The Effect of Reiki on the Autonomic Nervous System

As Measured by Entrainment Ratios of Heart Rate Variability

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The work reported in this thesis is original and carried out by me solely, except for the acknowledged direction and assistance gratefully received from colleagues and mentors.

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ABSTRACT

The purpose of this study was to use the popular energy healing modality known as Reiki to measurably reduce the level of stress in a recipient. The specific measurement of stress involved was heart rate variability (HRV), an autonomic nervous system (ANS) function with many well-defined stress responses and which is theoretically not under the subject's willful control.

The study employed forty participants, equally divided into control and intervention groups. After an initial session to obtain a baseline reading, Reiki was applied to the intervention group in an A-B-A-B fashion, where A = no Reiki applied and B = Reiki applied. The length of each A and B session was fifteen minutes. HRV data were recorded and analyzed using a HeartMath pulse sensor attached to the subjects' finger and the Freeze Framer computer program. This program measured HRV to obtain a relative level of entrainment, where the heart's rhythms were synchronized, a condition that was associated with reduced stress levels. Higher entrainment levels were considered "better."

Statistical results were disappointing, in that there was no significant correlation to the application of Reiki in HRV as measured by the Freeze Framer system. However, a number of potential reasons for

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this were explored and form the basis of recommendations for future research.

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CHAPTER 1: INTRODUCTION

The purpose of this study was to demonstrate how Reiki energy applied to a recipient could reduce the recipient's stress level. Specifically, the Reiki treatments would target an element of the recipient's autonomic nervous system (ANS), namely the heart, and use heart rate variability (HRV) to measure the of the amount of stress reduction resulting from the Reiki treatments. The goal was to cause a change in the recipient's HRV by a statistically significant amount, ideally to a "healthier level" from that experienced when Reiki was not applied.

The Researcher has practiced Reiki as an energy healing modality for some time. However, upon researching Reiki in greater detail, it became painfully clear that, to date, little actual scientific method had been applied to validating many of the claims of Reiki practitioners and anecdotal reports of the recipients. The impetus for this study was to (at least partially) advance the body of scientific evidence pertaining to Reiki.

Reiki's history is rich with messages of not only healing others but also healing oneself. Reiki stands as a subtle energy modality that can interact with the nervous and cardiovascular systems, according to its founder, Mikaomi Usui (Lubeck, Petter, & Rand, 2003; Usui & Petter, 2002). The first part of the Review of Literature (Chapter 2) covers the history and some of the background technical data pertaining to the practice of Reiki.

HRV was first used in 1965 primarily in labor delivery units in hospitals, and its applications have grown over the years. While it has met with some resistance in the U.S., European medical uses include predicting future health states and reducing stress. The second part of the Review of Literature discusses the anatomy and physiology of the

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ANS as it pertains to stress, reviews the definitions and characteristics of stress as a disease (and disease state), and finally examines the mechanisms of measuring the heart's reactions to stress through the mechanism of HRV.

Chapter 3 outlines the methodology used in the experiment, including the equipment and processes employed. It also goes into some detail on the demographics of the subjects that participated in the study.

Chapters 4 and 5 identify the results and discuss their implications. They also identify a number of areas of potentially viable future research pertaining to the use of Reiki as a healing modality, especially with respect to stress reduction.

A number of Appendices are included that contain ancillary data that is, for the most part, germane to but not directly involved in the subject of the report. Two of the appendices also contain the raw data and statistical analyses.

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CHAPTER 2: REVIEW OF LITERATURE

This section is divided into two parts. The first is a description of the development of Reiki and of the relevant procedures that will be involved in the study. The second is a discussion of the anatomy and physiology of stress, its effects on the autonomic nervous system, and how heart rate variability can be used to detect and measure stress.

Reiki

This section begins by observing the development of Reiki to its present-day practices. Following this historical perspective is a discussion of modern Reiki concepts and methods as they pertain to stress reduction or relief, and a comparison of Reiki to other "hands-on" disciplines.

Development of Reiki

To understand the processes of Reiki, it is important to understand the environment into which it emerged. This involves tracing the historical path and sociological elements of a Japan beginning to emerge from the feudal system and join the modern world, examining the life of Mikaomi Usui (1865-1926), founder of modern Reiki, and its development from Usui's death until the present.

Many modern Reiki classes ignore the history of Reiki. Admittedly, there are inconsistencies due to the lack of written material by early masters and monks who practiced Reiki's precursor procedures and handed them down through oral history. However, it is generally accepted that studying the roots of a healing system leads the

student to a better understanding of and respect for the healing process and the deep responsibilities involved.

Brief History of Japan

From 1639 to 1854, Japan operated under strict law of "national isolation," or *sakoku*. During this time, Japan forcefully refused international trade and cut off the borders of its country for over 200 years (Lubeck, Petter &, Rand, 2003). This self-imposed isolation prevented the Japanese people from mixing their cultural beliefs with those of other countries, ensuring little change in Japan's socio-economic structure.

In 1876, Japan's Emperor Meiji slowly began to open Japan to the rest of the world (Petter,1997). Emperor Meiji was very curious about the Western way of life, and embraced all things new or from the West. He even invited the United States military to open talks with Japan (Lubeck et al.). This seed of change heralded the end of the Shogun, and Samurai's way of life (Stiene & Stiene, 2004).

Until the 1870's, social privilege and class were the accepted way of life. Common people did not even have the luxury of surnames. However, Usui's family lineage included high ranking Hatamoto Samurai warriors, and Usui's name was taken from a famous warlord who conquered the city of his birth around 1551, assigning the name Usui to the people (Petter, 1999). The original clan name, Chiba, then became reserved for one's afterlife (Lubeck, Petter &, Rand, 2003). In 1601, the battle of Sekigahara split the Chiba (Usui) clans; one moved to Kyushu, the other to Tokyo (Usui & Petter, 2003).

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Biography of Mikaomi Usui

The preponderance of information on this legendary developer of Reiki comes from Frank Arjava Petter and his wife, Chetna, who have gone to great lengths to unearth the most accurate portrayal of Usui's life and how it affected the creation and growth of Reiki as a healing modality.

Contrary to most authors, Mikaomi Usui was not a doctor, but a prolific reader of religion, medicine, and spiritual studies (Stiene & Stiene, 2004). He studied the Buddhist path along with several forms of martial arts. Meditation, prayer, and chanting all became critical to the development of Reiki (Petter, 1997).

Mikaomi Usui was born on August 15, 1865, in the village of Taniai (now known as Miyama cho) in the district of Gifu prefecture, near Nagoya (Petter, 1997). As a young man, Usui studied *Kiko* at the Tendai Buddhist Monastery on Mt. Kurama, just north of Kyota. *Kiko* was a Japanese form of Qi Gong, a Chinese discipline that focused on the use of meditation, breathing practice, and slow moving exercises to promote health and healing (Stiene & Stiene, 2004). Kiko taught that one must build up a supply of healing energy through exercise, and that one can deplete one's energy during the healing process (Lubeck, Petter, & Rand, 2003).

Interested in something better, Usui traveled over Japan, China, and Europe, seeking a method of healing that would not exhaust the healer's energy (Lubeck, Petter & Rand, 2003;Stiene & Stiene, 2004). During this time of exploration, Usui also studied a wide range of topics, including theology, psychology, and medicine, and joined a group of men known as the *Rei Jyuptu Ka*, who studied the spiritual world (Lubeck, Petter & Rand, 2003).

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Mikaomi Usui married Sadako Suzuki in 1908; together they had two children, a boy and a girl. Usui's son Fuji was a university professor and died at the early age of 22 (Stiene & Stiene, 2004). His daughter Toshiko was born six years later than her brother, and lived a full measure of life. This point will become crucial to the history and development of Reiki upon Usui's death.

