, the Reiki seeds had comparatively higher mean germination on each day of an experiment from day 3 onwards. The greater germination of the Reiki group did not reach statistical significance on any individual day though, as disclosed by independent samples t-tests (Day 1: t = -0.103, *ns*; Day 2: t = 0, *ns*; Day 3: t = 0.806, *ns*; Day 4: t = 1.273, *ns*; Day 5: t = 0.972, *ns*; Day 6: t = 0.881, *ns*; Day 7: t = 1.068, *ns*; Day 8: t = 0.831, *ns*; Day 9: t = 1.086, *ns*; Day 10: t = 1.045, *ns*; Day 11: t = 1.181, *ns*).

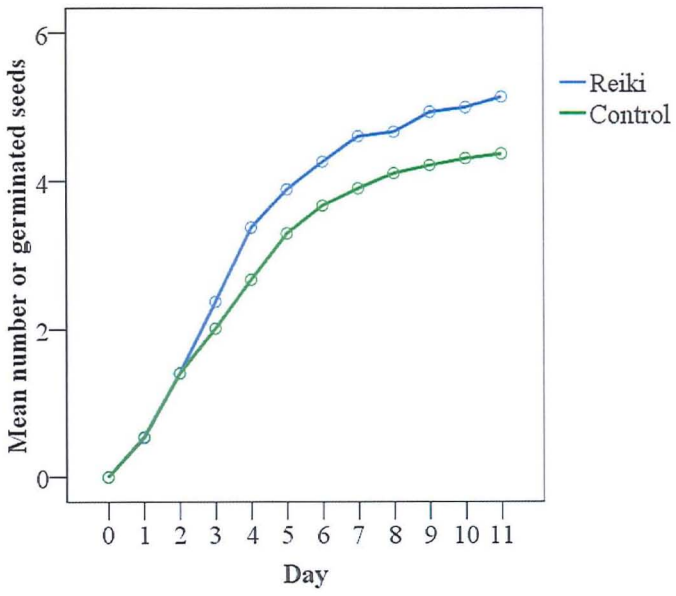

Figure 17. The mean numbers of germinated Reiki and Control seeds in a dish-quadrant for the dishes treated Third on each day of an experiment overall for Experiments 1, 2 and 3.

For the dishes treated Fourth the mixed ANOVA found the comparatively greater overall germination of the Reiki seeds to be near-significant (F = 3.015, *P* = 0.052). As shown in Figure 18, the Reiki seeds had higher mean germination than their controls on each day of an experiment from day 4 onwards, although, again, independent samples t-tests did not find that the group differences reached statistical significance on any particular day (Day 1: t = -0.337, *ns*; Day 2: t = -0.84, *ns*; Day 3: t = 0.175, *ns*; Day 4: t = 1.136, *ns*; Day 5: t = 1.35, *ns*; Day 6: t = 1.159, *ns*; Day 7: t = 0.953, *ns*; Day 8: t = 0.1.105, *ns*; Day 9: t = 1.3, *ns*; Day 10: t = 1.401, *ns*; Day 11: t = 1.281, *ns*).

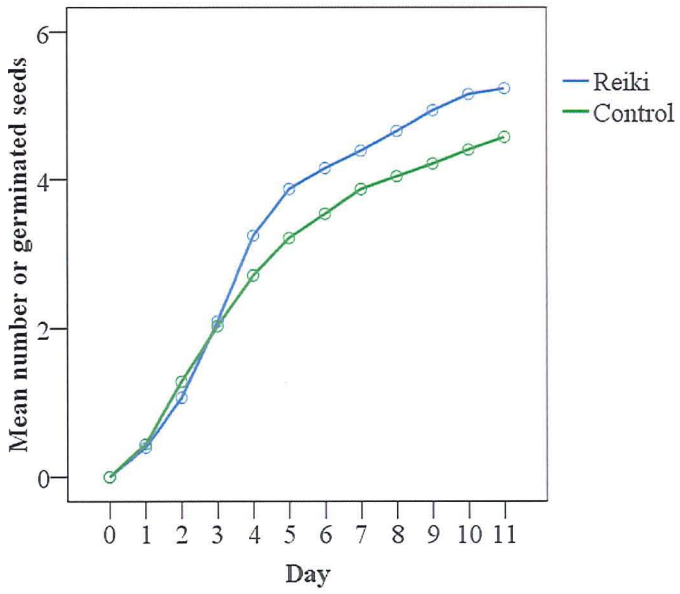

Figure 18. The mean numbers of germinated Reiki and Control seeds in a dish-quadrant for the dishes treated Fourth on each day of an experiment overall for Experiments 1, 2 and 3.

These Dish-Order effects would seem to support the hypothesis made in Section 5.2.8. - that the dishes treated with Reiki last would have higher germination compared to their control dishes than the dishes treated first, due to the effectiveness of Reiki increasing over time. However, no conclusions of this nature can be drawn, since the

Control dishes of the dishes treated First had comparatively higher overall germination than the other Control dishes. As previously stated, a mixed ANOVA with all eight practitioners and all Dish-Orders did not find a significant Time x Session interaction for the whole sample. Conducting the mixed ANOVA with the dataset restricted to just the Control dishes though disclosed a significant Time x Dish-Order interaction ($F = 2.5408$, $P = 0.017$). As can be seen in Figure 19, the Control dishes of the dishes treated First had higher germination than the Controls of the dishes treated Second, Third and Fourth. Furthermore, as can be seen in Table A3, the Control dishes of the dishes treated First also had higher mean germination than the Reiki dishes treated First, Second, Third and Fourth, where a mean of 5.7/12 seeds had germinated on Day 11 compared to 5.03/12 germinated seeds for the whole sample. Post-hoc Tukey tests disclosed that the difference in the germination of the Control dishes of the dishes treated First and Second was not statistically significant. There were however trends for the Control dishes of the dishes treated First to have comparatively higher germination than the Controls of the dishes treated both Third (Mean Difference = 0.635, $P = 0.063$) and Fourth (Mean Difference = 0.65, $P = 0.055$).

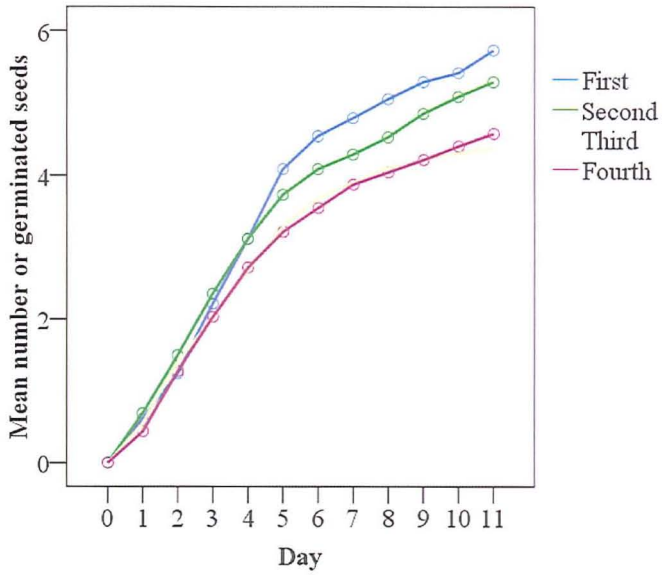

Figure 19. The mean number of germinated seeds in a dish-quadrant for the Control dishes treated First, Second, Third and Fourth on each day of an experiment overall for Experiments 1, 2 and 3.

Considering just the Reiki dishes, a mixed ANOVA did not find a significant Time x Dish Order interaction ($F = 1.293$, *ns*), although as can be seen in Figure 20, the dishes treated with Reiki First had slightly lower mean germination than the dishes treated Second, Third and Fourth. Nonetheless, the higher overall germination of the Control dishes of the dishes treated First compared to the other Control dishes suggests that certain dishes of seeds had higher germination than others by chance, which weakens the conclusions that can be drawn with regards to a Dish-Order Reiki effect.

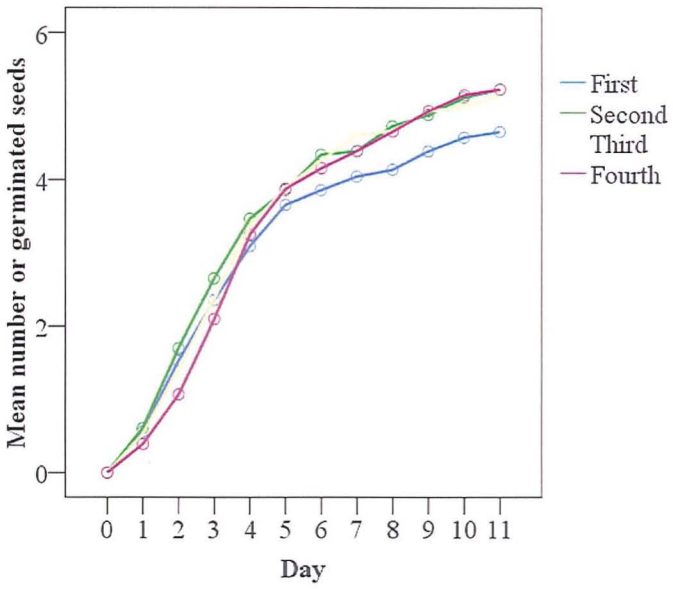

Figure 20. The mean number of germinated seeds in a dish-quadrant for the Reiki dishes treated First, Second, Third and Fourth on each day of an experiment overall for Experiments 1, 2 and 3.

5.3.1.5. Practitioner

The mean (and standard deviation) numbers of germinated seeds in a quadrant for the Reiki and Control dishes of the practitioners of the three experiments are shown in Tables A4, A5 and A6 in the Appendix respectively.

The overall germination of the different practitioners' samples was found to differ, and the four-way mixed ANOVA yielded a highly significant Time x Practitioner interaction ($F = 24.448$, $P < 0.001$). Post-hoc Tukey tests disclosed that the dishes of Practitioners 1, 2 and 3 – the Practitioners from the first experiment - all had highly significantly lower germination than the seeds of each of the practitioners from the other experiments - Practitioner 4, 5, 6, 7 and 8 (Mean difference ≥ -2.137, $P < 0.001$). The comparatively lower overall germination of the seeds of the practitioners from Experiment 1 for the whole sample can be seen in Figure 21.

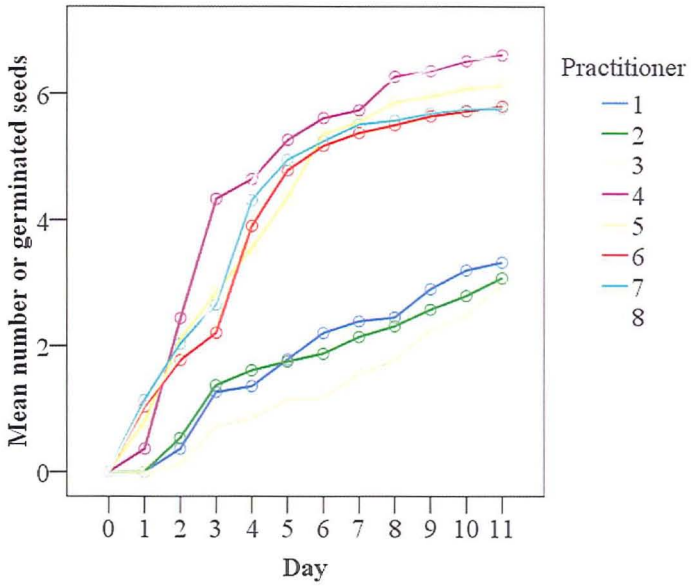

Figure 21. The mean number of germinated seeds in a dish-quadrant of the eight practitioners for the whole sample.

The four-way mixed ANOVA also found a significant Time x Group x Practitioner interaction (F = 4.144, P = 0.044). Conducting the mixed ANOVA with the dataset restricted to each of the individual practitioners separately disclosed a highly significant overall Time x Group effect for Practitioner 1 (F = 6.924, P = 0.001). Independent samples t-tests found that the Reiki seeds of Practitioner 1 had significantly higher germination from Day 3 to Day 11, and only on Day 2 was the difference between the groups nonsignificant (Day 2: t = 1.63, *ns*; Day 3: t = 3.428, P = 0.002; Day 4: t = 3.483, P = 0.002; Day 5: t = 4.471, $P < 0.001$; Day 6: t = 3.146, P = 0.004; Day 7: t = 2.888, P = 0.007; Day 8: t = 2.853, P = 0.008; Day 9: t = 2.677, P = 0.012; Day 10: t = 2.437, P = 0.021; Day 11: t = 2.491, P = 0.019 (a t-test could not be conducted on Day 1 as no seeds had germinated)). Figure 22 shows the mean numbers of germinated Reiki and Control seeds in a quadrant on each day of Experiment 1 for Practitioner 1.

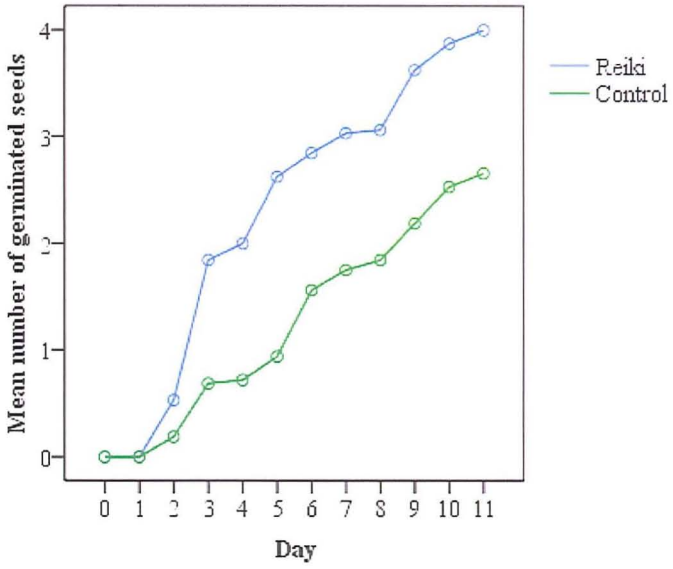

Figure 22. The mean number of Reiki and Control seeds germinated in a dish-quadrant for Practitioner 1 on each day of Experiment 1.

A significant Time x Group interaction was also found for Practitioner 4 (F = 3.297, *P* = 0.034). As can be seen in Figure 23, which shows the mean numbers of Reiki and Control seeds germinated in a quadrant for Practitioner 4 on each day of Experiment 2, the Reiki seeds of Practitioner 4 had comparatively greater germination throughout the experiment from Day 2 to Day 11. Independent samples t-tests indicated that the higher germination of the Reiki group was statistically significant on Day 6 and Day 7 and approached significance on Day 3, Day 5 and Day 8, but the groups did not statistically differ on any other day (Day 1: t = -1.315, *ns*; Day 2: t = 0.741, *P* = 0.092; Day 3: t = 1.741, *P* = 0.092; Day 4: t = 1.405, *ns*; Day 5: t = 1.938, *P* = 0.062; Day 6: t = 2.105, *P* = 0.044; Day7: t = 2.065, *P* = 0.048; Day 8: t = 1.709, *P* = 0.098; Day 9: t = 1.623, *ns*; Day 10: t = 1.561, *ns*; Day 11: t = 1.473, *ns*).

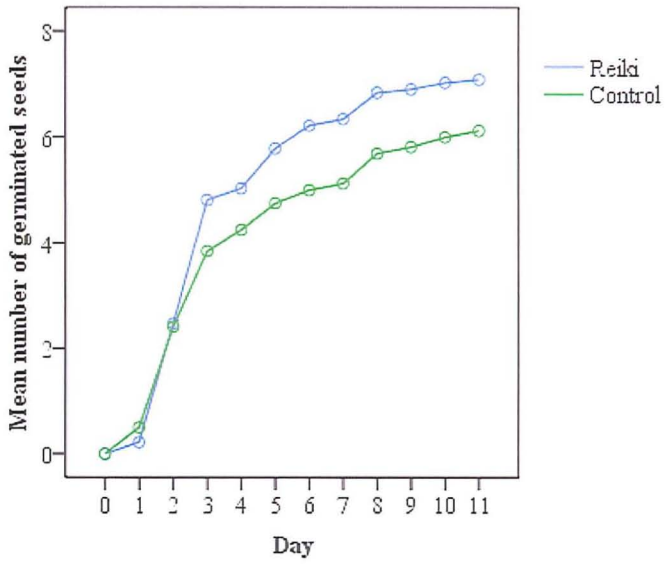

Figure 23. The mean numbers of germinated Reiki and Control seeds in a dish-quadrant for Practitioner 4 on each day of Experiment 2.

However, there was a significant Time x Group interaction for Practitioner 6 where the Control seeds had comparatively higher germination (F = 4.144, $P = 0.044$). Figure 24 shows the mean numbers of germinated Reiki and Control seeds in a quadrant for Practitioner 6 on each day of Experiment 3. Individual samples t-tests disclosed that while the germination of the Control seeds did not statistically differ from the Reiki seeds on Day 1 and Day 2 of the experiment, the difference between the groups increased and approached statistical significance on Day 3 and Day 4, and from Day 5 onwards the higher germination of the Control group was statistically significant (Day 1: t = -0.988, *ns*; Day 2: t = -1.497, *ns*; Day 3: t = -1.748, $P = 0.091$; Day 4: t = -1.869, $P = 0.071$; Day 5: t = -2.325, $P = 0.027$; Day 6: t = -2.096, $P = 0.045$; Day 7: t = -2.631, $P = 0.013$; Day 8: t = -2.224, $P = 0.034$; Day 9: t = -2.35, $P = 0.026$; Day 10: t = -2.405, $P = 0.023$; Day 11: t = -2.459, $P = 0.02$).