In the early 1900's Usui worked for Secretary Shinpie Goto, the then head of the Department of Health, and later the Mayor of Tokyo. Goto had a very strict policy of ideals regarding how a person should live that he expected his staff to understand and diligently practice. According to research conducted by Frank Petter in Japan, this was the time when Usui adopted the Reiki precepts that he taught as the first part of his classes (Petter, 1997), and Goto's guidelines may have played a contributory role.

Following his work placement with Goto, Usui had a difficult time in his business life, causing great hardship in his family around 1914 (Petter, 1997). As a partial solution, Usui became a lay Tendai priest known as *Zaike*. This vocation afforded him the privilege of remaining home and being a priest, while embracing the Buddhist studies of his youth (Stiene & Stiene, 2003).

Development of Usui Reiki Ryoho Gakkai

In conflict with Japanese Buddhist guidelines of the time, Usui meditated and fasted for long periods as a part of his studies. On one such occasion, he fasted and meditated for 21 days on Mount Kurama. As part of his meditation, Usui sometimes stood under a waterfall. He claimed that, on one of these occasions, the water opened the crown chakra at the top of his head, which in turn allowed him to receive a spiritual light as a *satori* or enlightening experience (Lubeck et al., 2003, p.14). While in this state,

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Symbols started flowing into his head, one after the other, like the water of the falls (Lubeck et al., 2003). As he experienced the symbols, he became attuned to Reiki Ryoho, a process Usui believed to be an attunement of enlightenment (Mitchell, 1994). The satori provided him with the information for which he had been seeking: the ability to heal others without depleting one's own energy (Petter, 1997).

Usui first experimented with this new healing ability on himself and then later, on his family. In 1922 Usui started an organization called *Usui Reiki Ryoho Gakkai*, which translates into, "Usui Reiki Healing Society" (Lubeck et al., 2003, p. 14). He then opened a healing clinic in Harajuku, Aoyama, near Emperor Meiji's shrine in central Tokyo. Here Usui began to teach Reiki and provide healings to the public for very little, or no, money (Petter, 1997). Mikaomi Usui also taught a distant form of hands- on healing called *Usui-hands on healing* (Stiene & Stiene, 2003). One very important aspect of Usui's teachings was the lack of an organized religious focus. However, even without such a focus, his concepts of meditation and living were easily adopted as a means of living a spiritual life (Petter, 1997).

One of the unique elements of Reiki was the concept of attunements, or reiju. An attunement was a method in which a student was prepared by a master to receive Reiki energy channeled to and through him. These attunements allowed the student to become an advanced healer in his/her own right, and to pass this ability on to the next generation of students (Stiene & Stiene, 2003).

Until 1917, Usui drew a very fine line between clients and students. During this time, people began to seek him out on matters of spiritual teachings as well as those of healing. It was also around this time that Usui embraced the *Tendai*, or *Lotus Sutra*,

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believing it to be the Buddha's complete and perfect teachings (Lubeck et al., 2003, p.332).

In 1922, the Usui Reiki Center was formally renamed *Reiki Ryoho Gakki*. Usui assigned healing guides to each Reiki student that he taught (some of whom are listed in Figure 1. At the same time, he introduced the students to the hand positions, symbols and mantras (Stiene & Stiene, 2004). Usui's instruction began with meditation, chanting, and teaching the students to know their intuition first, then to learn the symbols and practice Reiki (Lubeck et al., 2003). As Usui grew older, he decided to designate a master who would continue to teach his life's work, thus ensuring Reiki's future after his death (Lubeck et al., 2003).

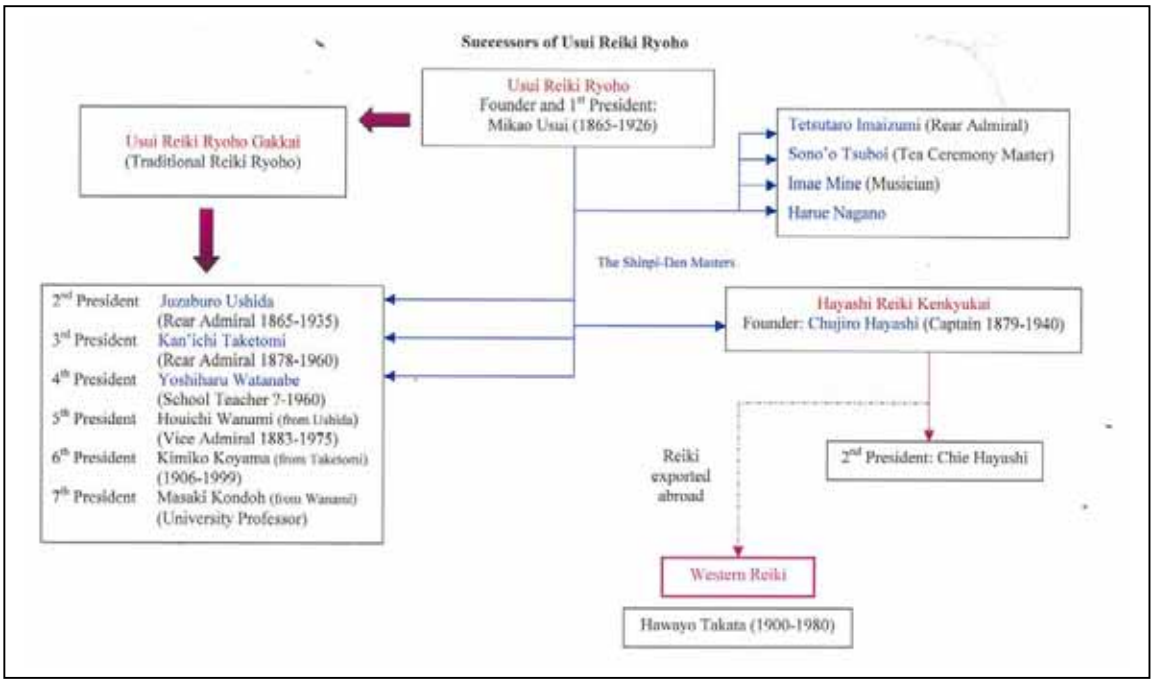

Figure 1. Lineage of Presidents of the Usui Organization

It is interesting to note that term *master*, used today to describe an experienced Reiki practitioner, is a western term and is not a part of the Japanese history. Usui

certainly did not use this term; instead, he referred to himself as Usui *Sensei*. *Sensei* is the name given with great honor and respect to teachers or a person in a high position (Stiene, 2004).

In 1923, the Kanto earthquake hit Japan, killing over 140,00 people and injuring many more. During this time, the demand for Reiki became overwhelming. Usui and his students worked tirelessly to accommodate as many people as they could. The immediate aftermath of the earthquake was almost unmanageable; however, Usui and his students worked long after the first wave of the injured arrived (Lubeck et al., 2003, pp.14-15). Their dedication and success greatly expanded the public's awareness of the use and credibility of Reiki, and as the need for Reiki grew, Usui opened a larger clinic in Nakano, Tokyo, and began to travel between the two to teach (Petter, 1997).

On the ninth day of March, 1926, Mikaomi Usui Sensei died of a massive stroke, and his ashes were interred at the Saihoji Temple in Suginami-Ku, Tokyo. Following his death, his Reiki students and clients erected a memorial describing his life at the burial site (Rand, 2000).

Development of Reiki After Usui

Since his death, many branches of Reiki developed, all adding to the original concept and beliefs. The President of the Usui Reiki Ryoho Gakkai continues to teach the original style, since several members there, including himself, were taught by Usui (Lubeck et al., 2003).

Chujiro Hayashi established one of the more significant branches of Reiki. He was a one-time student of Usui who did receive some degree of training did not complete it. (Petter, 2000; Stiene & Stiene, 2004). Hayashi broke away from Usui, forming his

own, very successful organization known as the *Hayashi Reiki Kenkyu Kai* or the *Hayashi Spiritual Energy Society* (Lubeck, Petter, & Rand, 2003, pp.14-16). However, since he was never the president of the Usui Reiki Ryoho Gakkai, under traditional Japanese Reiki rules, Hayashi's students would not be eligible to have a position in Usui's organization.

Hawayo Takata experienced a problem related to that of Hyashi (Stiene & Stiene). References show that Takata, who was to become a Reiki master under Hyashi and who was to later introduce Reiki to the Western world, was also not a pupil in the Usui system of Reiki. Instead, Takata's first exposure to Hyashi was in 1935 as a client who suffered from unrelievable abdominal pains. Takata came to Tokyo from the United States to be with her parents and seek medical help, and exhausted the traditional Japanese medical community before arriving at Hayashi's clinic. There she received two treatments a day for four months and became well again (Lubeck et al., 2003, pp. 25-31). Following her recovery, she stayed on at the clinic and studied with Hayashi until 1937, when she returned home to America and began to teach Reiki there. Hayashi visited the United States several times to lecture on Reiki with Takata, but these travels were not without incident (Lubeck et al., 2003). At a time when Japan and the United States were increasingly at odds over competing political and economic interests in the western Pacific, these trips caused him to come under the scrutiny of the Japanese government, and Hayashi believed they suspected him to be a spy (Petter, 1997). During one visit, Takata had received her master, or *Shinpiden*, level from Hayashi in Hawaii in 1938 (Lubeck et al., p. 301) A copy of this certificate is in **Appendix A**, (Lubeck, Petter & Rand, 2003)

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Figure 12, page 106.

The term *Shinpiden* is the passage of Reiki from one teacher to a student without first seeking self-enlightenment (Petter, 1997). Shinpiden means that the Reiki channel is open and available to all students, from the child who has not studied Reiki to the adult who has devoted his/her life to the practice (Petter, 1997).

In 1940, Chujiro Hayashi committed suicide in Japan, reportedly because of the pressure he felt from the accusation and suspicions, real or perceived, of being an American spy. His wife, Chie Hayashi, succeeded him as president of the *Hayashi Reiki Kenyu Kai* in Japan. According to research, Takata did not assume the title of president for either the Usui or Hayashi organizations (Lubeck et al.).

Hawayo Takata fared little better than her teacher. She was teaching a Japanese-based technique at a time when war and mistrust were still very much on the minds of the Japanese and American people (Lubeck et al., 2003). In 1942, President Roosevelt issued an order for all Japanese-Americans living in the United States to be placed in coastal Pacific concentration camps in California, where they remained until the end of the war. These 100,000 Japanese Americans lost their homes and an estimated 400 million dollars in possessions (Lubeck et al., 2003; Stiene & Stiene, 2004).

World War Two indirectly played a dramatic role in the history of Reiki. Both the Usui and Hayashi lines of Reiki training suffered great difficulty during this time due to the political state of affairs in Japan, the United States, and Europe (Lubeck et al.) Even after the war, Japanese practices were considered suspect. As a result, Reiki experienced almost no activity from 1940 until the early 1980s (Petter, 1997).

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Modern Reiki

Much of what is known about Reiki in the West comes from Takata, who began to teach Reiki in the more enlightened period of the 1960s and 1970s. However, her teachings have more recently been tainted with some degree of suspicion due to several false statements that she made concerning from whom she received her degree and the content of the course that she taught.

In 1970, she began teaching the very basic level up to and including the Shinpiden, or master level, in one week. Takata combined the first four levels of the Usui system into four attunements in one session. This would account for the reason she gave three attunements at level one. The class would last one week and cost $10, 000 and there was no apprenticeship period (Stiene & Stiene, 2004, p. 158). A copy of a flyer for one of Takata's early classes is found in **Appendix A**, Figure 13, page 107 (Lubeck et al, 2003).

Takata posted a flyer advertising her class, stating that she was the only living Reiki Master in the world (Lubeck, Petter, & Rand, 2003, p. 26). Takata also made reference that Usui attended college at the University of Chicago. However, a communication from the University of Chicago to William Rand, dated 1990, reveals this to be untrue (Lubeck et al., p.304). Takata also said that Usui was a professor at Doshisha University in Kyoto, Japan; again information has been obtained to the contrary (Lubeck, Petter, & Rand, 2003, p.303). She also claimed to be teaching the method of Reiki taught by Usui, not Hayashi, although what she taught was a combination of the two teachers' material (Lubeck et al., 2003).

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Takata must be credited for the spread of Reiki in the Western world; she is also to blame for some of the misinformation and distrust associated with Reiki. If the actual lineage to Usui was not important, it would not matter. However, in tracing Reiki to its place of origin, the purity and effectiveness of the concepts taught is at risk and lineage becomes very important (Petter, 2000).

The researchers William Rand and Frank Petter speculate that the purpose of these distortions may have been to assign a title of *doctor* to Usui, in an attempt to create trust and increase her validity and credibility as a teacher charging. With it, she could justify charging huge prices for her workshops (Lubeck et al., 2003, pp. 28-31). On one respect, she created the perfect Sensei for her own branch of Reiki lineage that does go back to the original master, Usui; the path is just somewhat more convoluted than she portrayed (Petter, 1997; Lubeck et al., p.18).

Defining Reiki

General Characteristics

In general, hands-on healers seek to manipulate (ad to, move transform, or remove) energy associated with the body. In essence, they use the physical body as a template for or landscape of the energy body. By this definition, Reiki is a hands-on discipline.

The Center for Complementary and Alternative Medicine (CAM) refers to a Reiki practitioner as one serving as a conduit for healing energy coming from the Universe. In the healing process, Reiki energy enters the Practitioner through the top of his/her head, exits through his/her hands, and is directed into the body or energy field of the recipient (Westley, 2000). Reiki is a naturally emitted Universal energy whose source is the

physical body of all living beings. Reiki offers the Practitioner the means to direct this energy flow at will (Usui & Petter, 2002).

All true Reiki disciplines recognize and adhere to the basic tenets of Reiki.

- The fundamental ability to perform Reiki comes from attunements rather than the development of a skill. Attunements are processes performed by a Teacher or Master on a recipient/Student that open the recipient's awareness of and ability to channel Reiki energy.
- All Reiki techniques can trace the history of their passage along well-defined lineages. Information is passed directly from Teacher to Student by way of attunements and general training. Thus, each student should be able to draw a straight line of Teacher-Student relationships from him/herself back to Usui.
- The Reiki Practitioner does not use mental or guided imagery. Rather, Reiki is always guided by a higher power that matches the vibrations of the energy channeled to that of the energy needed by the recipient.
- The process of sending or receiving Reiki energy never causes harm.

According to Petter, Reiki not only heals disease, but also amplifies the recipient's innate healing abilities by balancing the spirit, and thus promoting a healthy mind and body (Petter, 1997, p. 30).

Usui taught that following one's own intuition in the healing process was the best way to honor the practice and path of Reiki (Usui & Petter, 2003, p. 28). In his school, every Student had to develop and hone his/her sense of intuition and always worked from this intuitive level. Conceptually, the Student allowed the body of the recipient to

"speak" to him/her (Usui & Petter, 2002). Using this intuitive ability, the Student would scan the physical body of a recipient until the Student "knew" where in the body an energy distortion was located.

As Students/Practitioners practice Reiki energy would work on themselves and others, and their intuitive awareness grew, and they began to recognize the "signature" and intensity of the vibrations of the energy (Lubeck et al, 2003, p. 101; Stiene &Stiene, 2004, p. 86). During Usui's training sessions, Students learned to scan the body in a diagnostic fashion (Usui & Petter, 2002, p. 8). They were directed to begin to heal an area the moment that they detected and isolated a discrepancy in energy. Using Reiki, the students would energize the recipients' bodies on a number of levels simultaneously:

- On the physical level through warmth of the hands;
- On the mental level through thought or use of Reiki symbols;
- On the emotional level through love that flows within and between them; and
- On the energetic level through the presence of the initiated person (the Master/Practitioner), as well as through the power of Reiki energy itself (Usui & Petter, 2002, p. 8).