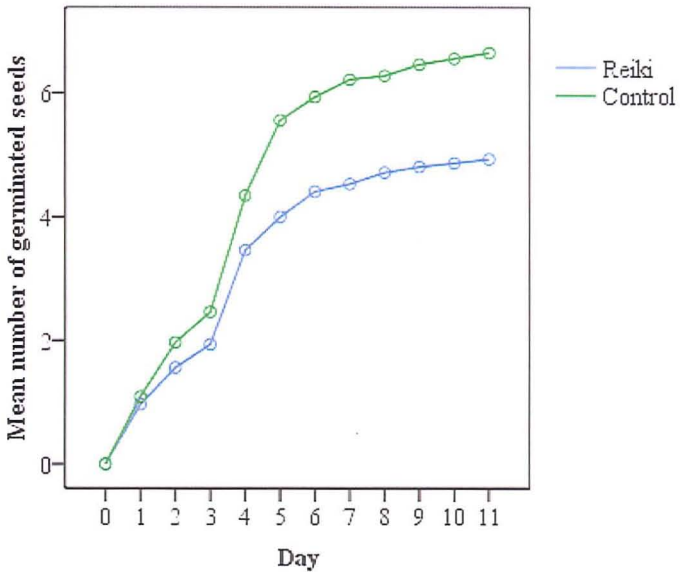

Figure 24. The mean numbers of germinated Reiki and Control seeds in a dish-quadrant for Practitioner 6 on each day of Experiment 3.

No overall Time x Group effects were found for any of the other practitioners though (Practitioner 2: F = 1.432, ns; Practitioner 3: F = 0.711, ns; Practitioner 5: F = 0.421, ns; Practitioner 7: F = 0.567, ns; Practitioner 8: F = 0.858, ns).

5.3.1.6. Summary of the overall analysis of the three experiments

Overall analysis of the data from all three experiments did not find that the germination of the Reiki and Control seeds significantly differed. However, there were significant Dish-Order effects. There was a significant Time x Reiki-Group effect for the dishes treated First ($P = 0.001$), such that the Control dishes had higher overall germination than the Reiki dishes, although the difference did not reach statistical significance on any individual day. For the dishes treated Second no statistical difference in overall germination was found between the Reiki and Control groups. For the dishes treated Third there was a trend for the Reiki seeds to have comparatively greater overall germination than the Controls ($P = 0.074$), although the difference was not statistically

significant on any particular day. The dishes treated with Reiki Fourth also showed comparatively higher overall germination than their Control dishes, where the Time x Reiki-Group interaction was near-significant (P = 0.052). As with the other Dish-Orders though, the differences between the Reiki and Control seeds of the dishes treated Fourth did not statistically differ on any individual day.

These Dish-Order effects are in accordance with hypothesis and seem to suggest that the overall greater germination of the dishes treated Third and Fourth than their Control dishes may have been due to a Reiki effect. However, consideration of the Dish-Order effects of the Control dishes in isolation suggests that this may not have been the case. Analysis of the Control seeds alone disclosed a significant Time x Dish-Order interaction (P = 0.017), where there were trends for the Controls of the dishes treated First to have higher germination than the Controls of the dishes treated both Third (P = 0.063) and Fourth (P = 0.055). Since this presumably arose by chance, it seems possible that the dishes of seeds treated with Reiki Third and Fourth may have had higher germination than their Control dishes by chance too.

Regarding Practitioner effects, the overall germination of the Reiki seeds significantly exceeded the Controls for 2/8 of the practitioners – Practitioner 1 (P = 0.001) and Practitioner 4 (P = 0.034). However for Practitioner 6 the reverse effect was found (P = 0.044), and the overall germinations of the Reiki and Control seeds of the other five practitioners did not statistically differ. In addition to the differential Time x Group effects found for the different practitioners, there was also a significant Time x Practitioner effect found for the sample as a whole. Such that the overall germination of the seeds of Practitioners 1, 2 and 3 – i.e. all the practitioners from Experiment 1 - for the sample as a whole had highly significantly lower germination than each of the

practitioners from the other two experiments. This suggests that the conditions in which the seeds were kept in Experiment 1 may have differed from those of the subsequent two experiments.

5.3.2. Analyses of the separate experiments

Table A7 in the Appendix shows the mean (and standard deviation) numbers of germinated seeds in a quadrant on each day of Experiments 1, 2 and 3 for the total sample and the Reiki and Control Groups.

In order to assess whether mean germination differed for the sample as a whole for the three experiments, a two-way Mixed ANOVA was conducted with a within-subjects factor of Time (Day 0, Day 1, Day 2, ...Day11) and a between-subjects factor of Experiment (1-3). This yielded a highly significant Time x Experiment interaction ($F = 63.357$, $P < 0.001$). In accordance with the highly significantly lower germination of each of the three practitioners from Experiment 1 compared to the other practitioners, the germination of the seeds in Experiment 1 was found to be substantively lower than in the other two experiments. A Post-hoc Tukey test disclosed that Experiments 2 and 3 both had highly significantly greater overall germination than Experiment 1 (Experiment 2: Mean Difference = -2.714, $P < 0.001$; Experiment 3: Mean Difference = -2.574, $P < 0.001$). The mean number of germinated seeds in a quadrant for each day of Experiments 1, 2 and 3 are shown in Figure 25.

It can be seen from the means in Table A7 and Figure 25 that nearly twice as many seeds had germinated on Day 11 in Experiments 2 and 3 as in Experiment 1. In Experiment 1 only a mean total of 3.13/12, or 26.02%, of seeds had germinated in a quadrant on Day 11. This compares to 6.4/12, or 53.33%, of seeds in Experiment 2 and

6.05/12, or 50.42%, of seeds in Experiment 3, where the overall numbers of seeds that germinated were very similar.

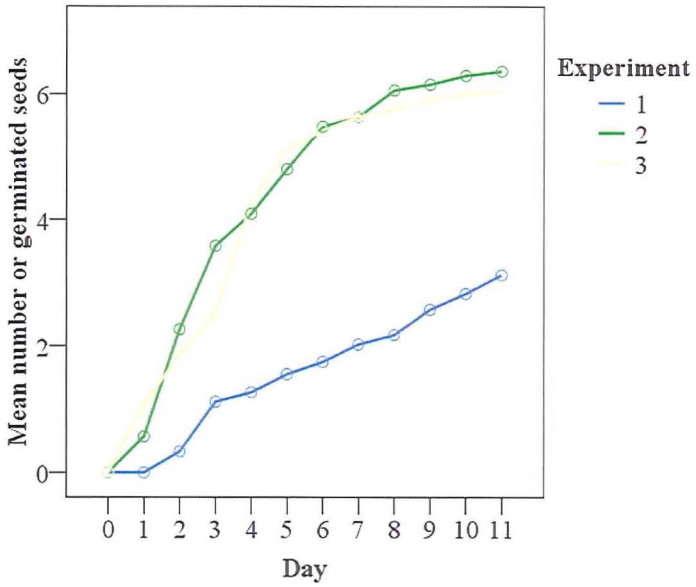

Figure 25. The mean number of germinated seeds in a dish-quadrant for each day of Experiments 1, 2 and 3.

5.3.2.1 Experiment 1

Highly significant Pearson's correlations were found for each day of Experiment 1 between the two scorers' counts of the number of germinated seeds (Day 2: r = 0.662, $P < 0.001$; Day 3: r = 0.769, $P < 0.001$; Day 4: r = 0.706, $P < 0.001$; Day 5: r = 0.59, $P < 0.001$; Day 6: r = 0.738, $P < 0.001$; Day 7: r = 0.8, $P < 0.001$; Day 8: r = 0.723, $P < 0.001$; Day 9: r = 0.813, $P < 0.001$; Day 10: r = 0.837, $P < 0.001$; Day 11: r = 0.767, $P < 0.001$). Thus, as with the overall analysis of the three experiments, the means of the two scorers' counts for each quadrant were taken and used in the following analyses for Experiment 1.

5.3.2.1.1. Dish Number

Similarly to the overall analysis of the experiments, the two-way Mixed ANOVA with the data from Experiment 1 yielded a nonsignficant Time x Dish-Number interaction (F = 1.697, ns), implying that germination was not affected by position along the z axis.

5.3.2.1.2. Quadrant Number

Conducting the three-way mixed ANOVA for Experiment 1 also found no Time x Quadrant-Number interaction (F = 1.304, ns), nor was there a Time x Group x Quadrant-Number interaction (F = 0.72, ns).

5.3.2.1.3. Group

A mixed ANOVA with a within-subjects factor of Time (Day 0, Day 1, Day 2, ...Day11) and a between-subjects factor of Group (Reiki and Control) found a highly significant main effect of Time (F = 315.019, $P < 0.001$) for Experiment 1.

The four-way mixed ANOVA also found a tendency towards a significant Time x Group interaction (F = 3.088, $P = 0.033$), where a comparatively higher number of Reiki seeds had germinated on each day of the experiment from Day 2 onwards. The substantively higher means of the Reiki seeds can be seen in Figure 26, which shows the mean numbers of germinated Reiki and Control seeds in a dish-quadrant on each day of Experiment 1. Independent samples t-tests were conducted in order to identify whether the comparative differences in the germinations of Reiki and Control seeds reached statistical significance on any particular days of the experiment. While no seeds had germinated in either group on Days 0 and 1, the t-tests disclosed trends for significantly more Reiki seeds to have germinated on each day of Experiment 1 from Day 2 to Day 7 (Day 2: t = 2.42, $P = 0.017$; Day 3: t = 2.268, $P = 0.026$; Day 4: t =

2.207, $P = 0.03$; Day 5: t = 2.631, $P = 0.01$:Day 6: t = 1.978, $P = 0.051$; Day 7: t = 1.98, $P = 0.051$). However, by Day 8 the germination of the Control group had caught up slightly so the groups did not statistically differ (Day 8: t = 1.4, *ns*; Day 9: t = 1.407, *ns*; Day 10: t = 1.417, *ns*; Day11: t = 0.988, *ns*).

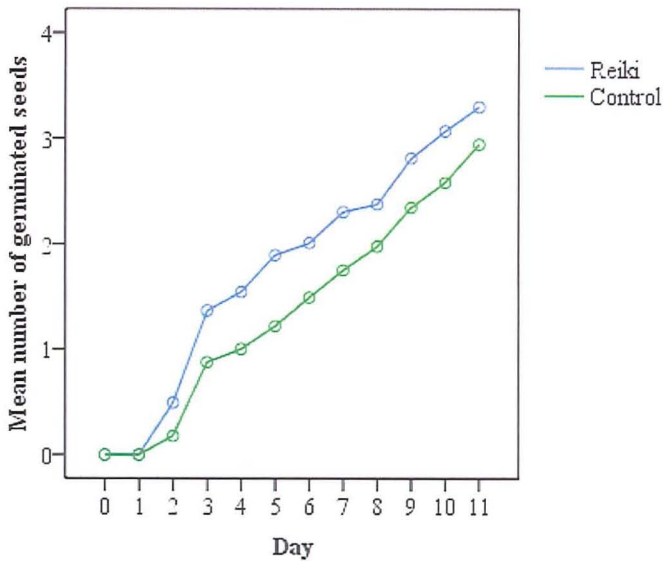

Figure 26. The mean numbers of Reiki and Control seeds germinated in a dish-quadrant on each day of Experiment 1.

5.3.2.1.4. Dish Order

The mean (and standard deviation) numbers of germinated seeds for the dishes given Reiki First, Second, Third and Fourth, and their Controls, on each day of Experiment 1 are shown in Table A8 in the Appendix.

Unlike the overall analyses of the experiments, Dish-Order was found to influence the results of the first experiment for the sample as a whole, and the four-way mixed ANOVA found a significant Time x Dish-Order interaction ($F = 2.644$, $P = 0.006$). Restricting the dataset to the Reiki and Control seeds separately disclosed a significant Time x Dish-Order interaction for the Reiki seeds ($F = 4.195$, $P = 0.006$), although

there was also a significant interaction for the Controls (F = 5.606, $P < 0.001$). Posthoc Tukey tests indicated that the germination of the Reiki dishes treated Fourth significantly exceeded the germination of those treated Second (Mean Difference = 1.2326, $P = 0.003$) and Third (Mean Difference = 1.1528, $P = 0.006$), accompanied by near-significant comparatively greater germination than those treated First (Mean Difference = 1.0139, P = 0.017). However, for the Controls posthoc Tukey tests disclosed that the germinations of the Second dish highly significantly differed from the Third (Mean Difference = 1.2217, $P < 0.001$) and Fourth (Mean Difference = 0.9687, $P = 0.001$) dishes, and the difference between the First dish was near-significant (Mean Difference = 0.75, $P = 0.017$). Figure 27 shows the mean number of germinated seeds per dish-quadrant for the Reiki dishes treated First, Second, Third and Fourth on each day of Experiment 1, and their corresponding Control dishes are shown in Figure 28.

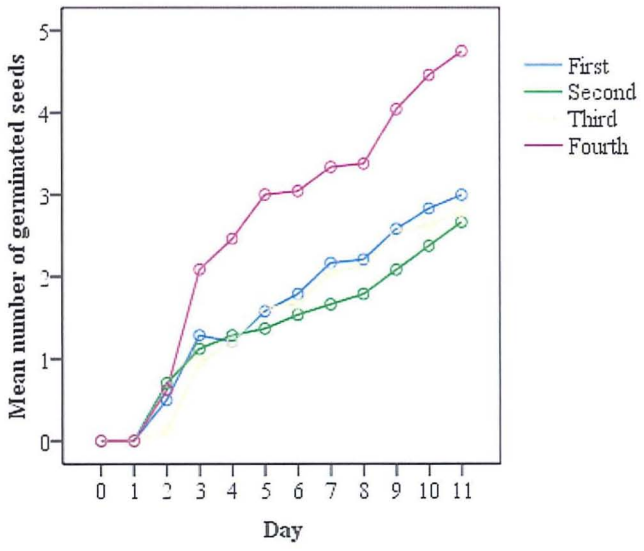

Figure 27. The mean numbers of germinated seeds in a dish-quadrant for the Reiki dishes treated First, Second, Third and Fourth on each day of Experiment 1.

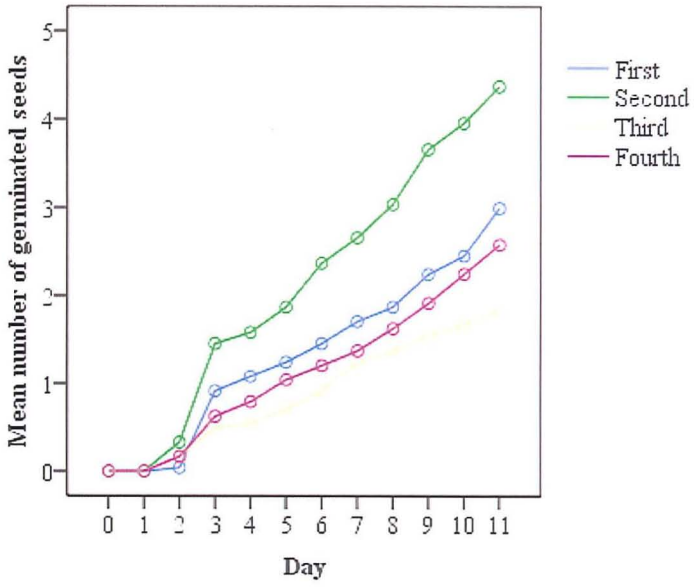

Figure 28. The mean number of germinated seeds in a dish-quadrant for the Control dishes treated First, Second, Third and Fourth on each day of Experiment 1.

There was also a highly significant Time x Group x Dish-Order interaction ($F = 6.974$, $P < 0.001$). Figures 29-31 show the mean numbers of germinated Reiki and Control seeds in a quadrant on each day of Experiment 1 for the dishes treated Second, Third and Fourth respectively.

Restricting the dataset to each Dish-Order separately disclosed a highly significant Time x Group interaction for the dishes treated Second ($F = 8.3$, $P < 0.001$), where the control seeds had higher germination each day from Day 3 onwards, as can be seen in Figure 29. This may have been due to the substantively higher germination of the Second Control dishes than the other three Control dishes. Independent samples t-tests disclosed that the Control seeds has significantly higher germination from Day 8 onwards, and trends of this nature on Day 6 and Day 7, although the groups did not significantly differ on any earlier days (Day 2: $t = 1.406$, *ns*; Day 3: $t = -8.61$, *ns*; Day 4: $t = -6.97$, *ns*; Day 5: $t = -1.297$, *ns*; Day 6: $t = -2.209$, $P = 0.038$; Day 7: $t = -2.353$, P

= 0.028; Day 8: t = -2.934, *P* = 0.008; Day 9: t = -3.433, *P* = 0.002; Day 10: t = -3.062, *P* = 0.006; Day 11: t = -2.856, *P* = 0.009).