The Reiki Concept of Attunements

While Usui's version of Reiki training included the use of prescribed hand positions to help channel energy, these were simply the mechanical aspects of the healing process. It was through the channeling of Reiki energy, facilitated by attunements, that true Reiki healing took place.

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As presented earlier, an attunement is a process performed by a Teacher or Master on a recipient or Student that opens the recipient's awareness of and ability to channel Reiki energy. There are many different attunements. In training, these are presented in a particular order. In healing, they are used as a means to promote or enhance the healing process.

The *Reiju Attunement* (translated as "great difference") is a ritual initially used and taught by Usui and appears to have a two-fold action. First, it creates a sense of reconnection to one's true self, and second, it promotes clearing of the meridians, thus allowing one to pass more energy through one's body during an attunement (Stiene & Stiene, 2004; Stein, 1996). This creates a state of energetic awareness that is usually only achieved in other disciplines through a great deal of spiritual and energetic training. Reiju creates within the recipient the ideal vessel in which to receive Reiki energy (Stiene & Stiene, 2004).

Reiki Levels

Reiki training and certification are conducted in three stages called *Levels*. Each Level has an associated degree of training and demonstrated expertise. Levels also delineate to some extent what the Practitioner can accomplish or perform. However, even though much learning, training, and practice are necessary to complete Levels II and III, a Level I student is still expected to be able to provide healing services.

Level I.

Reiki Level I introduces the Student to general concepts and basic practices, including helping the student to reconnect to his/her inner self and the divine. During this first level of Reiki, things are explained in very simple terms (Petter, 1997, p.38). Hand

positions provide the means for Students to be proficient in treatments both on themselves and on others. The *First Attunement* is provided early in the training to enhance the Student's recognition of energetic channels within the body and their ability to receive Reiki energy (Petter).

After the *Second Attunement*, Students begin to practice on themselves and each other. Group treatments promote bonding between Reiki Students/Practitioners. The Second Attunement also gives the Student a means of comparing his/her intuitive recognition of energy states and flow by comparing perceptions before and after the attunement. During this portion of their training, it is common for Students to experience warm, tingling sensations in their hands (and sometimes in their back) as they attempt to scan for and channel energy.

Students eventually receive two additional attunements in Level I training. The purpose of these attunements is to open their channels, allowing the Reiki energy to flow freely through their bodies and into the recipient (Petter, 1997).

Reiki Level I also introduces the concept of centering (or grounding), whereby the Reiki Practitioner connects to the center of the Earth. Each student is taught and encouraged to adopt Usui's precepts and pillars of Reiki. The well-=being of the Practitioner that results from following these precepts and pillars are at the very foundation of Reiki practice, and are paramount to maintaining the purity of Reiki as an energy healing practice (Lubeck et al, 2003). A teacher carefully and completely explains each precept to the students and provides examples. It is interesting to note that Usui's pillars are not part of the training currently taught in Japan, even though they

originated in that culture (Petter, 1997, pp. 61-64). This may be because the Japanese way of life is expected to more closely mirror the pillars than is Western culture.

A key element of practicing Reiki is the surrounding energetic environment. The Reiki instructor must not overlook the importance of preparing the energetic space in which Students of Reiki learn and practice. It seems obvious, but a quiet, calming, non-distracting atmosphere will significantly enhance the Students' ability to learn (Petter, 2000).

Level II.

Level II training begins with the Students' introduction to the concept of one's higher self. It also introduces the Students to a quantum leap in intuitive awareness training. As they continue to practice, Students learn to embrace their intuitive nature during scanning and treatment. They also learn to employ Reiki in all aspects of everyday life. For example, they discover that they can perform Reiki on a flower, a cat, medication, or food (Petter, 1997). Students are also taught that the only limitations to the practice of Reiki are those that are imposed by the Practitioners themselves.

Every student participating in Reiki Level I and II training should become aware that, through the practice of Reiki, their lives will change in many ways. Through teaching and experience, they are shown that adding Reiki to one's everyday life has many beneficial outcomes (Mitchell, 1994, pp. 71-72). Recognizing these changes is important, and the Students are strongly encouraged to come to know their own bodies and the characteristics of their own intuitive abilities before they begin to practice on other people (Petter, 2000).

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Level II attunements turn each Student into an energy transmitter with the ability to affect people and things across space, time and matter (Petter, 1997). Even though Students were previously taught to center themselves when healing, this is reinforced because it is so important when performing a distance healing. A critical component of distance healing is the Absence Symbol, which is designed to help the Practitioner send energy to a recipient over a distance (Mitchell, 1994). Mastering it is key to this phase of training. On average, the duration of a distance healing procedure is around fifteen minutes (Petter, 1997).

While many anecdotal examples of quick relief exist, Reiki is a subtle energy rather than a lightning bolt; its results are often not immediately noticed, or indeed, in some cases, immediately noticeable (Horan, 1995). It is important for the Practitioner and recipient to understand that, regardless of the Practitioner's level of training and experience, healing does not always end immediately with the termination of the healing session (Horan, 2002, p. 135). In other words, subtle energy flow may continue after the overt process ends. Similarly, some of the healing processes may require an extended period of time for the healing to reach a macroscopic level of manifestation. The Student/Practitioner and recipient both need to be patient during and after healing work.

Level III.

Level III is for the Student that wants to teach Reiki. However, this is not to say that a Student/Practitioner could only use the information in this level to teach.

Reiki Level III begins with the concept that the Student and Teacher are to become a clear vessel into which Reiki energy can enter and pass through (Horan, 2002, p. 179). Students engage in energy transference with the Teacher, first as the student, and

then as the Master (Horan, pp. 180-182). This switching of roles gives the Student an opportunity to experience the flow of energy both ways (Horan, pp. 180-182).

Reiki Hand Placements

Usui taught that the basic hands-on treatment involved hand positions applied to specific locations on the body (Usui & Petter, 2002). To this end, he developed and taught the use of a number of prescribed hand positions as part of Reiki. These hand positions, combined with scanning and intuition, formed the basis for systematic healing. Takata simplified these to twelve standard hand placements on the forehead, temples, back of the head, throat, back of the neck over the throat, diaphragm, and heart (Usui & Petter). As most Western Reiki Practitioners can trace their lineage back through Takata, these are the primary techniques used here today.

Usui provided a detailed handbook to his students that described a number of prescribed hand positions to be used in the Reiki process. These are far more extensive in number than have historically been taught in the West. He correlated a particular hand position to both the symptomology and healing of the disease (Usui & Petter, 2003, p. 7). Conceptually, the hand(s) formed a *cavity* where energy would be focused and channeled (Usui & Petter, 2002). Usui favored his right hand for this, but none of his teachings dictated that a specific hand be used for a specific purpose (i.e., performing a hand position or sending or receiving energy). Instead, he taught that the Healer should do whatever "feels comfortable." Furthermore, there were no definitive rules discussing the length of time that a healer had to leave his/her hand son an area. Usui simply taught his students to remain in an area until the pain was gone. Tanaka simplified Usui's hand

positions, distilling them down to twelve. These twelve have significant merit, but are considered by some to be limiting (Usui & Petter, 2002).

Of the twelve hand positions taught by Takata, six are intended to have a direct effect on stress (and therefore, the autonomic nervous system) (Lubeck et al, 2003, p203-207). Illustrations of these positions are found in **Appendix B**. It is important that the Reiki Healer understand Usui's interpretations of each hand position, and the position's effects on both the human body in general and the organs within the body in particular (Lubeck et al, 2003, p. 217). Consequently, these descriptions are also provided below.

These six hand positions are:

- **Position 1.** The focus of this position is on the face. Usui correlated his position with anatomy and physiology (Usui & Petter, 2002). The expected outcome was to relax and dissolve the body's internal fear and stress. The sinus area received energy for sinus problems, eye, teeth, and jaw alignment. The Reiki energy works in balancing the pineal and pituitary glands (Petter, 1997, p. 55).

  (See **Appendix B**, Table 5, page 108.)