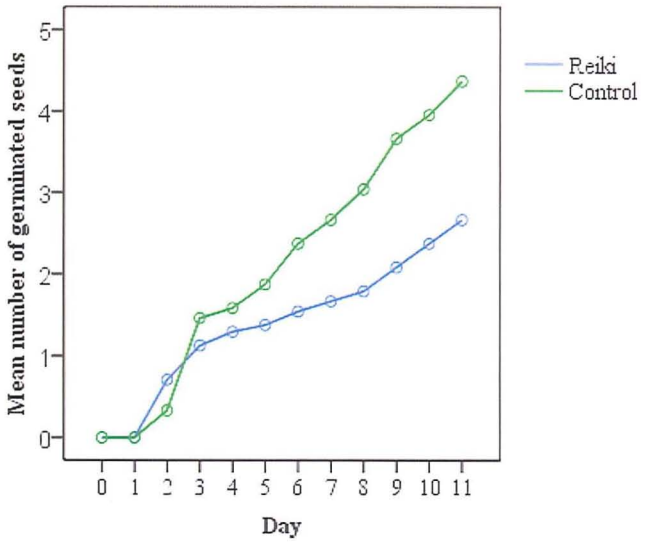

Figure 29. The mean number Reiki and Control seeds germinated in a dish-quadrant for the dishes treated Second on each day of Experiment 1.

There was also a tendency towards a Time x Group interaction for the dishes treated Third (F = 3.609, *P* = 0.024), although here the Reiki seeds had higher germination from Day 3 onwards, as is shown in Figure 30. Independent samples t-tests found a trend for the Reiki group to have higher germination on Day 5, although the groups did not statistically differ on any other day (Day 2: t = -.321, *ns*; Day 3: t = 1.421, *ns*; Day 4: t = 1.807, *P* = 0.084; Day 5: t = 2.429, *P* = 0.024; Day 6: t = 1.756, *P* = 0.093; Day 7: t = 1.648, *ns*; Day 8: t 1.509, *ns*; Day 9: t = 1.903, *P* = 0.07; Day 10: t = 1.793, *P* = 0.087; Day 11: t = 1.743, *P* = 0.095 (t-tests could not be conducted for Day 1 as no seeds had germinated)).

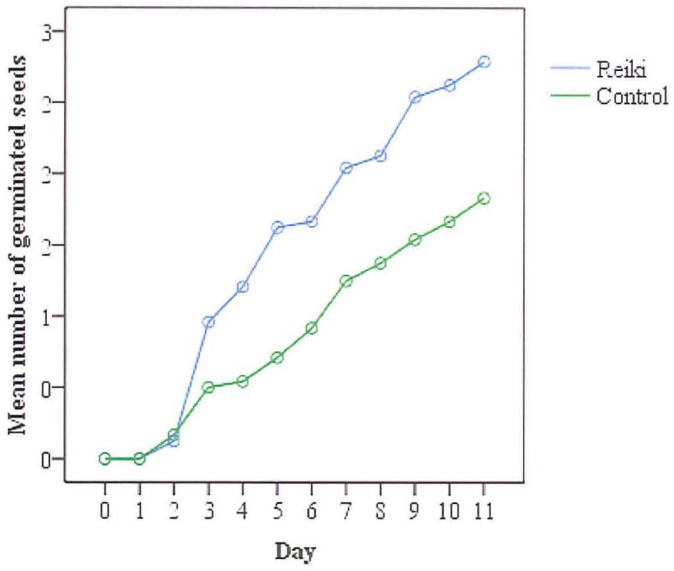

Figure 30. The mean number of Reiki and Control seeds germinated in a dish-quadrant for the dishes treated Third on each day of Experiment 1.

An even larger Time x Group interaction was seen for the dishes treated Fourth ($F = 10.887$, $P < 0.001$), as shown in Figure 31.

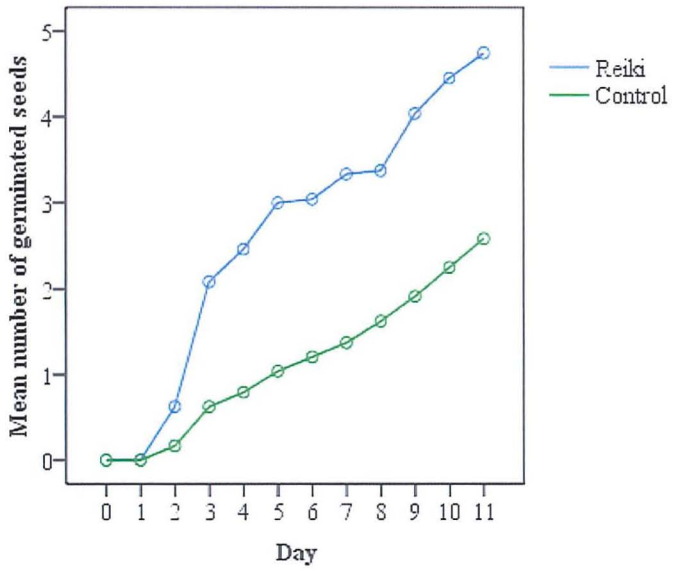

Figure 31. The mean numbers of Reiki and Control seeds germinated in a dish-quadrant for the dishes treated Fourth on each day of Experiment 2.

Independent samples t-tests indicated that the comparatively greater germination of the Reiki seeds was significant from Day 3 onwards, although the difference between the groups on Day 2 was nonsignificant (Day 2: t = 1.421, *ns*; Day 3: t = 3.035, $P = 0.006$; Day 4: t = 2.888, $P = 0.009$; Day 5: t = 3.309, $P = 0.003$; Day 6: t = 3.24, $P = 0.004$; Day 7: t = 3.24, $P = 0.004$; Day 8: t 2.96, $P = 0.007$; Day 9: t = 2.968, $P = 0.007$; Day 10: t = 3.16, $P = 0.005$; Day 11: t = 3.336, $P = 0.003$ (a t-test could not be conducted on Day 1 as no seeds had germinated)).

No Time x Group effect was found for the dishes treated First, however (F = 0.45, ns).

5.3.2.1.5. Practitioner

The mean (and standard deviation) numbers of germinated seeds in a quadrant for the Reiki and Control dishes of each of the practitioners in Experiment 1 are shown in Table A4 in the Appendix.

The overall germinations of the samples of the different practitioners of Experiment 1 also differed, and the four-way mixed ANOVA found a significant Time x Practitioner interaction (F = 3.428, $P = 0.004$). However, restricting the dataset to the Reiki and Controls seeds separately suggested that that was due to the differing germinations of the Reiki dishes of the practitioners (F = 5.121, $P < 0.001$), as there was no difference in the Controls (F = 0.846, ns). There was also a significant Time x Group x Practitioner interaction (F = 3.701, $P = 0.002$), although as the analyses of the eight individual practitioners was detailed above, consideration of the individual practitioners of Experiment 1 is unnecessary.

5.3.2.1.6. Summary of Experiment 1

The seeds treated with Reiki in Experiment 1 had a tendency towards higher overall germination on average than their controls (P = 0.033). There were trends for significantly more Reiki seeds to have germinated on each day of the experiment from Day 2 to Day 7, although by Day 8 the groups did not statistically differ. There were also Dish-Order effects, including a tendency for the germination of the dishes treated Third to exceed their Controls (P = 0.024). An effect of this nature was also seen for the dishes treated Fourth, where the comparatively higher germination of the Reiki seeds was highly significant ($P < 0.001$). This effect was not seen in the dishes treated First and Second however. The germination of the Reiki and Control seeds did not statistically differ for the First dish, and for the Second dish the Control seeds had significantly higher germination ($P < 0.001$).

5.3.2.2. Experiment 2

5.3.2.2.1. Dish Number

Similarly to Experiment 1, there was no interaction between Time and Dish-Number (F = 0.83, ns) in Experiment 2.

5.3.2.2.2. Dish Quadrant

There was also no Time x Dish-Quadrant interaction (F = 1.719, ns) nor Time x Group x Quadrant-Number interaction (F = 0.266, ns).

5.3.2.2.3. Group

The four-way mixed ANOVA again found a highly significant main effect of Time (F = 438.46, $P < 0.001$). As can be seen from Figure 32, which shows the mean numbers of germinated Reiki and Control seeds in a quadrant on each day of Experiment 2, a

comparatively higher number of Reiki seeds had germinated throughout Experiment 2 from Day 3 onwards. However, the Time x Group interaction was nonsignificant (F = 2.532, $P = 0.07$).

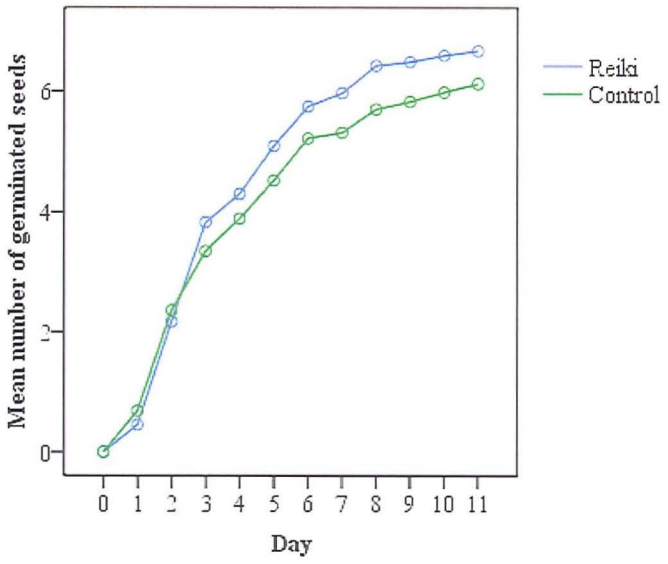

Figure 32. The mean numbers of Reiki and Control seeds germinated in a dish-quadrant on each day of Experiment 2.

5.3.2.2.4. Dish Order

The mean (and standard deviation) numbers of germinated seeds for the dishes given Reiki First, Second, Third and Fourth, and their Controls, on each day of Experiment 2 are shown in Table A9 in the Appendix.

Unlike in Experiment 1, the germination of the sample as a whole in Experiment 2 was not influenced by Dish-Order, and the four-way mixed ANOVA yielded no Time x Dish-Order interaction (F = 0.808, ns). However, there was a slight tendency towards a Time x Group x Dish-Order interaction (F = 1.987, $P = 0.05$). Conducting the ANOVA with the dataset restricted to each Dish-Order separately disclosed a near-significant Time x Group interaction for dishes treated Second (F = 4.622, $P = 0.011$). As can be

seen in Figure 33, which shows the mean numbers of germinated Reiki and Control seeds in a quadrant for the dishes treated Second on each day of Experiment 2, comparatively more Reiki seeds had germinated throughout the experiment from Day 3 onwards.

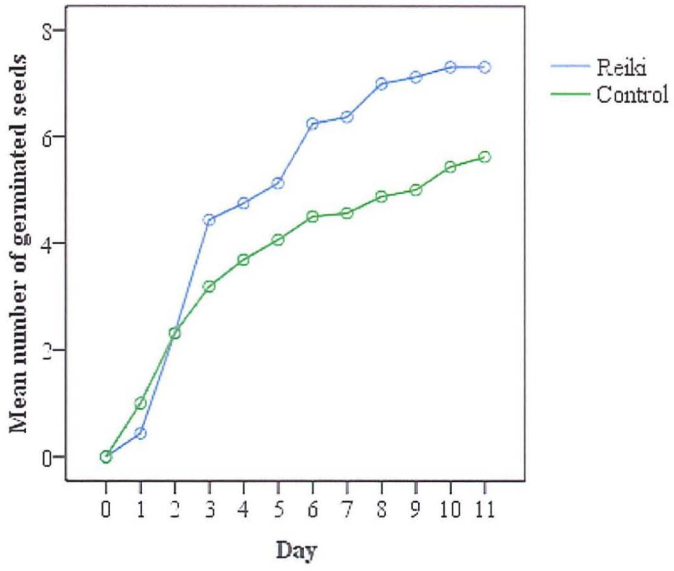

Figure 33. The mean numbers of Reiki and Control seeds germinated in a dish-quadrant for the dishes treated Second on each day of Experiment 2.

Independent samples t-tests indicated that although the Reiki and Control groups did not statistically differ from Day 0 to Day 7, the difference approached statistical significance on Days 8 to 11 (Day 1: t = -1.76, *ns*; Day 2: t = 0, *ns*; Day 3: t = 1.675, *ns*; Day 4: t = 1.495, *ns*; Day 5: t = 1.24, *ns*; Day 6: t = 1.952, $P = 0.071$; Day 7: t = 1.417, $P = 0.064$; Day 8: t = 2.348, $P = 0.034$; Day 9: t = 2.429, $P = 0.029$; Day 10: t = 2.301, $P = 0.037$; Day 11: t = 2.124, $P = 0.052$).

No Time x Group effects were found for the First (F = 1.097, ns), Third (F = 0.327, ns) or Fourth (F = 2.759, $P = 0.083$) dishes though.

5.3.2.2.5. Practitioner

The mean (and standard deviation) numbers of germinated seeds for the Reiki and Control dishes of each of the practitioners in Experiment 2 are shown in Table A5 in the Appendix.

Similarly to Experiment 1, the overall germinations of the samples of the different practitioners in Experiment 2 differed from one another, and a significant Time x Practitioner interaction was again found for the sample as a whole ($F = 5.603$, $P = 0.002$). When the dataset was restricted to just the Reiki and Control seeds separately though, there was only a near-significant Time x Practitioner interaction for the Reiki seeds ($F = 4.097$, $P = 0.015$). The Control seeds of Practitioners 1 and 2 did not significantly differ ($F = 2.346$, ns). However, unlike in Experiment 1, here the Time x Group x Practitioner interaction was nonsignificant ($F = 0.998$, ns).

5.3.2.2.6. Summary of Experiment 2

Unlike in Experiment 1, where there was a tendency for the overall germination of the Reiki seeds to exceed the Controls, in Experiment 2 the overall comparatively greater germination of the Reiki seeds did not approach statistical significance ($P = 0.07$). Dish-Order effects were again found however, where unlike in Experiment 1 where the controls seeds of the dishes treated Second had greater overall germination than the Reiki seeds, here the Reiki seeds of the dishes treated Second had near-significantly greater germination than the Controls ($P = 0.011$).

5.3.2.3. Experiment 3

Highly significant Pearson's correlations were again found between the two scorers' counts on each day of Experiment 3 except for Day 2 (Day 1: $r = 0.704$, $P < 0.001$; Day 2: $r = 0.095$, ns; Day 3: $r = 0.525$, $P < 0.001$; Day 4: $r = 0.337$, $P = 0.001$; Day 5: r =

0.901, $P < 0.001$; Day 6: r = 0.929, $P < 0.001$; Day 7: r = 0.866, $P < 0.001$; Day 8: r = 0.930, $P < 0.001$; Day 9: r = 0.874, Day 10: r = 0.925, $P < 0.001$; Day 11: r = 0.927, $P < 0.001$). Since few seeds had germinated on Day 2 and there were very high correlations between the counts of the two scorers from Days 3 onwards, the mean of the two scorers' counts was again used in the analyses.

5.3.2.3.1. Dish Number

As with the other experiments, no interaction between Time and Dish-Number was found (F = 0.824, ns).

5.3.2.3.2. Dish Quadrant

There was also no Time x Dish-Quadrant interaction (F = 1.71, ns) or Time x Group x Quadrant-Number interaction (F = 0.251, ns).

5.3.2.3.3. Group

A highly significant main effect of Time was found for Experiment 3 (F = 544.377, $P < 0.001$), although there was no Time x Group interaction (F = 2.295, ns). The mean numbers of germinated Reiki and Control seeds per dish-quadrant for each day of Experiment 3 are shown in Figure 34.

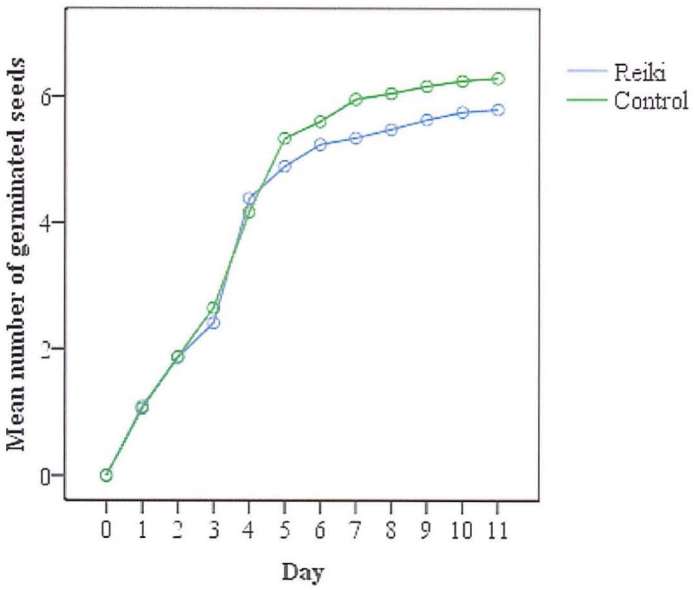

Figure 34. The mean numbers of Reiki and Control seeds germinated in a dish-quadrant for each day of Experiment 3.

5.3.2.3.4. Dish Order

The mean (and standard deviation) numbers of germinated seeds in a quadrant for the dishes given Reiki First, Second, Third and Fourth, and their Controls, on each day of Experiment 3 are shown in Table A10 in the Appendix.

As with Experiment 2, no Time x Dish-Order interaction was found (F = 0.589, ns), although there was a significant Time x Group x Dish-Order interaction (F = 3.354, P = 0.005). Conducting the ANOVA with the dataset restricted to each Dish-Order separately disclosed a Time x Group interaction for the dishes treated First (F = 9.831, P = 0.001). Figure 35 shows the mean number of germinated Reiki and Control seeds in a quadrant for the dishes treated First for each day of Experiment 3, and it can be seen that the Control seeds had higher germination on each day except for Day 2. Independent samples t-tests found that the greater germination of the Control group was statistically significant on each day of the third experiment except for Day 0 to Day

4 (Day 1: t = -0.192, *ns*; Day 2: t = 0.227, *ns*; Day 3: t = -0.171, *ns*; Day 4: t = -0.684, *ns*; Day 5: t = -2.833, *P* = 0.01; Day 6: t = -3.035, *P* = 0.006; Day 7: t = -3.904, *P* = 0.001; Day 8: t = -3.602, *P* = 0.002; Day 9: t = -3.642, *P* = 0.001; Day 10: t = -3.406, *P* = 0.003; Day 11: t = -3.433, *P* = 0.002).

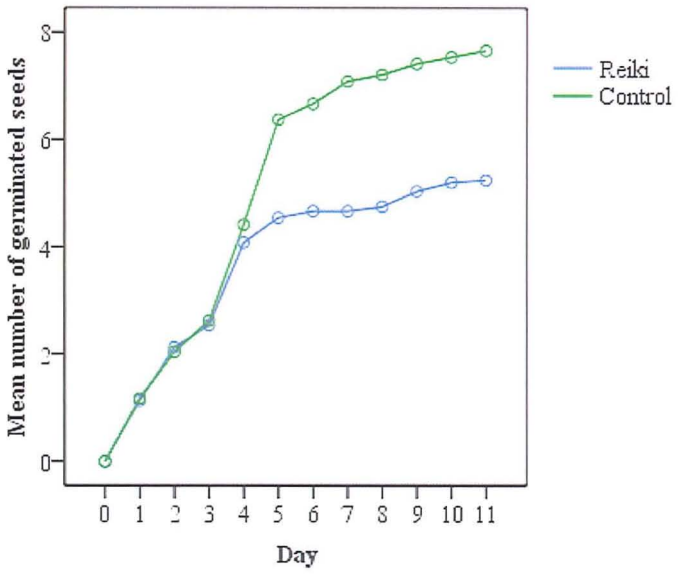

Figure 35. The mean numbers of germinated Reiki and Control seeds in a dish-quadrant for the dishes treated first on each day of Experiment 3.

The Time x Group interactions for the Second (F = 0.145, ns), Third (F = 1.662, ns) and Fourth (F = 1.434, ns) dishes were all nonsignificant though.

5.3.2.3.5. Practitioner

Table A6 in the Appendix shows the mean (and standard deviation) numbers of germinated seeds in a quadrant for the Reiki and Control dishes of each of the practitioners in Experiment 3.

No Time x Practitioner effect was found (F = 1.689, *ns*), and the Time x Group x Practitioner interaction was also nonsignificant (F = 1.759, ns).

5.3.2.3.6. Summary of Experiment 3

Similarly to Experiment 2, in Experiment 3 the overall germinations of the Reiki and Control seeds did not statistically differ. However, there was a significant Time x Group effect for the dishes treated First (P = 0.001), where the germination of the Control seeds substantively exceeded the Reiki seeds on each day of the experiment from Day 5 onwards. However, no Time x Reiki-Group affects occurred for the other Dish-Orders.

5.4. Discussion

Our goal was to conduct three rigorous experiments with the same replicable double-blind design in order to investigate whether the germination of irradiation-damaged seeds in constant controlled conditions can be influenced by Reiki above and beyond placebo effects. However, overall analysis of the data from the three experiments did not disclose a significant difference between the germination of the Reiki and Control seeds. While there was a tendency for the overall germination of the Reiki seeds to exceed the controls in Experiment 1 (P = 0.033), no statistical differences were found between the groups in the subsequent two experiments. Thus it does not appear that Reiki had an overall effect on the germination of the seeds.

Considering the germination of the seeds as a whole, overall only 41% of the seeds used in the study germinated, whereas 57% of gamma-irradiated canary seeds were reported to germinate in the Teixeira et al. study (2001). It was found in the current study though that nearly twice as many seeds germinated in both the latter experiments as in the first, where only 26% of seeds germinated on average. This suggests that the conditions in which the seeds were maintained in Experiment 1 were not optimal for

germination, and differed from the conditions in Experiments 2 and 3. Although the seeds in all three experiments were incubated at a temperature of $24 \pm 0.5^{\circ}C$, the monitoring of the germination of seeds was performed at room temperature. The room temperature differed for the three experiments, and the weather was considerably warmer in May 2009 when the first experiment was carried out. In addition, the experimenters took an average of two hours a day to perform the germination count in Experiment 1, as compared to an average time of one and a quarter hours in the latter two experiments, when the experimenters were more experienced at judging germination. It thus seems likely that the dishes may have dried out slightly when the germination count was being performed in the first experiment, so that less water was available to trigger germination. Nonetheless the 53% of seeds that germinated in Experiment 2 and the 50% of seeds that germinated in Experiment 3 are still notably lower than the 57% of irradiated seeds that germinated in the Gomes et al. study. This was perhaps because the seeds in the Gomes et al. study were dissected and only the embryonic halves used in their germination experiments, which enhanced the water diffusion towards the embryonic tissue and permitted the radical irruption through the coleorhyza of a seed to be viewed through a microscope.

While there was no overall effect of Reiki on seed germination, some practitioners produced Reiki seeds whose overall germination statistically differed from the control seeds, while other practitioners did not.[4] In Experiment 1, the overall germination of the seeds treated by the first practitioner substantively exceeded the Controls ($P = 0.001$), whereas there was no difference between the Reiki and Control seeds for the second or third practitioners. Similarly, in Experiment 2 the overall germination of the

[4] Amongst the eight Reiki Masters who participated in the study, only two were males and the significant positive overall Reiki effects seen for individual practitioners were obtained with a practitioner of either sex.

Reiki seeds of the first practitioner was again significantly greater than the Controls (P = 0.034), while there were no group differences for the second practitioner. Conversely, in Experiment 3 the germination of the control seeds of the first practitioner exceeded the Reiki seeds (P = 0.044), while there were no group differences for either of the other practitioners. The question is raised of whether the varying effects observed for the different practitioners could perhaps have arisen due to varying levels of practitioner skill. The highly significant greater overall comparative germination of the Reiki-treated seeds of Practitioner 1 in the first experiment in particular suggests that this may have been the case. It has been found though that the same practitioners may not produce the same outcomes in different studies (Taft, Moore and Yount 2005; Yount et al., 2004), and also that the well-being of Reiki practitioners may influence their results (Rubic et al., 2006). Conducting further replications of the experiments but using the same practitioners in each one would help to evaluate whether the same practitioners may tend to produce similar results in each experiment.

Another interesting finding of the trial was that in all three experiments the order in which the dishes were given Reiki seemed to effect the comparative germinations of the groups, particularly in Experiment 1. In the first experiment there were no statistical group differences for the dishes treated First, and for the dishes treated Second the control seeds had comparatively greater germination than the Reiki seeds ($P < 0.001$). Although they also had comparatively higher germination than the control dishes of the dishes given Reiki First, Third and Fourth, which may explain this finding. Unlike the dishes treated First and Second, though, the germination of the seeds given Reiki Third and Fourth exceeded the controls, particularly for the dishes treated Fourth ($P < 0.001$). In Experiment 2, the germination of the seeds treated Second exceeded the controls (P = 0.011), although no group differences were seen for the dishes treated First, Third or

Fourth. No group effects favouring the Reiki seeds were found in Experiment 3 however, where the only Dish-Order effect was that the germination of the Control seeds of the First dishes exceeded the Reiki seeds ($P = 0.001$).

Overall analysis of the data from all three experiments disclosed a significant Time x Reiki-Group x Dish-Order interaction ($P = 0.001$), whereby the germination of the Reiki-treated dishes increased progressively relative to their Control dishes in accordance with the order in which they were treated. The overall germination of the Control dishes of the dishes given Reiki First significantly exceeded the Reiki dishes ($P = 0.001$). No difference was then seen between the germination of the Reiki and Control dishes of the dishes treated Second. For the dishes treated Third, there was a trend for the Reiki-treated seeds to have higher germination than their Controls ($P = 0.074$). For the dishes given Reiki last, the comparatively greater germination of Reiki-treated dishes was near-significant ($P = 0.052$). These results are in accordance with our hypothesis that the dishes treated with Reiki last would have higher germination compared to their control dishes than the dishes treated first, which seems to suggest that the effectiveness of Reiki may have increased over the total 60 minutes of treatment.

However, overall for the three experiments, the germination of the Control dishes of the dishes treated First was comparatively greater than that of the Controls of the dishes treated Third ($P = 0.063$) and Fourth ($P = 0.055$). Since the Control dishes were maintained in constant, identical conditions for each experiment, it follows that the comparatively greater germination of the Controls of the dishes treated First probably arose by chance. It therefore seems possible that the higher overall germination of the Reiki dishes treated Third and Fourth relative to their Controls may have arisen by

chance too. Thus, no conclusions can be drawn with regards to whether the order that the dishes received Reiki effected the comparative germination of the Reiki and Control seeds. While a total of 3072 seeds were used in the study over the three experiments, the chance effects found for the Control dishes indicate that the study would have been strengthened by using a larger number of seeds. Especially considering that 58% of the seeds used in the study did not germinate. If the dishes had contained more seeds then it would have been less likely that dishes would be chance contain a significantly higher proportion of seeds sufficiently damaged that they could not germinate.

However, it may be speculated that the comparatively greater overall germination of the Reiki seeds for the dishes treated third and fourth but not for those treated first and second arose because time was needed for the practitioners to adopt a meditative or healing state of mind, which is considered necessary when giving Reiki (Rand, 2002). This idea is consistent with the findings of Rubic et al. (2006) – that heat-shocked Escherichia coli K12 bacteria given Reiki only had greater growth than control cultures when the practitioners had treated a patient with chronic pain immediately before treating the bacteria. A similar effect may have occurred in the current study, where since the practitioners were not accustomed to treating seeds in petri dishes they were not immediately able to adopt the healing state of mind required for effective Reiki healing. It is possible that if the practitioners had treated a patient before treating the seeds, then the dishes of seeds that were given Reiki first may have demonstrated higher germination, which is a hypothesis worthy of investigation.

In conclusion, while no overall effect of Reiki was found, the results of the study are equivocal with regards to whether the Reiki seeds of certain practitioners had higher

overall germination than the controls by chance or due to differing levels of practitioner skill. It is also not clear whether the Reiki-treated seeds for the dishes treated third and fourth had comparatively greater overall germination because of a Reiki effect or simply because the germination of certain dishes of seeds exceeded others by chance. However, these results taken together with the unambiguous findings of studies that have reported greater seed germination to occur after treatment with biofield therapies (Grad, 1967, 1965, 1963, 1964; Haid and Hubricar, 2001; Teixeira et al, 2001; Creath and Schwartz, 2004) warrant further rigorous double-blind trials where healing is given to a larger sample of seeds.

Chapter 6. Conclusion

6.1. Summary of the research conducted

The overall goal of the PhD was to investigate whether Reiki is effective, and if so whether its effectiveness can be attributed to subtle-energy effects, rather than to patient and practitioner expectation that healing will occur, or to other nonspecific factors such as relaxation. If it could be consistently shown through replicated randomised placebo-controlled trials that subjects who receive Reiki demonstrate significantly greater benefits than control subjects, this would suggest that a subtle-energy effect may be taking place. The challenge however is in conducting a Reiki intervention where the subjects, the experimenters and the practitioners are all blind to participant group allocation, since Reiki as it is generally practiced involves close patient and practitioner proximity. The research presented aimed to address this issue, and while the first study consisted of exploratory case studies, the second, third and fourth studies were RCTs designed to control for placebo and to minimise experimenter bias as far as possible.

The intention initially was to investigate the efficacy of treating Chronic Fatigue Syndrome (CFS) with Reiki. Thus, the first study of the PhD was a non-controlled exploratory feasibility study involving CFS patients, detailed in Chapter 2. Three case studies were conducted in the spring of 2007, where seven hour-long Reiki sessions were given to three chronic fatigue syndrome (CFS) patients over a period of seven weeks. As hypothesized, all three patients were found to be in better overall health at the end of the intervention than at its start, and the improvements were maintained in two out of three of the patients at eight-week follow-up. However, due to the small patient sample and the lack of a control group, it is not possible to infer whether the

observed improvements were due to placebo, relaxation effects or chance, rather than to a subtle energy exchange.

The original intention had been to follow the CFS case studies with a RCT where Reiki would be administered to a far larger sample of CFS patients. However, difficulties were encountered in conducting the case studies, and it was considered more sensible to use a different participant group. This led to the RCT detailed in Chapter 3 where normally-healthy Psychology undergraduates received ten roughly 20-minute sessions of Reiki or a non-Reiki control over a period of two to 12 and a half weeks. A method of blinding participants to the receipt of Reiki was developed for the study, where a Reiki practitioner sat behind each participant throughout their 10 sessions and sent non-contact Reiki to those in the Reiki group. The Reiki group demonstrated a statistically significant overall improvement in illness symptoms compared to the control group ($P = 0.001$), accompanied by a near-significant comparative reduction in Stress ($P = 0.057$). However, the Reiki group also had comparatively higher illness-symptoms and stress scores at baseline, which allowed them more room for improvement, and the results are thus inconclusive. One possible interpretation of the findings is that the differential patterns of change of the groups arose due to convergence towards the mean, rather than due to a Reiki effect. Alternatively, it could be argued that while the higher baseline scores of the Reiki group may explain their marginal improvement in illness symptoms, they do not wholly explain the pervasive and reliable increase in illness symptoms seen in the controls, irrespective of their baseline scores. This could possibly suggest that the Reiki buffered the decline in health seen in the control group, which may have arisen due to the pressures of the academic year.

A constructive replication of the first RCT was conducted following the CFS case studies, where the impact of Reiki on anxiety and depression was examined while employing a design which ensured that the baseline scores of the groups did not differ. 40 students - half with high depression and/or anxiety and half with low depression and/or anxiety – received Reiki or a non-Reiki-control. Participants experienced six 25-minute sessions over two to eight weeks, where their attention was absorbed in a guided-relaxation in order to facilitate Reiki-blinding. The efficacy of the intervention was assessed pre-post intervention and at five-week follow-up by self-report measures of mood, illness symptoms and sleep. The Reiki group did not demonstrate the comparatively greater reduction in symptoms of illness seen in our earlier study. However, the participants with high anxiety and/or depression who received Reiki showed a progressive improvement in overall mood, which was significantly better at five-week follow-up, while no change was seen in the controls. While these mood benefits support those seen in our earlier study, and here there were no baseline group differences, due to the small sample of participants in the high negative effect group the results must be interpreted with caution.While the first three studies of the PhD were investigations of the therapeutic effectiveness of Reiki in human participants, the final study investigated the effects of Reiki on the germination of seeds maintained in constant, controlled conditions. This study consisted of three separate double-blind experiments, where in each experiment different Reiki Masters each treated four dishes of gamma-irradiated canary seeds for 15 minutes per dish. A total of eight practitioners took part – three in each of the first and third experiments and two in the second experiment. Following treatment with Reiki, the seeds were incubated at $24 \pm 0.5^{\circ}C$ for 12 days together with Control dishes of irradiated seeds that did not receive Reiki. The numbers of germinated Reiki and Control seeds were monitored daily by two

independent experimenters whom were blind to which dishes had received Reiki, and these data were compared at the end of the study. The central hypothesis was that a greater number of Reiki-treated seeds than Control seeds would germinate overall over the course of each experiment. Since the experimenters who monitored the germination of the seeds were blinded to group allocation, as were the seeds themselves presumably, the experiment was placebo-controlled. The Reiki and Control seeds had mutual, constant, identical conditions throughout the experiments, although a minor exception to this is that the Reiki-treated petri-dishes were briefly held by the practitioners whilst they carried them between rooms in order to administer Reiki. Thus the Reiki-treated seeds may have briefly been exposed to thermal radiation from the practitioners' hands, which was not the case for the Control seeds.

Overall analysis of the three experiments did not find that the germination of the Reiki and Control seeds statistically differed. Analysis of the experiments separately found that although significantly more Reiki seeds germinated overall in the first experiment ($P = 0.033$), in the second and third experiments there were not statistical differences in the overall germinations of the Reiki and Control seeds.