- **Position 3.** The focus of this position is on the ears. In forming position three Usui believed a light touch should be used over the ears, as contact is not required for Reiki energy to work. This area is stimulated, resulting in an increase in the body's ability to remain in a state of equilibrium. This includes the body organs and parts of the brain. Reiki decreases the stress mechanism in the body (Lubeck et al., 2003, p.219). The body goes into a relaxed state, dissolving stress, calming the mind, and decreasing

headaches (Petter, 1997, p.55).

(See **Appendix B**, Table 6, page 109.)

- **Position 4.** The focus of this position is on the back of the head. The forth position orchestrates the normalization of many unconscious or auto body functions, as promoted through the medulla oblongata. This places the body in a restful state of healing as it connects to the spinal column and other areas of the nervous system. The thymus gland is included, as are the lungs and cardiovascular system (Petter, 1997, p.57). (See **Appendix B**, Table 7, page 110.)
- **Position 5.** The focus of this position is on the throat. The fifth position allows the client to release negative feelings and to speak his/her mind. Reiki generally believes that the connection between the head/brain and the rest of the body occurs here, and that this position affects the balance of male and female energy. Other anatomical elements in this area include the thyroid and parathyroid (which control bodily functions), the vocal cords (where one's voice begins and is sent through the mind and mouth to be heard), and the lymphatic nodules as well as ganglia that are located in the carotid arteries (which are responsible for maintaining blood pressure to the head) (Lubeck et al., 2003, p.220-221). (See **Appendix B**, Table 8, page 111.)
- **Position 7.** The focus of this position is on the lower ribs. The seventh position deals with strengthening an organ just after the organ has released its specific energy, for example the liver and gallbladder (Lubeck et al.,

2003, p.222). The stimulation of this position treats the spleen and large intestines. This includes portions of the transverse colon and a large part of the stomach (Lubeck et al., 2003, p.222). Researcher Frank Petter explains that this position dispels fear and therefore stress. It also enhances the function of the liver, gallbladder, spleen, and digestive track (Petter, 1997, p.57).

(See **Appendix B**, Table 9, page 112.)

- **Position 9.** The focus of this position is on the heart. The ninth position strengthens the heart center. Emotionally it strengthens one's ability to say, "yes" to excelling in groups. This position is important to the function of the thymus gland, enhancing a youthful vitality as well as mental freshness (Lubeck et al., 2003, p.224). The prominent physiology of this position combats against stress, promotes relaxation, and regulates the heart rhythm (Petter, 1997, p.57).

(See **Appendix B**, Table 10, page 113.)

Reiki Symbols

Background.

Many of the precursor concepts related to Reiki are ancient; it is important to realize that, in many instances, symbols were the only means of communicating the characteristics and meanings of these concepts, including the healing energies used by the ancient Masters (Lubeck et al, 2003, p. 117). Most of the information from these practices were maintained and passed down through verbal lore, a practice that still exists in many Eastern cultures today, including Japan (Stiene & Stiene, 2004). The written

symbols, most of which have survived for 2,500 years or more, are not the Reiki symbols as we know them today (Stiene & Stiene, 2004, pp. 132-133), but are instead related to the pictures and sounds (mantras) resident in the Japanese language and culture (Lubeck et al, pp. 117-119). The mystic portion of Reiki involves how the symbols are used and the nature of the preparation involved for their use.

In Japan, numbers represents Reiki symbols used for attunements. In the West, the actual name of the symbol is used as the name of the mantra (Stiene & Stiene, 2004, p. 85). The search for additional symbols and for more detailed information about the existing ones has been difficult at best (Petter, 1997). This is due, in part to a deliberate attempt to shroud the concepts and meanings of Reiki, and particularly the symbols, in secrecy.

In Eastern history, healing was a science and art that was passed down from Master to Student, and usually not disseminated to the general public. Many of the activities involving the manipulation or control of energy (including most martial arts) practiced (and often still maintain) some degree of restriction when it came to disclosing their "trade secrets." Reiki is no exception. According to the teachings of Takata, publicly displaying the actual symbols was an act of dishonor. Indeed, in modern Japan, only recognized Reiki Practitioners and Students are permitted to enter the Usui Reiki establishment (Lubeck et al, 2003).

The Japanese Practitioners believe that the "value" of a symbol is not in its energy but rather in its ability to activate a Reiki channel as an attunement. Put differently, the power of Reiki resides not in its symbols, but in the connection that is established within the Reiki Master by the symbol. In this context, many believe that making public Reiki

symbols is not dishonoring Reiki tradition, since the symbol is not the true source of power; That is, knowing the symbol itself is not dangerous or irresponsible; it cannot be activated without a Master making the connection to the student.

Another way to view the role of symbols in Reiki is to consider them as training wheels; as one learns to ride a bike, one removes the training wheels when they are no longer necessary. The symbols provide a focus to initially help the Student/Practitioner channel energy effectively. With practice and increased skill, detection of an channeling energy becomes an innate ability and the symbols are not needed.

There are a number of translations and interpretations of the symbols into English. The ones used in this study are from Diane Stein (Stein, 1996). Instructions in the use of the symbols are almost as scattered as the actual translations of the symbols' meanings. According to Petter, Usui did not present symbols to his students until their second year, and then only until the students became more comfortable and accurate with their intuition skills (Usui & Petter, 2002).

Actual employment of the symbols is equally diverse. Some practices hold that one should draw the symbols in the air above the recipient's body with the dominant hand, while others believe that such physical actions are not necessary and that one can, instead, mentally draw them (Usui & Petter, 2002; Stiene & Stiene, 2004).

Symbols used in this study.

The four Reiki symbols relevant to this study are Cho-Ku-Rei, Hon-Sha-Ze-Sho-Nen, Sei-He-Ki, and Dia-Ko-Mio (Stein, 1997, pp. 132-140). Most of these symbols are based in Taoist theology merging with the Japanese traditions (Stein, 1996).

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- **Cho-Ku-Rei (CKR)** is believed to be the power symbol, the intensifier of Reiki energy. It can be used alone or in conjunction with any other symbol (Lubeck et al., p.132). The CKR symbol also strengthens the connection of the student to the universal source of Reiki energy (Stiene & Stiene; Lubeck et al., 2003).
- **Hon-Sha-Ze-Sho-Nen (HSZSN)** is the symbol of distant healing. It connects the Practitioner with the levels of light and his/her higher self. Through the activation of this symbol, the Reiki Practitioner becomes one with the recipient (Stein, 1996; Stiene & Stiene, 2004).
- **Sei-He-Ki (SHK)** is the symbol that heals the mind of illness. This symbol is used with people who experience headaches and most other physical and emotional problems involving the head. Consequently, the SHK symbol is also used to balance those with depression and emotional upset. It is a calming symbol and should only be applied to the head (Lubeck et al., 2003, p. 119).
- **Dia-Ko-Mio (DKM)**, also called the *Master Symbol*, is the symbol used to unify the mind and body. Its ultimate purpose is to help the Practitioner become one with the Universe (Stein, 1996), and it possesses great spiritual significance. As one uses the DKM, one merges with the "light Wisdom" of the Original Buddha nature, which manifests as the pure light of one's radiant self. A natural energetic force appears, that one can tap into to obtain light and healing energy (Lubeck et al., 2003; Stiene & Stiene, 2004).

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The Master DKM is the most coveted energy symbol and has been spelled out in this paper (Figure 2, page 27). This symbol was long held as a great secret of Reiki Level III Masters, but was presented to the world (along with all of the other primary Reiki symbols) when Diane Stein's book, Essential Reiki, was published in 1996. Stein's book created a great deal of controversy over her release the coveted Reiki symbols. The manner in which she presented them (out of the context of the Reiki classroom) was very upsetting to other Reiki Masters (Lubeck et al., 2003). It is interesting to note that the symbols continue in use today and are still respected by Reiki Practitioners. They are just no longer a big secret (Petter, 1997).