Statistically significant practitioner and dish-order effects were found however. Separate consideration of the seed-germination data for each practitioner disclosed that two out of the eight practitioners who took part produced Reiki-treated seeds with statistically significantly higher overall germination than their Control seeds. Whereas, for five of the practitioners the germination of the Reiki-treated seeds did not statistically differ from the Controls, and for one of the practitioners the germination of the Control seeds significantly exceeded the Reiki-treated seeds. One possible interpretation of these findings is that the varying results found for the different

practitioners arose due to differing levels of practitioner skill. The highly comparatively greater germination of the Reiki-treated seeds of one practitioner in particular (P = 0.001) would support this hypothesis. Another interpretation though is that the differing practitioner affects arose by chance.

Significant effects of Dish-Order – the order in which the practitioners gave Reiki to their four dishes of seeds – were found in all three experiments conducted and also when the three experiments were analysed overall. Overall analysis of the three experiments showed a tendency for the germination of the Reiki dishes of seeds to increase relative to their Controls in accordance with the order in which the practitioners treated the dishes. The dishes that the practitioners treated First had significantly lower overall germination than their Control dishes (P = 0.001). The germination of the dishes treated second did not statistically differ from their Controls. The dishes treated Third tended to have higher overall germination that their Control dishes (P = 0.074), and for the dishes treated Fourth the comparatively higher germination of the Reiki seeds was near-significant (P = 0.052). These findings support our hypothesis that the beneficial effects of Reiki on the germination of seeds would increase in proportion to the length of time that the practitioners had been giving Reiki. However, the overall germination of the Control dishes of the dishes treated First was comparatively higher than the Controls of the dishes treated both Third (P = 0.063) and Fourth (P = 0.055). Since the Control dishes did not receive Reiki and were maintained in constant, identical conditions for each experiment, the comparatively greater germination of the Control dishes treated first presumably arose by chance. It thus seems possible that the dishes treated with Reiki third and fourth had higher germination than their Control dishes by chance as well.

6.2. Overall Conclusions

Overall benefits were seen in the participants treated with Reiki in all three of the studies conducted with human participants, which supports the therapeutic effectiveness of Reiki. However, the goal of the PhD was to investigate whether the reported effectiveness of Reiki (Miles and True, 2000) is partly attributed to a subtle energy exchange between the practitioner and recipient, rather than wholly due to nonspecific effects such as placebo. Since the CFS case studies conducted were non-controlled, the benefits seen in the patients following the intervention may have arisen due to due to placebo, relaxation or chance. However, the university students who participated in the two RCTs that followed the case studies were blinded to whether or not they received Reiki. A method of blinding participants to Reiki was developed, where non-contact Reiki was given to students whose attention was occupied by undergoing self-hypnosis or guided relaxation. The blinding method was found on the whole to have been effective in both studies, suggesting that the comparative overall benefits seen to occur in the Reiki participants may not have been due to participant expectation. However, due to the limitations of these studies, it cannot be concluded that the benefits arose due to an effect of Reiki either.

A shortcoming of these studies was that the investigator who conducted the intervention sessions with participants also administered the Reiki, and so knew which groups the participants were in. The investigator was careful to interact in an identical manner with the Reiki and no-Reiki participants so as not to influence the expectations of the participants or to give away any clues about their group membership. However, the possibility that the experimenter unknowingly exerted bias in her treatment of the Reiki and control participants weakens the conclusions that can be drawn regarding an energy-healing effect. Another shortcoming of these two single-blind RCTs was the

large variation in intersession interval, although this was not found to affect the results of either study. There were also unequal baseline illness symptoms and mood scores of the Reiki and control participants in the first RCT, despite the random assignment of participants to groups, which allowed more room for potential improvement in the Reiki group, so the results are inconclusive. Although the baseline scores of the Reiki and Control groups did not differ in the second student trial, little can be concluded from the comparatively greater mood benefits of the high negative affect participants who received Reiki due to the small sample size. Thus, while significant benefits were seen to follow Reiki compared to controls who did not receive Reiki in both student studies, the findings are merely suggestive.

Nonetheless, while the results of the two single-blind RCTs are inconclusive, the benefits for symptoms of illness and the replicable benefits for mood call for further investigation, particularly since other biofield therapy interventions have found similar results. The mood benefits seen in students following Reiki treatment in the second and third studies accord with the mood benefits seen in students after training in Johrei (Naito et al., 2003; Laidlaw et al., 2003). In one RCT where medical students were randomised to Johrei, hypnosis or relaxation training (Naito et al. (2003), all but one of the 12 Johrei participants showed an increase in CD3-CD+ natural killer cell percentages with decreased percentages of CD3+CD4. Whereas in the hypnosis and relaxation groups any decline with exam stress was merely buffered for the groups as a whole. Reductions in anxiety, depression, anger and loss of vigour and confusion were also seen to follow Johrei training, although this study was also limited by its small sample size. Even so, these mood benefits and those found with Reiki in the second and third studies of the PhD, while they are inconclusive, support the findings of the systematic review of proximally-practiced biofield therapies conducted by Jain and

Mills (2009). Although the numbers of studies reviewed were insufficient for there to be an evidence-based synthesis of healthy participant populations or populations with mood disorders, there was moderate evidence that biofield therapies decrease anxiety in hospitalised populations.

Regarding the final study of the PhD, Reiki did not appear to have an overall effect on seed germination, since overall analysis of the three experiments found no statistical differences between the groups. However, since the Reiki seeds of certain practitioners had comparatively greater overall germination than their controls, it could be interpreted that some practitioners were successful in positively effecting the germination of their seeds, whilst the other practitioners were not. If this were the case then conducting successive replications of the experiments using only the practitioners for whom significant effects were found may stand a better chance of producing an overall replicable significant effect. This is a hypothesis worth investigating. However, it may also be interpreted that the absence of a statistical difference in the overall germination of the groups was due to an absence of a Reiki effect.

The significant Dish-Order effects found overall for the three experiments may also be subject to more than one interpretation. The first is that Reiki did have an effect on the germination of the seeds, but only on the latter two dishes treated - possibly because the practitioners required time to "warm up". While no positive effect of Reiki was found on the dishes treated either first or second, the dishes that the practitioners treated third and fourth both had higher overall germination than their control dishes. This is in accordance with our hypothesis, which predicted that the germination of the Reiki-treated dishes would increase relative to their control dishes progressively as the time that the practitioners had been giving Reiki increased. Perhaps the practitioners needed

time to adopt a meditative or healing state of mind, which may be necessary for Reiki to be effective. The findings of Rubic et al. (2006) support this theory. These authors reported that heat-shocked Escherichia coli K12 bacteria given Reiki only showed greater growth than control cultures when the practitioners had treated a patient with chronic pain immediately before treating the bacteria. One interpretation of the current seed study is thus that since the practitioners were not accustomed to giving Reiki to seeds they could not immediately adopt the healing state of mind necessary for effective healing. If the practitioners had treated a patient before treating the seeds, as had the practitioners in the Rubic et al. study before treating bacteria cultures, then the dishes of seeds given Reiki first and second may also have shown higher overall germination than their control dishes.

However, the control dishes of the dishes treated first had higher germination than the control dishes of the dishes treated both third and fourth, which presumably arose by chance, and probably explains why they had significantly higher germination than the Reiki dishes treated first. It thus seems conceivable that certain Reiki dishes may also have had higher germination than other dishes by chance, which may explain why the dishes of seeds that received Reiki third and fourth had comparatively higher overall germination than their control dishes. Thus, as with the other studies presented in this thesis, no conclusions can be drawn with regards to an effect of Reiki. In light though of the greater overall germination of the Reiki seeds than their controls for the dishes treated third and fourth, which is in accordance with hypothesis, further investigation of whether practitioners require a "warm-up" time in order for Reiki to be effective is needed.

6.3. Future Research Directions for Reiki and Other Biofield Therapies

A 2009 systematic review of biofield therapies as they are practiced proximally stated that the 66 clinical trials included in the review were of medium quality and met minimum standards for validity of inferences (Jain and Mills, 2009). The authors concluded that there is strong evidence that biofield therapies reduce pain intensity in pain populations, and moderate evidence for reducing pain in hospitalised and cancer populations as well as for decreasing negative behavioural symptoms in dementia and for decreasing anxiety for hospitalized populations. The results of this systematic review are encouraging for the efficacy of biofield therapies, although it is possible that biofield interventions with negative outcomes have been conducted and not published. The influence that publication bias can have on the results of systematic reviews and meta-analyses is well documented (Dickersin, 1990; Egger and Smith, 1998; Ernst and Pittler, 1997; Pittler et al., 2000), and such publication bias may have led to an overall result more positive than the totality of all the studies of the efficacy of biofield therapies ever conducted would indicate. Nonetheless, the results of this systematic review, while they are in no way conclusive, support the hypothesis that biofield therapies may be effective above and beyond placebo and relaxation effects for the treatment of certain conditions.

In addition to the positive results of many of the trials of biofield therapies systematically reviewed by Jain and Mills (2009), a high proportion of the studies included in recent systematic reviews of Reiki (Lee et al., 2008; Vandervaart et al., 2009) have reported statistically significant outcomes. However, unfortunately the general poor quality of these Reiki trials and their inadequate reporting mean it is not presently possible to draw definitive conclusions about the effectiveness of Reiki. If studies of Reiki are to be evaluated and accepted based on their stated outcomes, then it

is essential that authors meet the necessary standards of methodological quality and reporting. These systematic reviews found that authors of Reiki trials often failed to report important aspects of study design such as randomisation and blinding, which greatly reduces the quality assessment of the trials. The CONSORT for Herbal Interventions (Gagnier et al., 2006), was developed to guide authors and reviewers in the necessary standards of designing and reporting of CAM studies. It is important for authors to adhere to these guidelines so that readers can assess the internal and external validity of trials and make reliable judgments about the influence of methodological flaws on the results.

Despite the poor quality of the evidence to support the efficacy of Reiki though, it is increasingly being used by patients with or without the knowledge of their physicians. Reiki is used to treat a wide range of emotional and physical conditions (Miles and True, 2000), and it is recommended by The NHS Trust Association (2006) and The Prince of Wales's Foundation for Integrated Health (2005) for the management of chronic diseases. Given the rise in patient spending in biofield therapies, it is essential that good quality RCTs are carried out in order to establish efficacy. In the current paradigm of evidence based medicine, RCTs are the ''gold standard'' for investigating the effectiveness of therapies, and only through validation through RCTs will biofield therapies such as Reiki be integrated into mainstream medicine. A potential problem with validating biofield therapies exclusively through RCTs, though, is that they may be restricted in their ability to fully measure the claimed holistic therapeutic effects of such therapies. It has been proposed that advanced research methods may be needed to measure these purported holistic healing effects, such as nested qualitative research within a RCT (Verhoef, 2005). It may be necessary to incorporate qualitative research methods into the designs of RCTs of biofield therapies, so that qualitative data may be

collected alongside quantitative data to obtain a more thorough understanding of their effects. A potential weakness of the present PhD was that qualitative data was not factored into the designs of the studies conducted, which may have prevented a deeper understanding being reached of the subjective nature of experiencing healing (Miles and True, 2000). It may thus be advisable for researchers of biofield therapies to incorporate qualitative data collection into the designs of their future trials.

A total of 31 different outcome measures were used in the 12 trials of Reiki systematically reviewed by Vandervart et al. (2009), which, as stated by these authors, indicates that researchers of Reiki are in an ''exploratory mode'' with regards to understanding its therapeutic effects. Different tools were used in these 12 RCTs to measure outcomes such as depression, pain and anxiety, and the differing results of the trials may be related to the appropriateness of the measures. It could be argued though that it makes sense to assess a wide range of outcomes when evaluating the effectiveness of biofield therapies, since they are purported to heal the whole patient as opposed to a particular symptom or condition. However, if the efficacy of Reiki is to be proven then it is important for researchers to employ common validated measuring tools in the treatment of certain conditions, so that the results of trials can be more easily evaluated and compared. Furthermore, none of the Reiki trials included in the systematic review of Vandervarl et al. mentioned their rationale for the treatment duration, and the optimal dosage of Reiki treatment requires further study.

Another potentially important issue in establishing the efficacy of Reiki is the choice of the practitioners that give healing in Reiki interventions. The findings of a systematic review of trials of distant healing suggests that biofield therapy practitioners should have been regularly practicing for a minimum of three years in order to be performing

optimally (Astin, Harkness and Ernst, 2000). In accordance with this, the recent systematic review of the therapeutic effectiveness of Reiki (Jain and Mills, 2009) found no significant outcomes in any Reiki trials that used Level I or II Reiki practitioners whom had less than 3 years experience. Whereas all but one of the studies that used a Reiki Master found a significant difference in the measured outcome in the Reiki group. However, as was seen in the study detailed in Chapter 5, only 2/8 of the Reiki Masters who gave healing to irradiation-damaged seeds produced Reiki-treated seeds with overall germination that significantly exceeded that of the controls, indicating that training to Master-practitioner level is not sufficient for a practitioner to produce optimal results. Other research indicates that the same practitioner may produce different outcomes in different studies (Taft, Moore and Yount, 2005; Yount et al., 2004), suggesting that no Reiki practitioner may have an assured success rate. Given these findings, it would seem sensible for future trials of Reiki to use Master-level practitioners with as much experience as possible, and to replicate an experiment a sufficient number of times for the efficacy of a practitioner to be demonstrated. Furthermore, due to differences in the levels of Reiki practitioner training, the varying brands of Reiki, and the varying teachings of Reiki schools, it is essential that the practitioners in Reiki trials and their techniques are clearly described.

In addition to the lack of rigorous scientific data to support the efficacy of Reiki, biofield therapies are controversial because their scientific mechanisms of action are unknown and seem implausible. Reiki claims to work through the transmission of 'subtle energy' or 'Ki' from a practitioner to a recipient, and this idea is incongruous with current scientific understanding. However, while neither biofields nor subtle energies have been shown to exist, it has been proposed that the biomagnetic fields that emanate from the hands of healers may be able to trigger healing in the body-tissues of

a patient (Oschman, 2000; Schwartz, 2008), as discussed in Chapter 1, Section 1.8. It has been repeatedly shown that exposure to extremely low frequency magnetic and electric fields produces biological responses in animals (Anderson, 1996), and ELF fields are used by mainstream medicine in PMFT to trigger healing in body tissues. Zimmerman (1990) and Seto et al. (1992) reported that the fields around healers' hands pulsed in a range of 0.3-30 Hz, with most of the frequencies centred around 7-8 Hz, which is the frequency used in PMFT to stimulate bone growth. Zimmerman and Seto et al. also both reported that the pulsing of healers' biomagnetic fields were significantly greater when the healers adopted a healing state of mind and intentionally "sent" healing. Furthermore, Seto et al. (1992) reported biomagnetic fields as strong as 0.0002 gauss around the hands of healers, which is 1000 times stronger than any other field emitted from the human body or from the hands of the healers themselves when they were not intentionally channelling healing. However, the magnetic fields strengths used in PMFT are 1000 times stronger still, and the notion that even the relatively strong fields purportedly produced by certain healers can affect health is incompatible with current scientific knowledge. While other researchers have measured the changes in the biomagnetic fields around healers hands using a gaussmeter (Schwartz, 2008), the experiments of Zimmerman (1992) have tended not to be replicated and extended due to the high cost of a SQUID. The findings reported by Zimmerman, Seto et al and Swartz do not provide evidence to support the theory that the biomagnetic fields produced by healers can facilitate healing. They do however suggest that the fields produced by healers when they are intentionally "sending" healing may differ from those produced when they are not, which is worthy of further investigation. Collaborative studies with physical sciences departments who have access to this equipment would help to facilitate further study in this area.

Research into the efficacy of biofield therapies such as Reiki is in its infancy, and designing trials which evaluate whether a therapy is effective above and beyond placebo and other nonspecific effects remains a challenge, since we do not know the conditions that may be required for efficacy. The effectiveness of such therapies may be dependent on the experience and skills of individual practitioners, or on the suitability of individual practitioners for treating the subjects and conditions being tested, or it may be dose-dependent. Cross-disciplinary collaborative studies with the physical sciences are needed to rigorously research possible scientific mechanisms of biofield therapies such as Reiki, as well as high-quality RCTs to evaluate their therapeutic effectiveness. Future researchers of Reiki should use rigorous randomised controlled designs which are appropriately suited to the research questions being investigated. Such RCTs should ideally control for placebo and other nonspecific effects, be sufficiently powered based on proper sample-size calculations, employ validated outcome measures and fully report methodology so that independent replications can be conducted.

References

Abbot, N. C. (2000). Healing as a therapy for human disease: a systematic review. J Altern Complement Med, 6 (2), 159-169.

Ai, A. L., Peterson, C., Gillespie, B, Bolling, S. F., Jessup, M. G., Behling, B. A., *et al.* (2001). Designing clinical trials on energy healing: ancient art encounters medical science. Altern Ther. Health Med, 7(4), 83-90.

Ameling, A., & Nield-Anderson, L. (2000). The empowering nature of Reiki as a complementary therapy. Holistic Nursing Practice, 14(3), 21-29.

Amjad *et al.* (2003). Effect of Post-irradiation Storage on the Radiation-induced Damage in Onion Seeds. *Asian Journal of Plant Sciences 2, 9,* 702-707.

Astin, J. A., Harkness, E, Ernst, E. (2000). The efficacy of "distant healing": A systematic review of randomized trials. Ann Intern Med, 132, 903–910.

Baldwin, A. L. Schwartz, G. E. (2006). Personal Interaction with a Reiki Practitioner Decreases Noise-Induced Microvascular Damage in an Animal Model, J Altern Complement Med, 12(1), 15-22.

Barnes, P. M., Powell-Griner, E., McFann, K., Nahin R. L. (2002). Complementary and alternative medicine use among adults: United States. Adv Data, 343, 1–19.

Benor, D. J. (2001). Healing effects on the immune system. Spiritual healing, scientific validation of a healing revolution. Vision Publications, 356-357.

Bennett, B. M., Laidlaw, T. M., Dwivedi, P., Naito, A., Gruzelier, J.H. (2006) A qualitative study of the experience of self-hypnosis or Johrei in metastatic breast

cancer using interpretative phenomenological analysis. Contemp. Hypn. 23, 127 – 140.

Bjelland, L., Neckelman, D., Tangen Haug, T., et. al. (2002). A review of validation studies of the Hospital Anxiety and Depression Scale. J. Psych. Som. Res, 2, 69-77.

Bowden, D., Goddard, L., Gruzelier, J. H. (2010). A randomised controlled single-blind trial of the effects of Reiki and positive imagery on well-being and salivary cortisol. Brain res. Bull, 81, 66-82.

Brewitt, B. Vittetoe, T. Hartwell, B. (1997). The efficacy of Reiki: Improvements in spleen and nervous system function as quantified by electro dermal screening. Altern Ther, 3, 89-97.

Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S., R., Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res, 23,193–213.

Castro, M., Elias, P. C. L., Martinelli, J. R., Antonini, S. R. R., Santiago, L., Moreira, A. C. (2000). Salivary Cortisol as a tool for physiological studies and diagnostic strategies. Braz. J. Med. Biol. Res., 33(10), 1171-117.

Chambers, D., Bagnall, A., Hempel, S., Forbes, C. (2006). Interventions for the treatment, management and rehabilitation of patients with chronic fatigue syndrome/myalgic encephalomelitis: an updated systematic review. Journal of the Royal Society of Medicine, 99.

Cohen, D., Edelsack, E. A., Zimmerman, J. E. (1970). Magneticcardiograms Taken

Inside a Shielded Room with a Superconduction Point-Contact Magnetometer. Applied Physics Letter, 16, 81-107.

Crawford, S. E., Leaver VW, Mahoney SD. (2006). Using Reiki to decrease memory and behaviour problems in mild cognitive impairment and mild Alzheimer's disease. J Altern Complement Med, 12, 911–913.

Creath, K., Schwartz, G. E. (2004). Measuring Effects of Music, Noise, and Healing Energy Using a Seed Germination Bioassay. Journal of Alternative and Complementary Medicine, 10 (1), 113-122

Dickersin, K. (1990). The existence of publication bias and risk factors for its occurrence. JAMA, 263, 1385–9.

Dressen, L. J., Singg, S. (1998). Effects of Reiki on pain and selected affective and personality variables of chronically ill patients. Subtle Energies Energy Med, 9, 51–82.

Edmonds, M., Maguire, H., Price, J. (2004). Exercise therapy for chronic fatigue syndrome. Cochrane Database of Systematic Reviews, CD003.

Egger, M., Smith, G. D. (1998). Bias in location and selection of studies. BMJ, 316, 61–6.

Ernst, E., Pittler, M. H. (1998). Alternative therapy bias. Nature, 385, 480.

Ernst, E., Rand, J. I., & Stevinson, C. (1998). Complementary therapies for depression: an overview. Archives of General Psychiatry, 55, 1026-1032.

Fernandez, C. (2000). Reiki healing. New York: Lorenz books.

Fukuda, K., Straus, S. E., Hickie, I., Sharpe, M. C., Dobbins, J. G., Komaroff, A. (1994). The chronic fatigue syndrome; a comprehensive approach to its

definition and study. Ann Int Med, 121, 953-959.

Fröhlich, H. (1978). Coherent Electric Vibrations in Biological Systems and the Cancer Problem. IEEE Transaction on Microwave Theory and Techniques MTT, 26. 613 – 617.

Gagnier, J. J., Boon, H., Rochon, P. et al. (2006). Recommendations for reporting randomized controlled trials of herbal interventions: Explanation and elaboration. J Clin Epidemiol, 59, 1134–1149.

Gillespie, E. A., Gillespie, B. W., Stevens, M. J. (2007). Painful diabetic neuropathy: impact of an alternative approach. Diabetes Care, 30, 999–1001.

Gomes, A., Teixeira P. C. N., Coelho Nt. J. A., Rocha H., Furtado K. G., Souza H. V. C. (2001). Influence of the Laying on of Hands Technique (Johrei) on the germination of Gamma-irradiated Canary Seed. Journal of Conscientiology, 170-192.

Grad, B. (1963). A telekinetic effect on plant growth: I. Int J Parapsychol, 5, 117–134.

Grad, B. (1964). A telekinetic effect on plant growth: II. Experiments involving treatment of saline in stoppered bottles. Int J Parapsychol, 6, 473–498.

Grad, B. (1965). Some biological effects of the "laying on of hands": A review of experiments with animals and plants. J Am Soc Psychical Res, 59, 95–127.

Grad, B. (1967). The "Laying on of hands": Implications for psychotherapy, gentling and the placebo effect. J Am Soc Psychical Res, 61, 286–305.

Gruzelier, J. H., Levy, J., Williams, J., Henderson, D. (2001). Self-hypnosis and exam stress: Comparing immune and relaxation-related imagery for influences on immunity, health and mood. Contemp. Hypn, 18, 73-86.

Gruzelier, J. H., Smith, F., Nagy, A., Henderson, D. (2001). Cellular and humeral immunity, mood and exam stress: The influences of self-hypnosis and personality predictors. Int. J. Psychophysiol, 42, 55-71.

Gruzelier. J. H. (2002). The role of psychological intervention in modulating aspects of immune function in relation to health and well-being. Int. Rev. Neurobiol, 52, 383-417.

Haberley, H. (1990). Reiki: Hawayo Takata's Story. Olney, MD: Archedigm.

Haid, M., Huprikar, S. (2001). Modulation of germination and growth of plants by meditation. Am. J. Chin. Med., 29, 393–401.

Jain, S., Mills, P. J. (2009) Biofield therapies: helpful or full of hype? A best evidence synthesis. Int. J. Behav. Med.

Kumar AR & Karup. (2003). Changes in the isoprenoid pathway with transcendental meditation and Reiki healing practices in seizure disorder. Neurol. India, 51, 211–214.

Laidlaw, T. M. Naito, A. Dwivedi, P., Enzor, N., Brincat, C. E., Gruzelier, J. H. (2003). Mood changes after self-hypnosis and Johrei prior to exams. Contemp. Hypn. 20(1), 25-40.

Laidlaw, T. M., Bennett, B. M., Dwivedi, P. Naito, A., Gruzelier, J. H. (2005). Quality of life and mood changes in metastatic breast cancer after training in self-hypnosis or Johrei: a short report. Contemp. Hypn., 22, 84-93.

Lloyd, A., Vernon, S. D., Klimas, N., Jason, L. A., Bleijenberg, G., Evengard, B., White, P. D., Nisenbaum, R., Unger, E. R. (2003). Identification of ambiguities in the 1994 chronic fatigue syndrome research case definition and recommendations for resolution. BMC Health Services Research, 3, 25.

Lovallo, W. R., Farag, N. H., Vincent, A. S., Thomas, T. L., Wilson, M. F. (2006). Cortisol responses to mental stress, exercise, and meals following caffeine intake in men and women. Pharmacol. Biochem. Behav., 83 (3), 441-447.

Lübeck. W. (2000a). A Japanese system for describing the life energies. The spirit of Reiki (6th ed.) (52-60). Shangri-LA: Lotus Press.

Lübeck. W. (2000b). The systematic whole body treatment with Reiki. The spirit of Reiki (6th ed.) (203-207). Shangri-LA: Lotus Press.

Lübeck. W. (2000c). Walking in the Reiki path. The spirit of Reiki (6th ed.) (245-253). Shangri-LA: Lotus Press.

Lübeck. W. (2000d). The Reiki Symbols and Mantras. The spirit of Reiki (6th ed.) (117-135). Shangri-LA: Lotus Press.

Mackay. N., Hansen, S., McFarlane, O. (2004). Autonomic nervous system changes during Reiki treatment: a preliminary study. J Altern Complement Med, 10, 1077–81.

Miles, P., True, G. (2003). Reiki - review of a biofield therapy history, theory, practice, and research. J Alter. Complement Ther., 9(2), 62-71.

Mamtani, R., & Cimino, A. (2002). A primer of complementary and alternative medicine and its relevance in the treatment of mental health problems. Psychiatric Quarterly, 73(4), 367-381.

Mansour, A. A., Beuche, M., Laing, G., Leis, A., Nurse, J. (1999). A study to test the effectiveness of placebo Reiki standardization procedures developed for a planned Reiki efficacy study. J Altern Complement Med. 5(2), 153-164.

Mykletun, A., Stordal, E., Dahn, A. A. (2001). Hospital Anxiety and Depression Scale: factor structure, item analysis and internal consistency in a large population. Brit. J. Psych., 179, 540-544.

Naito, A. Laidlaw, T. M., Henderson, D. C., Farahan, L., Dwivedi, P., Gruzelier, J. H. (2003). The impact of self-hypnosis and Johrei on lymphocyte subpopulations at exam time: a controlled study. Brain Res. Bull, 62, 241-253.

The NHS Trusts Association. (2006). The NHS New Guide to Healthy Living. London: The NHS Trusts Association.

Olson, K., Hanson, J., Michaud, M. (2003). A phase II trial of Reiki for the management of pain in advanced cancer patients. J Pain Symptom Manage, 26, 990–7.

Oshmann, J. (2000). Energy Medicine – the Scientific Basis. Edinburgh: Churchill Livingstone.

Pittler, M. H., Abbot, N. C., Harkness, E. F., Ernst, E. (2000). Location bias in controlled clinical trials of complementary / alternative therapies. J Clin Epidemiol, 53, 485–9.

Potter, P. J., Breast biopsy and distress: feasibility of testing a Reiki intervention. J Holist Nurs, 25, 238–48.

Price, J. R. & Couper. J. (1998). Cognitive behavioural therapy for chronic fatigue syndrome in adults. Cochrane Database of Systematic Reviews, CD001.

The Prince of Wales's Foundation for Integrated Health. (2005). Complementary Health Care: a Guide for Patients. London: The Prince of Wales's Foundation for Integrated Health, 2005.

Rand, W. L. (2000a). Reiki in the Eastern World. The Spirit of Reiki (6th ed.) (13-17). Shangri-LA: Lotus Press.

Rand, W. L. (2000b). Reiki in the Western World. The Spirit of Reiki (6th ed.) (13-17). Shangri-LA: Lotus Press.

Rand, W. L. (2000c). Reiki Training. The Spirit of Reiki (6th ed.) (13-17). Shangri-LA: Lotus Press.

Rand, W. L. (2000d). A Scientific Explanation of Reiki Energy. The Spirit of Reiki (6th ed.) (13-17). Shangri-LA: Lotus Press.

Rand, W. L., Gaia, L. S. (2007). Discovering the Roots of Reiki. The international Centre for Reiki Healing. Reiki News Articles. Retrieved July 14, 2007, from the World Wide Web: http://www.reiki.org/reikinews/rootsreiki.html.

Reeves, W. C., Lloyd, A., Vernon, S. D., Klimas, N., Jason, L. A., Bleijenberg, G., Evengard, B., White, P. D., Nisenbaum, R., Unger, E. R. (2003). Identification of ambiguities in the 1994 chronic fatigue syndrome research case definition and recommendations for resolution. BMC Health Services Research, 3, 25.

Rein, G. (1998). Biological effects of quantum fields and their role in the natural

healing process. Frontier Perspectives. 7(1). 16-23.

Roney-Dougal, S. M., Solfvin, J. (2002). Field study of enhancement effect on lettuce seeds: Their germination rate, growth and health. J Soc Psychical Res, 66, 129–143.

Ross, S. D., Estok, R. P., Frame. D., Stone, L. R., Ludensky, V., Levine, C. B. (2004). Disability and chronic fatigue syndrome: a focus of function. Arch Intern Med, 164, 1098-107.

Rubic, B. Brooks, A. J. Schwartz, G. E. (2006). In Vitro Effect of Reiki Treatment on Bacterial Cultures: Role of Experimental Context and Practitioner Well-Being. J Altern Complement Med, 12(1), 7-13.

Schmidt-Reinwald, J. C., Pruessner, D.H., Hellhammer, I. Federenko, N. Rohleder, .H. Schurmeyer, C. Kirschbaum. (1999). The cortisol response to awakening in relation to different challenge tests and a 12-hour cortisol rhythm. Life Sci., 64, 1653-60.

Scofield, A. M., Hodges, R. D. (1991). Demonstration of a healing effect in the laboratory using a simple plant model. J Soc Psychical Res, 57, 321–343.

Seto, A., Kusaka, S. Nakazato. S. *et al.* (1992). Detection of Extraordinary Large Biomagnetic Field strength from Human Hand. Acupuncture and Electro Therapeutic Research International Journal, 17, 75-94.

Shapiro, A. K., Shapiro, E. (1997). The Powerful Placebo: From Ancient Priest to Modern Physician. Baltimore and London: Johns Hopkins University Press.

Shiflett, S. C., Nayak, S., Bid, C., Miles, P., Agnostinelli, S. (2002). Effect of

Reiki Treatments on Functional Recovery in Patients in Post-Stroke Rehabilitation: A Pilot Study. J Alter Complement. Med, 8, 755–763

Shore, A. G. (2004). Long-term effects of energetic healing on symptoms of psychological depression and self-perceived stress. Altern Ther Health Med, 10, 42–8.

Smets, E. M., Garssen, B. J., Bonke, B., DeHaes, J. C. (1995). The multidimensional fatigue inventory (MFI) psychometric qualities of an instrument to assess fatigue. J Psychosom Res, 39, 315-325.

Taft. R., Moore. D., Yount, G. (2005). Time-lapse analysis of potential cellular responsiveness to Johrei, a Japanese healing technique. BMC Complement Altern Med 2005, 5-2.

Tsang, K. L., Carlson, L. E., Olson, K. (2007). Pilot crossover trial of Reiki versus rest for treating cancer-related fatigue. Integr Cancer Ther, 6.

Thayer, R. E. (1970). Activation States List S Assessed by Verbal Report and Four Psychophysiological Variables. Psychophysiol, 7 (1), 86–4.

Timothy, A., Brown, T. A., Chorpita, B. F., Korotitsch, W., Barlow, D. H. (1997). Psychometric properties of the Depression Anxiety Stress Scales (DASS) in clinical samples. Behav. Res. Ther., 35(1), 79-89.

Verhoef, M. J. (2005). Complementary and alternative medicine whole systems research: Beyond identification of inadequacies of the RCT. Complement Therap. Med., 13, 206.

Vitale, A. T., O'Connor, P. C. (2006). The effect of Reiki on pain and anxiety in women with abdominal hysterectomies: a quasi-experimental pilot study. Holist. Nurs. Pract., 20, 263–72

Wagner, D., Nisenbaum, R., Heim, C., Jones, J. F., Unger, E. R., Reeves, W. C. (2005). Psychometric properties of the CDC symptom inventory for the assessment of chronic fatigue syndrome. Population Health Metrics, 3, 8.

Wardell, D. W. Engebretson, J. (2001). Biological correlates of Reiki touch healing. J Adv Nurs, 33(4), 439-445.

Ware, J. E., Sherbourne, C. D. (1992). The MOS 36-item Short Form health survey SF-36): conceptual framework and item selection. Med Care, 30, 473-483.

Weinman, R. The recovery of VortexHealing. (2000). In: London and Southeast Connection. Series: The recovery of VortexHealing. Online document at: www.vortexhealing.com.

Wetzel, W. (1989). Reiki Healing: a physiologic perspective. J Holist Nurs, 7(1), 47-154.

Wilkinson, M. J., Barczak, P. (1988). Psychiatric screening in general practice: comparison of the general health questionnaire and the hospital anxiety depression scale. J. R. Coll. Gen. Pract. 38(312), 311-3.

Wirth, D. P, Chang, R. J., Eidelman, W. S., Paxton, J. B. (1996). Haematological indicators of complementary healing intervention. Complement Ther Med, 4, 14-20.

Wirth, D. P., Cram, J. R. (1997). Multisite surface electromyography and complementary healing intervention: a comparative analysis. J Altern Complement Med, 3(4), 355-364.

Wirth, D. P., Brenlan, D. R., Levine, R. J., Rodriguez, C. M. (1998). The effect of complementary healing therapy on postoperative pain after surgical removal of impacted third molar teeth. Complement Ther Med, 1, 133-138.

Whelan, K.M., & Wishnia, G.S. (2003). Reiki therapy: the benefits to a nurse/Reiki practitioner. Holistic Nursing Practice, 17(4), 209-217.