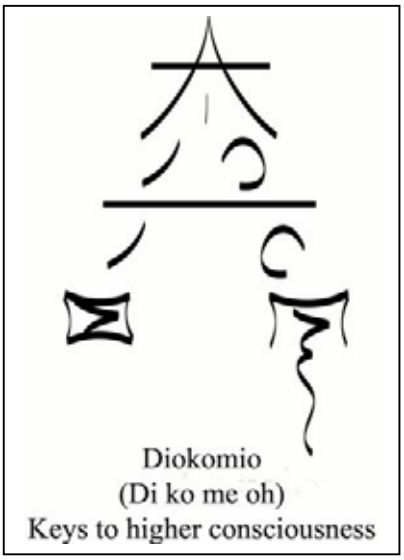

Figure 2. Reiki Master Symbol

Precepts and Pillars of Reiki

Precepts of Reiki.

The *Five Precepts* of Reiki, "*don't get angry today*," "*don't worry today*," "*be grateful today*," "*work hard today*," and "*be kind to others*," have a very unsure origin (Petter, 1997, p.30). The isolation of exactly when, where, and from whom Usui

obtained his information remains speculation. Two individuals are believed to have influenced Usui in writing his precepts. One was Usui's employer, Goto, the head of the Department of Health and later Mayor of Tokyo. Goto shared very simple beliefs regarding personal lifestyles and expected his staff to adopt these principles as part of his staff's home values (Petter, 1999). The other influence was Usui's most-respected Emperor Meiji, whose poetry and messages were so meaningful to Usui (so much so that he included them in his manual) (Petter, 1997, p.30). Either way, the information in the Five Precepts is a crucial part of Usui's classroom presentation (Petter, 1997).

Reiki was intended to not only heals disease, but also to amplify one's innate energetic and healing abilities, balance one's spirit, make one's body healthy, and in general help one to achieve true happiness (Petter, 1997, p.30). According to Usui, speaking these five precepts each day afforded one a happy life (Petter, 1998). Performing this act was done in order to promote within one a clearer channel through which Reiki energy could flow. Looking at each precept individually allows one to understand the meaning that Usui meant them to have.

- **Don't get angry today.** The meaning of this precept is generally misunderstood as, "all anger is inherently wrong to feel." This was not Usui's intention. Embracing anger, acknowledging it, observing it, and in doing so, releasing it forever, sets one free (Petter, 1997, p. 32). This process is an increasingly formative way to decrease stress.
- **Don't worry today.** Worry is aligned with fear of inadequacies, of not making the grade, and of not measuring up to others' standards. We worry because we see the entire world as competition. We worry because

we are unsure of change. It seems that some people can worry over nothing, but to them it is very serious and worry is actually a way of life (Petter, 1997).

- **Be grateful today.** This message has two parts. One is to notice and appreciate all of the good in one's life, not just in terms of possessions, but also in terms of intangibles such as family and friendship and life's lessons and experiences. Too often today, people tend compare themselves to others and lament at the disparity, not seeing the richness in their own lives. The other message is to see the good in everything, even those situations or events where good may, on the surface, be hard to find. Sometimes, the answer is in not getting what you asked for, but rather what you need. The blessing is in the unanswered prayer (Petter, 1997.
- **Work hard today.** This does not refer to what one might think. Most people work very hard at their jobs, keeping house, raising children, etc. "Work hard today," means to do what is important. It means to take time for inner, spiritual, mental and emotional maintenance, addressing the needs of the inside of your body, not just the outside. It includes inner growth, meditation, chanting, and prayer. In essence, it says that one should diligently strive to achieve whatever is needed to bring one closer to one's personal wholeness, be it change in diet or long walk in silence. Usui likened it to a remembrance of self (Petter, 1997).
- **Be kind to others.** This means to embrace the environment, nature, and one's "home" with love. It is important to acknowledge all forms of life.

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> Do not look at the negative, instead, look at the majestic mountains with respect and honor for their creation. Be kind to all living beings, not just people (Petter, 1997, p.35). Respect where each living being comes from. It is a daily privilege to honor all things great and small.

Pillars of Reiki.

The *Pillars* of Reiki work in conjunction with the *Five Precepts* to establish the landscape on which to begin teaching Reiki principles. Usui focused his classes on three essential components (pillars) that he used in teaching and healing: *Gassho*, *Riji-ho*, and *Chiryo* (Lubeck et al., 2003). The literal translation from Japanese to English, according to Frank Petter, is two hands coming together; it is used to prepare for Reiki teaching or for a treatment session (Usui & Petter, 2003).

The first pillar, Gassho, is a meditation used in conjunction with a kneeling, prayerful-like body position with one's hands folded in prayer. The meditation's intent is to focus and clear the mind, creating a clear channel in which Reiki may enter and flow through to the recipient. Gassho takes approximately one to two minutes, and is used in preparation for a Reiki session prior to beginning it (Usui & Petter, 2003). The Gassho is the point where your middle fingers meet while in this meditative position. Anytime one's mind wanders or becomes distracted, one is to return one's mind to where the fingertips meet (Usui & Petter, 2003, pp. 15-16; Stiene & Stiene, 2004).

The second pillar is the *Reiji-ho*, translated loosely into English as an *indication of the spirit* or *indication of Reiki energy* (Usui & Petter, 2003). During meditation, one prays for the healing and well-being of the client on all levels to be met. The spirit source (the source of Reiki energy) is requested to enter the healing session. Prayer is

offered that helps the healer's ego steps aside and assist in a healing for the receiver. It is considered good to pray that the highest good for that individual will be presented in the healing (Stiene & Stiene, 2004). A request is made for Reiki energy to flow through the Healer and into the receiver of the Reiki (Usui & Petter, 2003). Allowing Reiki energy to enter the healer's body and then pass through to the recipient's body helps the energy to go to wherever it is needed, that is, any area that is lacking in energy (Usui & Petter, 2003, p. 17).

The third pillar is *Chiryo*, meaning "treatment." Incorporating the *treatment* means using one's hands to heal. An important part of *Chiryo* is using intuition as one learns to trust in what the spirit provides. *Chiryo* comprises several different techniques, including *Reiji-ho* (scanning). Above all else, one must trust that the highest good for the recipient is being done. It is imperative that the Healer's ego be switched off during a Reiki session (Usui & Petter, 2003, p.19), that the Healer separates him/herself from outcome. Once the Reiki session has started, the *Chiryo* pillar is no longer required or needed (Usui & Petter, 2003).

An Ideal Reiki Session

Table 1, page 32, outlines the basic sequence of events for an ideal Reiki session (Lubeck et al., 2003, p.208). It is included to tie together the many concepts and activities discussed above. Note that this is only a general outline; it is up to the Reiki Master to use his/her intuition to identify any special needs or action to be taken and modify the course of treatment as appropriate to meet those needs.

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1. The Reiki Master (RM) clears and quiets the treatment room prior to the client's arrival.
2. The RM washes his/her hands, and then allows the water to run clear.
3. The RM engages in Gassho.
4. The RM engages in Reiji, offering a prayerful request for the client's highest good to be done. The RM then recites the pillars.
5. The RM welcomes the client and makes him/her feel comfortable.
6. The RM engages in Chiryo.
7. The RM scans the client.
8. The RM applies the Reiki symbols.
9. The RM rescans intuitively and reapplies the prescribed Reiki symbols and hand positions.
10. The RM closes by applying Reiki to the soles of the client's feet.

Table 1. Sequence of Events for a Reiki Session

Modern Reiki Research

In 2002, California Pacific Medical Center, one of the largest hospitals in Northern California, created a branch for a *Complementary Healing Clinic*. The clinic is staffed with two physicians, Mike Cantwell and Amy Saltzman (both of whom are Reiki Masters), and more staff is being added. Cantwell provides a one- to two-hour Reiki session for each client. Clients that respond well to this initial treatment are then enrolled in a beginning Reiki class to learn Level I skills as a method of self-treatment. Cantwell has found Reiki to be useful in the treatment of acute illness, musculo-skeletal injury, pain, headaches, acute infections, and asthma. Cantwell points out that one of the unique aspects of this manner of Reiki treatment is the act of prescribing ongoing education and self-treatment for the clients (Rand, 2004). In addition to improving the client's health, this has the added advantage of potentially reducing the client's dependence on existing medical care facilities and practices.

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Wardell and Engerbretson conducted a study focused on the biological correlations of Reiki Touch and Healing Touch. One of the most commonly reported effects of these therapies is enhanced ability to relax, and deeper states of relaxation. During the study, the researchers examined the physiological and biochemical effects of a thirty-minute session performed on a subject. A single group of twenty-three subjects were tested using an ABA design (three periods of testing: no intervention, intervention, and then no intervention again). Each researcher observed a battery of biological marker data related to stress and a stress-reduction response obtained from the subjects. This response measured the effects of treatment on anxiety, salivary IGA, cortisol, blood pressure, muscle tension, and skin temperature. Data was collected before, during, and after each Reiki session. The results showed that overall anxiety decreased, salivary IGA levels rose slightly (implying a more robust immune system), and that cortisol was not statistically significant (cortisol typically rises and drops with stress levels). There was also a significant decrease in blood pressure and an increase in body temperature. The conclusion reached by the researchers was that Reiki treatments for stress produced a significant change in biochemical and physiological states associated with stress and that could potentially lead to a deeper state of relaxation in the subject (Wardell & Engerbretson, 2001).

Wardell and Engerbretson carefully scripted the study's Reiki hand placements, along with the amount of time they spent in each position. These testing sessions were unlike a conventional Reiki session, where the Healer/Practitioner depends on intuition and feedback to guide his/her healing activities, including hand placements. Due to the way that the study was conducted, a causal relationship between the application of Reiki

practices and energy and some of the expected outcomes could not be statistically verified. The biggest problem was that of controlling external variables; other factors could not be ruled out as have been involved in the responses. In addition, the sampling was too small and not randomized. However, the anecdotal information obtained from the subjects clearly pointed out that all experienced one or more of the following feelings or states: a reduction in anxiety, feelings of warmth, stronger sense of security, peacefulness, and a general feeling of calmness (Wardell & Engerbretson, 2001). Even without its scientific validation, this study's results are significant enough to warrant further investigation into the biochemical response of the body to Reiki.

Mansour in Saskatchewan, Canada, conducted an initial series of research studies on Reiki whose purpose were to test standardization procedures developed by research teams for placebo Reiki. This was a pilot study (conducted prior to launching the complete series of full-scale studies, in order to save money for the larger scale test) that evaluated subjects and independent observers to see if they could be successfully blinded to "sham" versus "real" Reiki. The study used a four-round, crossover experimental design with twenty blinded subjects. Two Reiki practitioners were recruited, along with two actors who closely followed the motions of the Reiki practitioners. The combinations tested were Reiki plus Reiki, placebo plus placebo, Reiki plus Reiki and placebo plus placebo. Subjects were asked to identify who were the Reiki practitioners and who were the actors "faking doing Reiki." None of the subjects were able to accurately distinguish the Reiki practitioners from the placebo actors, suggesting that studies using hands-on healing such as Reiki therapy can be carried out in a double-blind research study. Another interesting finding in Mansour's study came from the subjects'

"self-reports." Subjects stated that the perceived sensation of the healing process was stronger on the second round of Reiki plus Reiki. The qualitative comments expressed by participants further confirmed this quantitative data (Mansour, 1999, p.153-164).

Comparison of Reiki to Other Hands-on Healing Modalities

The essential commonality between Reiki and other hands-on healing practices such as Therapeutic Touch and Healing Touch are their core concept of the application of energy to promote health and support healing. All three disciplines recognize that the nature of the energy in and around the body can determine the health of the physical body (Kramer, 2002). They also share a common belief that actual healing originates from a higher power and not from the Practitioner (Kramer; Lubeck, Petter, &, Rand, 2003), who is merely a conduit through which the healing energy flows to the area most needed by the recipient (Lubeck et al.).

Each of these disciplines can trace their fundamental principles and techniques back to the earliest healing practices. The concept of "laying on hands" is as old as recorded history (Stiene & Stiene, 2004). Ancient Egyptian papyrus scrolls dating to 1552 B.C. talk of hands-on healing for medical treatment (Gerber, 2000). Reiki's own roots go back some 2,500 years to early Oriental and Buddhist forms of healing (Horan, 1995). Healing Touch and Therapeutic Touch openly admit that they derive in one way or another from historic methods of hands-on healing. However, they are unable to isolate a specific source or lineage as their origin (Kramer, 2002; Krieger & Horrigan, 1998). In fact, many of their fundamental processes can be traced back to historical Reiki concepts (Kramer, 2002; Krieger & Horrigan, 1998; Petter, 1997).

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A few simple three-way comparisons of core concepts will suffice as an example. Each of the three disciplines espouses the process of *centering* to quiet the mind and relax as an essential precursor to healing activity, although their techniques vary somewhat (Kramer, 2002). Centering is a way to self-regulate the Healer's autonomic process so as to allow enough time for the Healer to relax and achieve inner peace and balance before a healing session takes place (Krieger, 1979; Kramer, 2002; Petter, 1997). (The same techniques work for the recipient, too.) Centering can be a prayer, a meditation, a chant, or simply a moment to separate oneself from the surrounding environment (Gerber, 2000, p. 386). Healing Touch considers this step paramount in the healing process.

A second concept basic (and common) to all three disciplines is the initial act of assessing the recipient's energy field to detect imbalances in the field's state (relatively speaking, its *quantity*), flow (the absence of flow and/or the presence of blockages where normal flow should take place), or nature (the general characteristics of the energy, sometimes defined in terms of its frequency, color, temperature, or trait) (Krieger, 1979; Kramer, 2002; Petter, 1997). Learning to detect and assess the flow of energy typically requires much training and experience, which explains why each modality requires, as a term of training and certification, that Student Practitioners perform a certain number of processes over a given time. This is done to enhance the skill level needed to accurately and reliably detect distortions in a recipient's energy flow (Gerber, 2000; Krieger, 1979; Kramer, 2002). In most instances, all three of these hands-on disciplines also subscribe to some form of apprenticeship training under a designated Master to establish optimum conditions for a Student's tailored growth within the respective disciplines. In most cases, a competent Teacher/Practitioner is able to detect quantities of energy that might

otherwise go unnoticed by Students or Practitioners with less experience or training (Krieger, 1979; Kramer, 2002; Petter, 1997). Historically most all of the hands-on disciplines agree that the more opportunities that one has to interact with energy fields, the sharper one's diagnostic and healing skills become (Kramer, 2002).

A third concept shared by all is the process of *unruffling*. This is a gentle brushing away of congested energy in conjunction with a on-going assessment of the recipient's energy as a feedback mechanism. Nearly identical, the technique is to position the hand slightly above the recipient's body and gently "sweep" the hand across and/or away from the body, thereby evening out the recipient's local energy patterns and sweeping away excess energy (Kramer, 2002; Krieger, 1979; Rand, 2000). Therapeutic Touch likens the process to using one's hands to fluff up and smooth out the sheets on a messy, unmade bed until the sheets lie flat and in a consistent manner (Kramer, 2002; Krieger, 1979; Rand, 2000). However, unlike making the messy bed, when smoothing or unruffling energy on a recipient's energy body, one generally refrains from touching the client's actual physical body (Kramer, 2002; Krieger, 1979; Rand, 2000).

Yet another commonality is found in the use of the Practitioner's hands to add to, modify, or remove energy from a recipient. This is also often linked to the physical location of the Practitioner's hands. For example, in Healing Touch, the Practitioner's hands are clasped in front of the Practitioner's chest, palms down and pointed towards the recipient, with the *intention* of directing the energy to the to the recipient (Kramer, 2002; Krieger, 1979; (Rand, 2000). Furthermore, each modality has a suggested progression of hand movements and/or steps to follow, and it is, in part, the motion of the Practitioner's hands that facilitates changes within the recipient's energy field. Each discipline has

specific (and somewhat differing) guidelines to follow, but the general intent and outcome are pretty much the same: The needs of the recipient dictate the actions performed by the Practitioner to meet those needs (Krieger & Horrigan, 1998; Kramer; Rand).