Whitehouse, W. G., Dinges, D. F., Orne, E. C., Keller, S. E., Bates, B. L., Bauer, N. K., Morahan, P., Haupt, B. A., Carli, M. M., Bloom, P. B., Zaugg, L., Orne, M.T. (1996). Psychosocial and immune effects of self-hypnosis training for stress management throughout the first semester of medical school. Psychosom. Med, 58, 249-63.

Wyllie, G., Mackenzie, F. (2003). Ascension Reiki attunement handbook (2nd Ed.). Iona Light.

Yount, G., Solfvin, J., Moore, D., et al. (2004). In vitro test of external Qigong. BMC Complement Altern Med, 4, 5.

Zimmerman, J. (1990). Laying-on-of-hands healing and therapeutic touch: a testable theory. BEMI Currents, Journal of Bio-Electro-Magnetics Institute, 2, 8-17.

Appendix

Table A1. The Primary Outcome Measure scores of the three CFS patients										
Item		Participant 1			Participant 2			Participant 3		
		Pre	Post1	Post2	Pre	Post1	Post2	Pre	Post1	Post2
Activities	Body pain	45	90	100	100	90	100	45	45	22.5
	General health perceptions	35	55	55	20	10	25	60	50	60
	General mental health	52	64	76	48	56	56	88	92	76
	Health *	50	75	75	75	75	75	75	75	75
	Physical function	61.11	66.67	66.67	50	61.11	66.67	16.67	11.11	5.56
	Role limitation	0	0	0	0	0	0	0	50	0
	Role limitation **	0	0	100	0	66.67	33.33	66.67	100	100
	Social function	0	75	62.5	25	0	62.5	25	50	25
	Vitality, energy or fatigue	10	40	25	35	30	30	45	25	25
Fatigue	General fatigue	20	13	18	20	19	15	17	0	19
	Global Fatigue	97	68	82	77	65	67	67	0	71
	Mental fatigue	19	14	16	16	9	14	8	0	7
	Physical fatigue	20	18	18	18	20	15	15	0	18
	Reduced activity	18	10	14	14	10	11	17	0	18
	Reduced motivation	20	13	16	9	7	12	10	0	9
Symptoms	Abdominal pain	0	1	0	0	0	0	0	0	0
	Chills	6	4	1	0	2	0	10	0	0
	Concentration problems	16	9	9	25	9	4	9	6	4
	Depression	1	3	0	0	0	0	0	0	0
	Diarrhoea	0	0	0	0	0	0	1	0	4
	Fatigue after exertion	25	6	6	15	12	6	16	9	20
	Fever	3	0	0	0	0	0	0	0	0
	Global Symptoms	117	42	33	132	57	27	112	61	119
	Headaches	4	0	0	0	1	0	2	3	0
	Joint pain	0	2	0	0	0	0	6	9	15
	Memory problems	6	6	4	15	9	2	6	0	16
	Muscle pain	6	1	0	2	1	6	9	9	15
	Nausea	3	0	0	0	0	0	1	0	0
	Sensitivity to light	3	4	6	25	15	2	16	0	16
	Shortness of breath	0	0	0	0	0	0	0	0	0
	Sinus symptoms	4	0	0	0	0	0	2	0	0
	Sleeping problems	6	3	1	25	2	0	9	16	9
	Sore throat	8	0	0	0	0	1	9	0	0
	Swollen glands	6	0	0	0	0	0	0	0	0
	Unrefreshing sleep	20	3	6	25	6	6	16	9	20
*: compared to last year; **:due to emotional problems.										

Table A2. The Secondary Outcome Measure scores of the three CFS patients										
		Participant 1			Participant 2			Participant 3		
Item		Pre	Post1	Post2	Pre	Post1	Post2	Pre	Post1	Post2
Mood	Anxiety score	8	7	8	9	11	14	7	0	6
	Depression score	15	9	11	6	5	4	4	0	9
	Global Mood	23	16	19	15	16	18	11	0	15
Sleep	Asleep/to bed/	0.88	0.82	0.88	0.78	0.75	0.88	0.8	0	0.94
	Daytime dysfunction	3	2	2	2	3	1	1	0	2
	ESI *	13	16	15	11	10	10	8	0	11
	Global Sleep	12.88	9.82	8.88	9.78	10.75	6.88	9.8	0	9.94
	Medication	0	0	0	0	0	0	0	0	0
	Sleep disturbance	2	2	1	2	1	1	1	0	1
	Sleep duration	1	1	1	1	2	1	0	0	0
	Sleep efficiency	3	3	3	3	3	3	3	0	3
	Sleep latency	2	1	0	0	0	0	3	0	2
	Sleep quality	1	0	1	1	1	0	1	0	1
*:Epworth Sleepiness Index										

Table A3. The mean (SD)* numbers of germinated Reiki and Control seeds for each Dish-Order on each day of an experiment overall for all experiments															
	First			Second			Third			Fourth			Total		
	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total
Day 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 1	0.56 (0.63)	0.61 (0.68)	0.59 (0.65)	0.61 (0.68)	0.69 (0.76)	0.65 (0.72)	0.53 (0.55)	0.55 (0.65)	0.54 (0.6)	0.39 (0.5)	0.44 (0.61)	0.41 (0.55)	0.52 (0.59)	0.57 (0.68)	0.55 (0.64)
Day 2	1.53 (1.29)	1.25 (1.13)	1.39 (1.21)	1.7 (1.09)	1.5 (1.21)	1.6 (1.15)	1.41 (1.29)	1.41 (1.42)	1.41 (1.34)	1.06 (0.85)	1.28 (1.2)	1.17 (1.04)	1.43 (1.16)	1.36 (1.24)	1.39 (1.19)
Day 3	2.36 (1.62)	2.22 (1.5)	2.29 (1.55)	2.66 (1.84)	2.36 (1.23)	2.51 (1.56)	2.38 (1.76)	2.02 (1.81)	2.2 (1.78)	2.09 (1.45)	2.03 (1.41)	2.06 (1.42)	2.37 (1.67)	2.16 (1.49)	2.26 (1.58)
Day 4	3.09 (1.99)	3.13 (1.9)	3.11 (1.93)	3.47 (2.3)	3.13 (1.88)	3.3 (2.09)	3.38 (2.26)	2.67 (2.16)	3.02 (2.22)	3.25 (1.93)	2.72 (1.81)	2.98 (1.88)	3.3 (2.1)	2.91 (1.93)	3.1 (2.02)
Day 5	3.66 (2.18)	4.09 (2.67)	3.88 (2.42)	3.86 (2.56)	3.73 (2.2)	3.8 (2.37)	3.89 (2.36)	3.3 (2.52)	3.59 (2.44)	3.88 (1.87)	3.22 (2.02)	3.55 (1.96)	3.82 (2.23)	3.59 (2.36)	3.7 (2.3)
Day 6	3.86 (2.18)	4.55 (2.78)	4.2 (2.5)	4.34 (2.78)	4.09 (2.15)	4.22 (2.47)	4.27 (2.72)	3.67 (2.67)	3.97 (2.69)	4.16 (2.03)	3.55 (2.18)	3.85 (2.11)	4.16 (2.42)	3.96 (2.46)	4.06 (2.44)
Day 7	4.05 (2.09)	4.8 (2.78)	4.42 (2.47)	4.39 (2.67)	4.3 (2.05)	4.34 (2.36)	4.61 (2.64)	3.91 (2.62)	4.26 (2.64)	4.39 (2.02)	3.88 (2.3)	4.13 (2.16)	4.36 (2.36)	4.22 (2.45)	4.29 (2.4)
Day 8	4.14 (2.19)	5.06 (2.86)	4.6 (2.57)	4.73 (2.89)	4.53 (1.92)	4.63 (2.43)	4.67 (2.65)	4.11 (2.76)	4.39 (2.7)	4.66 (2.16)	4.05 (2.25)	4.35 (2.21)	4.55 (2.47)	4.44 (2.48)	4.49 (2.47)
Day 9	4.39 (2.19)	5.3 (2.78)	4.84 (2.52)	4.89 (2.8)	4.86 (1.75)	4.88 (2.31)	4.94 (2.56)	4.22 (2.73)	4.58 (2.65)	4.94 (2.2)	4.22 (2.22)	4.58 (2.22)	4.79 (2.43)	4.65 (2.42)	4.72 (2.42)
Day 10	4.58 (2.23)	5.42 (2.71)	5 (2.5)	5.13 (2.8)	5.09 (1.61)	5.11 (2.27)	5 (2.57)	4.31 (2.69)	4.66 (2.63)	5.16 (2.17)	4.41 (2.12)	4.78 (2.16)	4.96 (2.44)	4.81 (2.35)	4.89 (2.39)
Day 11	4.66 (2.2)	5.73 (2.63)	5.2 (2.46)	5.23 (2.72)	5.3 (1.57)	5.27 (2.2)	5.14 (2.54)	4.38 (2.64)	4.76 (2.6)	5.23 (2.08)	4.58 (2.02)	4.91 (2.06)	5.07 (2.38)	5 (2.3)	5.03 (2.34)
*Standard deviations are shown in parenthesis.															

Table A4. The mean (SD)* numbers of germinated Reiki and Control seeds on each day of Experiment 1 for Practitioners 1, 2 and 3												
	Practitioner 1			Practitioner 2			Practitioner 3			Total		
	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total
Day 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 2	0.53 (0.76)	0.19 (0.36)	0.36 (0.61)	0.81 (1.06)	0.25 (0.48)	0.53 (0.86)	0.13 (0.34)	0.09 (0.2)	0.11 (0.28)	0.49 (0.82)	0.18 (0.36)	0.33 (0.65)
Day 3	1.84 (1.19)	0.69 (0.63)	1.27 (1.11)	1.63 (1.5)	1.13 (0.94)	1.38 (1.26)	0.63 (0.53)	0.81 (0.87)	0.72 (0.72)	1.36 (1.25)	0.88 (0.83)	1.12 (1.08)
Day 4	2 (1.33)	0.72 (0.63)	1.36 (1.21)	1.94 (1.72)	1.28 (1.09)	1.61 (1.46)	0.69 (0.54)	1 (1.05)	0.84 (0.84)	1.54 (1.41)	1 (0.96)	1.27 (1.23)
Day 5	2.63 (1.41)	0.94 (0.54)	1.78 (1.36)	2.13 (1.87)	1.38 (1.04)	1.75 (1.53)	0.94 (0.44)	1.34 (1.09)	1.14 (0.84)	1.9 (1.52)	1.22 (0.93)	1.56 (1.3)
Day 6	2.84 (1.31)	1.56 (0.96)	2.2 (1.31)	2.22 (1.88)	1.53 (0.97)	1.88 (1.51)	0.97 (0.46)	1.38 (1.06)	1.17 (0.83)	2.01 (1.54)	1.49 (0.98)	1.75 (1.31)
Day 7	3.03 (1.45)	1.75 (1.02)	2.39 (1.4)	2.44 (2)	1.84 (1.18)	2.14 (1.64)	1.44 (0.87)	1.66 (1)	1.55 (0.93)	2.3 (1.62)	1.75 (1.05)	2.03 (1.39)
Day 8	3.06 (1.4)	1.84 (0.98)	2.45 (1.34)	2.56 (2.01)	2.06 (1.3)	2.31 (1.68)	1.5 (0.91)	2.03 (1.07)	1.77 (1.02)	2.38 (1.62)	1.98 (1.11)	2.18 (1.39)
Day 9	3.63 (1.75)	2.19 (1.25)	2.91 (1.66)	2.72 (2.19)	2.44 (1.56)	2.58 (1.88)	2.09 (1.4)	2.41 (1.25)	2.25 (1.32)	2.81 (1.88)	2.34 (1.34)	2.58 (1.64)
Day 10	3.88 (1.76)	2.53 (1.34)	3.2 (1.68)	3.03 (2.35)	2.56 (1.54)	2.8 (1.97)	2.31 (1.5)	2.66 (1.27)	2.48 (1.38)	3.07 (1.97)	2.58 (1.36)	2.83 (1.7)
Day 11	4 (1.65)	2.66 (1.39)	3.33 (1.65)	3.34 (2.41)	2.81 (1.73)	3.08 (2.08)	2.56 (1.53)	3.38 (1.47)	2.97 (1.53)	3.3 (1.95)	2.95 (1.53)	3.13 (1.76)
*Standard deviations are shown in parenthesis.												

Table A5. The mean (SD)* numbers of germinated Reiki and Control seeds on each day of Experiment 2 for Practitioners 4 and 5									
	Practitioner 4			Practitioner 5			Total		
	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total
Day 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 1	0.22 (0.36)*	0.5 (0.77)	0.36 (0.61)	0.69 (0.6)	0.88 (0.5)	0.78 (0.55)	0.45 (0.54)	0.69 (0.67)	0.57 (0.62)
Day 2	2.47 (1.16)	2.41 (1.31)	2.44 (1.22)	1.88 (0.92)	2.31 (1.11)	2.09 (1.03)	2.17 (1.07)	2.36 (1.19)	2.27 (1.13)
Day 3	4.81 (1.59)	3.84 (1.56)	4.33 (1.62)	2.84 (1.54)	2.84 (1.08)	2.84 (1.3)	3.83 (1.83)	3.34 (1.41)	3.59 (1.64)
Day 4	5.03 (1.64)	4.25 (1.51)	4.64 (1.6)	3.56 (1.54)	3.53 (1.2)	3.55 (1.36)	4.3 (1.73)	3.89 (1.39)	4.09 (1.57)
Day 5	5.78 (1.38)	4.75 (1.62)	5.27 (1.57)	4.41 (1.46)	4.28 (1.14)	4.34 (1.29)	5.09 (1.56)	4.52 (1.4)	4.8 (1.5)
Day 6	6.22 (1.53)	5 (1.74)	5.61 (1.73)	5.28 (1.72)	5.44 (1.58)	5.36 (1.63)	5.75 (1.67)	5.22 (1.65)	5.48 (1.67)
Day 7	6.34 (1.51)	5.13 (1.81)	5.73 (1.76)	5.59 (1.53)	5.5 (1.56)	5.55 (1.52)	5.97 (1.54)	5.31 (1.67)	5.64 (1.63)
Day 8	6.84 (1.66)	5.69 (2.14)	6.27 (1.97)	6 (1.52)	5.72 (1.57)	5.86 (1.53)	6.42 (1.62)	5.7 (1.84)	6.06 (1.76)
Day 9	6.91 (1.64)	5.81 (2.14)	6.36 (1.96)	6.06 (1.54)	5.84 (1.45)	5.95 (1.47)	6.48 (1.62)	5.83 (1.8)	6.16 (1.73)
Day 10	7.03 (1.75)	6 (1.98)	6.52 (1.91)	6.16 (1.52)	5.97 (1.26)	6.06 (1.38)	6.59 (1.67)	5.98 (1.63)	6.29 (1.67)
Day 11	7.09 (1.72)	6.13 (1.99)	6.61 (1.9)	6.25 (1.55)	6.13 (1.36)	6.19 (1.44)	6.67 (1.67)	6.13 (1.68)	6.4 (1.68)
*Standard deviations are shown in parenthesis.									

Table A6. The mean (SD)* numbers of germinated Reiki and Control seeds on each day of Experiment 3 for Practitioners 6, 7 and 8												
	Practitioner 6			Practitioner 7			Practitioner 8			Total		
	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total
Day 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 1	0.97 (0.29)	1.09 (0.42)	1.03 (0.36)	1.03 (0.29)	1.25 (0.58)	1.14 (0.46)	1.28 (0.48)	0.84 (0.7)	1.06 (0.63)	1.09 (0.38)	1.06 (0.59)	1.08 (0.49)
Day 2	1.56 (0.83)	1.97 (0.69)	1.77 (0.78)	2.09 (0.76)	1.97 (0.81)	2.03 (0.77)	1.94 (0.89)	1.69 (0.96)	1.81 (0.92)	1.86 (0.84)	1.88 (0.82)	1.87 (0.83)
Day 3	1.94 (0.93)	2.47 (0.78)	2.2 (0.89)	2.63 (0.85)	2.69 (1.42)	2.66 (1.15)	2.66 (1.41)	2.78 (0.91)	2.72 (1.17)	2.41 (1.12)	2.65 (1.06)	2.53 (1.09)
Day 4	3.47 (1.38)	4.34 (1.26)	3.91 (1.38)	4.53 (1.53)	4.09 (1.64)	4.31 (1.57)	5.16 (1.88)	4.06 (1.25)	4.61 (1.66)	4.39 (1.73)	4.17 (1.37)	4.28 (1.55)
Day 5	4 (1.9)	5.56 (1.91)	4.78 (2.03)	5 (1.4)	4.91 (2.07)	4.95 (1.74)	5.69 (1.92)	5.53 (1.69)	5.61 (1.78)	4.9 (1.86)	5.33 (1.88)	5.11 (1.87)
Day 6	4.41 (2.24)	5.94 (1.88)	5.17 (2.18)	5.41 (1.58)	5.09 (1.98)	5.25 (1.77)	5.91 (1.98)	5.78 (1.83)	5.84 (1.88)	5.24 (2.01)	5.6 (1.89)	5.42 (1.95)
Day 7	4.53 (1.85)	6.22 (1.78)	5.38 (1.98)	5.5 (1.62)	5.53 (1.8)	5.52 (1.69)	6 (2.09)	6.13 (1.81)	6.06 (1.93)	5.34 (1.92)	5.96 (1.79)	5.65 (1.87)
Day 8	4.72 (2.16)	6.28 (1.8)	5.5 (2.11)	5.5 (1.62)	5.66 (1.83)	5.58 (1.7)	6.22 (2.06)	6.22 (1.84)	6.22 (1.92)	5.48 (2.02)	6.05 (1.81)	5.77 (1.93)
Day 9	4.81 (2.17)	6.47 (1.8)	5.64 (2.13)	5.63 (1.53)	5.75 (1.81)	5.69 (1.65)	6.47 (2.05)	6.28 (1.78)	6.38 (1.89)	5.64 (2.01)	6.17 (1.78)	5.9 (1.91)
Day 10	4.88 (2.16)	6.56 (1.8)	5.72 (2.13)	5.69 (1.49)	5.81 (1.82)	5.75 (1.64)	6.72 (2.11)	6.38 (1.75)	6.55 (1.91)	5.76 (2.05)	6.25 (1.78)	6.01 (1.92)
Day 11	4.94 (2.15)	6.66 (1.79)	5.8 (2.13)	5.69 (1.49)	5.84 (1.88)	5.77 (1.67)	6.78 (2.1)	6.38 (1.75)	6.58 (1.91)	5.8 (2.04)	6.29 (1.8)	6.05 (1.93)
*Standard deviations are shown in parenthesis.												

Table A7. The mean (SD)* numbers of germinated seeds on each day of Experiments 1, 2 and 3									
	Experiment 1			Experiment 2			Experiment 3		
	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total
Day 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 1	0 (0)	0 (0)	0 (0)	0.45 (0.54)	0.69 (0.67)	0.57 (0.62)	1.09 (0.38)	1.06 (0.59)	1.08 (0.49)
Day 2	0.49 (0.82)*	0.18 (0.36)	0.33 (0.65)	2.17 (1.07)	2.36 (1.19)	2.27 (1.13)	1.86 (0.84)	1.88 (0.82)	1.87 (0.83)
Day 3	1.36 (1.25)	0.88 (0.83)	1.12 (1.08)	3.83 (1.83)	3.34 (1.41)	3.59 (1.64)	2.41 (1.12)	2.65 (1.06)	2.53 (1.09)
Day 4	1.54 (1.41)	1 (0.96)	1.27 (1.23)	4.3 (1.73)	3.89 (1.39)	4.09 (1.57)	4.39 (1.73)	4.17 (1.37)	4.28 (1.55)
Day 5	1.9 (1.52)	1.22 (0.93)	1.56 (1.3)	5.09 (1.56)	4.52 (1.4)	4.8 (1.5)	4.9 (1.86)	5.33 (1.88)	5.11 (1.87)
Day 6	2.01 (1.54)	1.49 (0.98)	1.75 (1.31)	5.75 (1.67)	5.22 (1.65)	5.48 (1.67)	5.24 (2.01)	5.6 (1.89)	5.42 (1.95)
Day 7	2.3 (1.62)	1.75 (1.05)	2.03 (1.39)	5.97 (1.54)	5.31 (1.67)	5.64 (1.63)	5.34 (1.92)	5.96 (1.79)	5.65 (1.87)
Day 8	2.38 (1.62)	1.98 (1.11)	2.18 (1.39)	6.42 (1.62)	5.7 (1.84)	6.06 (1.76)	5.48 (2.02)	6.05 (1.81)	5.77 (1.93)
Day 9	2.81 (1.88)	2.34 (1.34)	2.58 (1.64)	6.48 (1.62)	5.83 (1.8)	6.16 (1.73)	5.64 (2.01)	6.17 (1.78)	5.9 (1.91)
Day 10	3.07 (1.97)	2.58 (1.36)	2.83 (1.7)	6.59 (1.67)	5.98 (1.63)	6.29 (1.67)	5.76 (2.05)	6.25 (1.78)	6.01 (1.92)
Day 11	3.3 (1.95)	2.95 (1.53)	3.13 (1.76)	6.67 (1.67)	6.13 (1.68)	6.4 (1.68)	5.8 (2.04)	6.29 (1.8)	6.05 (1.93)
*Standard deviations are shown in parentheses.									

Table A8. The mean (SD)* numbers of germination Reiki and Control seeds for each Dish-Order on each day of Experiment 1															
	First			Second			Third			Fourth			Total		
Day	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total
Day 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 2	0.5 (0.9)	0.04 (0.14)	0.27 (0.68)	0.71 (0.78)	0.33 (0.49)	0.52 (0.67)	0.13 (0.23)	0.17 (0.39)	0.15 (0.31)	0.63 (1.07)	0.17 (0.33)	0.4 (0.81)	0.49 (0.82)	0.18 (0.36)	0.33 (0.65)
Day 3	1.29 (1.29)	0.92 (0.82)	1.1 (1.07)	1.13 (0.98)	1.46 (0.92)	1.29 (0.94)	0.96 (0.92)	0.5 (0.64)	0.73 (0.81)	2.08 (1.53)	0.63 (0.64)	1.35 (1.37)	1.36 (1.25)	0.88 (0.83)	1.12 (1.08)
Day 4	1.21 (1.32)	1.08 (1)	1.15 (1.15)	1.29 (0.94)	1.58 (1.1)	1.44 (1.01)	1.21 (1.12)	0.54 (0.62)	0.88 (0.95)	2.46 (1.83)	0.79 (0.81)	1.63 (1.62)	1.54 (1.41)	1 (0.96)	1.27 (1.23)
Day 5	1.58 (1.44)	1.25 (1.1)	1.42 (1.27)	1.38 (0.96)	1.88 (0.93)	1.63 (0.96)	1.63 (1.17)	0.71 (0.58)	1.17 (1.02)	3 (1.93)	1.04 (0.69)	2.02 (1.74)	1.9 (1.52)	1.22 (0.93)	1.56 (1.3)
Day 6	1.79 (1.48)	1.46 (1.01)	1.63 (1.25)	1.54 (1.01)	2.38 (0.83)	1.96 (1)	1.67 (1.25)	0.92 (0.79)	1.29 (1.09)	3.04 (1.94)	1.21 (0.69)	2.13 (1.7)	2.01 (1.54)	1.49 (0.98)	1.75 (1.31)
Day 7	2.17 (1.54)	1.71 (1.1)	1.94 (1.33)	1.67 (1.19)	2.67 (0.86)	2.17 (1.14)	2.04 (1.34)	1.25 (0.99)	1.65 (1.22)	3.33 (1.99)	1.38 (0.64)	2.35 (1.76)	2.3 (1.62)	1.75 (1.05)	2.03 (1.39)
Day 8	2.21 (1.53)	1.88 (1.17)	2.04 (1.34)	1.79 (1.27)	3.04 (0.75)	2.42 (1.2)	2.13 (1.37)	1.38 (1.05)	1.75 (1.25)	3.38 (1.94)	1.63 (0.64)	2.5 (1.67)	2.38 (1.62)	1.98 (1.11)	2.18 (1.39)
Day 9	2.58 (1.89)	2.25 (1.41)	2.42 (1.64)	2.08 (1.33)	3.67 (0.89)	2.88 (1.37)	2.54 (1.37)	1.54 (1.2)	2.04 (1.36)	4.04 (2.35)	1.92 (0.79)	2.98 (2.03)	2.81 (1.88)	2.34 (1.34)	2.58 (1.64)
Day 10	2.83 (1.99)	2.46 (1.41)	2.65 (1.7)	2.38 (1.65)	3.96 (0.69)	3.17 (1.48)	2.63 (1.38)	1.67 (1.23)	2.15 (1.37)	4.46 (2.25)	2.25 (0.89)	3.35 (2.02)	3.07 (1.97)	2.58 (1.36)	2.83 (1.7)
Day 11	3 (1.95)	3 (1.65)	3 (1.77)	2.67 (1.78)	4.38 (1.07)	3.52 (1.68)	2.79 (1.39)	1.83 (1.3)	2.31 (1.41)	4.75 (2.07)	2.58 (0.87)	3.67 (1.91)	3.3 (1.95)	2.95 (1.53)	3.13 (1.76)
*Standard deviations are shown in parenthesis.															

Table A9. The mean (SD)* numbers of germination Reiki and Control seeds for the dishes treated First, Second, Third and Fourth on each day of Experiment 2															
	First			Second			Third			Fourth			Total		
Day	**Reiki**	**Control**	**Total**	**Reiki**	**Control**	**Total**	**Reiki**	**Control**	**Total**	**Reiki**	**Control**	**Total**	**Reiki**	**Control**	**Total**
Day 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 1	0.56 (0.62)	0.69 (0.53)	0.63 (0.56)	0.44 (0.42)	1 (0.8)	0.72 (0.68)	0.63 (0.69)	0.63 (0.74)	0.63 (0.7)	0.19 (0.37)	0.44 (0.56)	0.31 (0.48)	0.45 (0.54)	0.69 (0.67)	0.57 (0.62)
Day 2	2.19 (1.33)	1.88 (0.69)	2.03 (1.04)	2.31 (0.75)	2.31 (1.19)	2.31 (0.96)	2.75 (1.2)	2.75 (1.54)	2.75 (1.33)	1.44 (0.56)	2.5 (1.25)	1.97 (1.09)	2.17 (1.07)	2.36 (1.19)	2.27 (1.13)
Day 3	3.69 (1.67)	3.56 (1.21)	3.63 (1.41)	4.44 (1.78)	3.19 (1.13)	3.81 (1.58)	4.31 (1.93)	3.56 (2.08)	3.94 (1.97)	2.88 (1.87)	3.06 (1.24)	2.97 (1.53)	3.83 (1.83)	3.34 (1.41)	3.59 (1.64)
Day 4	4.44 (1.55)	4.25 (1.04)	4.34 (1.27)	4.75 (1.75)	3.69 (1.25)	4.22 (1.57)	4.63 (1.77)	4.13 (1.96)	4.38 (1.82)	3.38 (1.83)	3.5 (1.28)	3.44 (1.53)	4.3 (1.73)	3.89 (1.39)	4.09 (1.57)
Day 5	5.44 (1.57)	4.94 (0.98)	5.19 (1.29)	5.13 (1.94)	4.06 (1.45)	4.59 (1.74)	5.25 (1.6)	4.88 (1.66)	5.06 (1.59)	4.56 (1.24)	4.19 (1.46)	4.38 (1.32)	5.09 (1.56)	4.52 (1.4)	4.8 (1.5)
Day 6	5.75 (1.44)	6 (1)	5.88 (1.2)	6.25 (1.56)	4.5 (2)	5.38 (1.95)	5.88 (2.17)	5.75 (1.6)	5.81 (1.84)	5.13 (1.55)	4.63 (1.58)	4.88 (1.53)	5.75 (1.67)	5.22 (1.65)	5.48 (1.67)
Day 7	5.94 (1.35)	6 (1)	5.97 (1.15)	6.38 (1.55)	4.56 (2.03)	5.47 (1.98)	6.25 (1.77)	5.94 (1.7)	6.09 (1.69)	5.31 (1.56)	4.75 (1.56)	5.03 (1.53)	5.97 (1.54)	5.31 (1.67)	5.64 (1.63)
Day 8	6.13 (1.43)	6.63 (1.06)	6.38 (1.24)	7 (1.71)	4.88 (1.9)	5.94 (2.06)	6.38 (1.83)	6.44 (2.09)	6.41 (1.9)	6.19 (1.67)	4.88 (1.66)	5.53 (1.75)	6.42 (1.62)	5.7 (1.84)	6.06 (1.76)
Day 9	6.13 (1.43)	6.69 (1)	6.41 (1.23)	7.13 (1.64)	5 (1.85)	6.06 (2.02)	6.44 (1.78)	6.56 (1.92)	6.5 (1.79)	6.25 (1.73)	5.06 (1.82)	5.66 (1.82)	6.48 (1.62)	5.83 (1.8)	6.16 (1.73)
Day 10	6.25 (1.31)	6.69 (1)	6.47 (1.15)	7.31 (1.67)	5.44 (1.59)	6.38 (1.85)	6.44 (1.78)	6.56 (1.92)	6.5 (1.79)	6.38 (1.98)	5.25 (1.65)	5.81 (1.85)	6.59 (1.67)	5.98 (1.63)	6.29 (1.67)
Day 11	6.25 (1.31)	6.94 (1.24)	6.59 (1.28)	7.31 (1.67)	5.63 (1.51)	6.47 (1.77)	6.69 (1.71)	6.56 (1.92)	6.63 (1.76)	6.44 (2.04)	5.38 (1.75)	5.91 (1.92)	6.67 (1.67)	6.13 (1.68)	6.4 (1.68)
*Standard deviations are shown in parenthesis.															

Table A10. The mean (SD)* numbers of germination Reiki and Control seeds for each Dish-Order on each day of Experiment 3															
	First			Second			Third			Fourth			Total		
Day	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total	Reiki	Control	Total
Day 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Day 1	1.13 (0.43)	1.17 (0.62)	1.15 (0.52)	1.33 (0.44)	1.17 (0.62)	1.25 (0.53)	1 (0)	1.04 (0.5)	1.02 (0.35)	0.92 (0.36)	0.88 (0.64)	0.9 (0.51)	1.09 (0.38)	1.06 (0.59)	1.08 (0.49)
Day 2	2.13 (0.96)	2.04 (0.84)	2.08 (0.88)	2.29 (0.81)	2.13 (0.77)	2.21 (0.78)	1.79 (0.66)	1.75 (0.97)	1.77 (0.81)	1.25 (0.58)	1.58 (0.67)	1.42 (0.64)	1.86 (0.84)	1.88 (0.82)	1.87 (0.83)
Day 3	2.54 (1.18)	2.63 (1.19)	2.58 (1.16)	3 (1.26)	2.71 (1.03)	2.85 (1.14)	2.5 (0.77)	2.5 (1.24)	2.5 (1.01)	1.58 (0.79)	2.75 (0.87)	2.17 (1.01)	2.41 (1.12)	2.65 (1.06)	2.53 (1.09)
Day 4	4.08 (1.29)	4.42 (1.08)	4.25 (1.18)	4.79 (1.94)	4.29 (1.84)	4.54 (1.86)	4.71 (1.71)	3.83 (1.54)	4.27 (1.65)	3.96 (1.95)	4.13 (0.93)	4.04 (1.5)	4.39 (1.73)	4.17 (1.37)	4.28 (1.55)
Day 5	4.54 (1.36)	6.38 (1.79)	5.46 (1.81)	5.5 (2.07)	5.38 (2.17)	5.44 (2.07)	5.25 (1.94)	4.83 (2.04)	5.04 (1.96)	4.29 (1.95)	4.75 (1.1)	4.52 (1.56)	4.9 (1.86)	5.33 (1.88)	5.11 (1.87)
Day 6	4.67 (1.37)	6.67 (1.83)	5.67 (1.88)	5.88 (2.32)	5.54 (2.04)	5.71 (2.14)	5.79 (2.12)	5.04 (2.09)	5.42 (2.09)	4.63 (2)	5.17 (1.29)	4.9 (1.67)	5.24 (2.01)	5.6 (1.89)	5.42 (1.95)
Day 7	4.67 (1.37)	7.08 (1.65)	5.88 (1.93)	5.79 (2.02)	5.75 (1.79)	5.77 (1.86)	6.08 (2.1)	5.21 (2.01)	5.65 (2.06)	4.83 (1.97)	5.79 (1.27)	5.31 (1.69)	5.34 (1.92)	5.96 (1.79)	5.65 (1.87)
Day 8	4.75 (1.57)	7.21 (1.76)	5.98 (2.06)	6.17 (2.15)	5.79 (1.8)	5.98 (1.95)	6.08 (2.1)	5.29 (2.01)	5.69 (2.05)	4.92 (2.01)	5.92 (1.18)	5.42 (1.69)	5.48 (2.02)	6.05 (1.81)	5.77 (1.93)
Day 9	5.04 (1.54)	7.42 (1.65)	6.23 (1.98)	6.21 (2.1)	5.96 (1.66)	6.08 (1.86)	6.33 (2.15)	5.33 (2)	5.83 (2.09)	4.96 (2.03)	5.96 (1.25)	5.46 (1.73)	5.64 (2.01)	6.17 (1.78)	5.9 (1.91)
Day 10	5.21 (1.78)	7.54 (1.57)	6.38 (2.03)	6.42 (2.02)	6 (1.68)	6.21 (1.83)	6.42 (2.19)	5.46 (1.96)	5.94 (2.09)	5 (1.99)	6 (1.31)	5.5 (1.73)	5.76 (2.05)	6.25 (1.78)	6.01 (1.92)
Day 11	5.25 (1.86)	7.67 (1.57)	6.46 (2.09)	6.42 (2.02)	6 (1.68)	6.21 (1.83)	6.46 (2.18)	5.46 (1.96)	5.96 (2.09)	5.08 (1.94)	6.04 (1.3)	5.56 (1.69)	5.8 (2.04)	6.29 (1.8)	6.05 (1.93)
*Standard deviations are shown in parenthesis.															