One final common issue that is germane to this study is that the founders and present-day Practitioners of each of Reiki, Therapeutic Touch, and Healing Touch all believe that the regular application of their respective disciplines can lead to effective and successful stress management. They each employ similar techniques that elicit equally similar reactions/responses from the recipient.

In summary, the commonalities between Reiki, Healing Touch, and Therapeutic Touch far exceed their differences. Each one assesses the recipient's energy field and patterns and then applies appropriate techniques to "fix" problems (i.e., to heal or promote healing). These techniques involve the Practitioner either lightly touching the recipient directly or manipulating the Practitioner's hand(s) a few inches above the recipient's physical body (Horan, 2002; Kramer, 2002; Krieger, 1979; Rand, 2000).

Reiki – In Summary

The history of Reiki, however interesting, is set in the extensive folklore of Japan and is therefore of only anecdotal value. Even many of the more recent events of the twentieth century are not without some question as to their veracity. However, regardless of how Reiki was first developed, and regardless of its different schools and their (slightly) varying lectures, symbols and techniques, the fundamental concept of attunement as a means of opening energy channels and heightening awareness of energy remains universal and unchanged. This concept is also what sets Reiki apart from other

hands-on modalities; only in Reiki can a Teacher or Master activate the ability of a Student to see and affect the flow of energy. Although the background (e.g., principles) and mechanical aspects of Reiki (e.g., the hand positions) can be studied and learned, the overall practice of Reiki, by definition, cannot be self-taught. Energy attunements in a Student/Practitioner must take place in order for true Reiki processes to occur.; energy attunement must take place in order to open the healing energy channel.

There are a number of surmountable hurdles to Reiki becoming an established and trusted part of widespread future wellness and healing efforts. While Reiki in Japan remains a way of life, sometimes taking a lifetime to learn, in the West, formal Reiki training (such as that conducted in the Usui Reiki Ryoho Gakkai) doesn't take place. Instead, Reiki is usually offered as an adjunct class in weekend workshops. In a related vein, there is no State or Federal certification process in the United States, nor are there standardized and objective measures to determine if or when a Student can be elevated to the status of *Reiki Master*. All present-day teaching and "certification" is performed through a form of apprenticeship that creates an environment where the Teacher controls all aspects of the Student's learning and progress. All things must be tested and experienced; even Usui experimented with Reiki on himself and his family before teaching others. Still, the numbers of Practitioners in the West are increasing.

Wardell and Engerbretson have provided some empirical evidence that Reiki can be an effective stress-reduction technique to go along with a rather substantial body of anecdotal evidence as to Reiki's efficacy, and other studies have suggested that Reiki could be easily integrated into conventional medical practices. In order to reach this

point, Reiki had to prove that it didn't contradict previous medical treatment or carry unknown risks.

All of this implies that, in the (hopefully) near future, Reiki procedures and practices will contribute to the existing body of medical efforts in improving the health and well-being of all. It is further hopeful that insurance and managed care companies will acknowledge Reiki for its abilities.

The Effect of Reiki on The Autonomic Nervous System

Anatomy and Physiology

This section covers the nature of physiological reactions of the body to stress by examining the purpose and characteristics of the hypothalamus and the autonomic nervous system. It also reviews the physical and psychological definitions of stress. Finally, it discusses the role of heart rate variability as a measurement tool in evaluating stress.

Hypothalamus

General Description

The hypothalamus ("hypo" meaning "below") lies deep within the cranium below the thalamus and on either side of the inferior bed of the third ventricle. This small yet very important structure is composed of multiple nuclei and axonal tracts that carry out many specific functions (Blackwell, 2003), the most important of which is to maintain *homeostasis*, a state of equilibrium or balance within the body. It also plays a part in returning the body to its normal restive states.

The hypothalamus has the difficult and critical task of receiving inputs from a number of sources on the general physical state of the body, and then compensating when processes drift from typical ranges (Blackwell, 2003; Driesen, 2000). The hypothalamus is also a part of the *limbic system*, which is involved in memory and in emotions such as sadness, happiness, anger, and fear.

Complexity and Functions of the Hypothalamus

The hypothalamus acts as a control for the *autonomic nervous system* (ANS), regulating many visceral activities such as heart rate, blood pressure, respiratory arte, and motility of the digestive tract. It also serves to integrate the ANS. It accomplishes all of

this by affecting the autonomic centers in the brain stem, spinal cord and the rest of the body through nerve and chemical signals (hormones). A breakdown of the regulatory processes that the hypothalamus controls or supports follows (Driesen, 2000; Blackwell, 2003).

- **Body temperature –** Specialized cells of the hypothalamus act as the body's thermostat and initiate appropriate responses to maintain a stable internal temperature.
- **Food intake and processing –** The feeding center in the hypothalamus is responsible for creating signals to the body that are interpreted as hunger, and then inhibiting those signals once food has been ingested.
- **Sleep cycle –** The hypothalamus acts in concert with other brain centers to maintain a healthy cycle of sleep and wakefulness (Driesen, 2000).
- **Endocrine System –** The hypothalamus regulates this system by releasing factors that, in turn, control the release of hormones from the anterior pituitary gland. It also directly produces two hormones (anti-diuretic and oxytocin) that are stored in the posterior pituitary gland and released when needed.
- **Water balance and thirst –** Osmoreceptors in the thirst center of the hypothalamus monitor the volume of body fluids and then take appropriate action when necessary by stimulating the release of the aforementioned anti-diuretic hormone.
- **Emotional responses and behavior –** The hypothalamus acts (through the ANS) to mediate the physical responses to emotions and mind-over-

body phenomena. Nuclei involved in feelings of rage, aggression, and pleasure are located within the hypothalamus (Blackwell, 2003).

- **Adrenal system –** The hypothalamus influences both portions of the adrenal gland (the medulla and the cortex), but through different mechanisms. Nerve impulses that originate in the hypothalamus travel through the brain stem, spinal chord, and sympathetic nerves regulate the functioning of the *adrenal medulla* (Benarrach, 1997; Blackwell, 2003). Chemical signals (in the form of *adrenocorticotropic hormone*, or ACTH) released by the hypothalamus. This hormone causes the anterior pituitary gland to secrete *glucocorticoid*, which in turn stimulates and regulates the processes of the *adrenal cortex* (Benarrach, 1997).

The following sections of the body provide inputs to the hypothalamus as part of the homeostatic system's feedback mechanism.

- **Nucleus of the solitary –** This portion of the brain stem collects all of the visceral sensory information from the vagus nerve and relays it to the hypothalamus and other parts of the brain and body. This information includes blood pressure and the status of digestion within the gut.
- **Reticular formation –** This part of the brain stem receives a variety of inputs from the spinal cord (among them information about skin temperature) and relays these inputs to the hypothalamus.
- **Retina –** A few fibers from the optic nerve go directly to a small area within the hypothalamus called the *suprachiasmatic nucleus*. This nucleus

regulates circadian rhythms and couples the light/dark cycles of the body to these rhythms.

- **Limbic and Olfactory systems –** Structures such as the amygdala, the thalamus, and the olfactory cortexes send data to the hypothalamus. This allows the hypothalamus to regulate behaviors such as eating and reproduction (Chen, 2002; Blackwell, 2003).

The hypothalamus constantly releases signals to the anterior pituitary gland to secrete one or more of six hormones, including the aforementioned ACTH and the *thyroid-stimulating hormone* (TSH). Ultimately, the hypothalamus directly or indirectly controls every endocrine gland in the body, setting and altering blood pressure (through vasopressin and vasoconstriction), body temperature, metabolism (through TSH) and epinephrine levels (through ACTH) (Chen, 2002).

The Autonomic Nervous System

The ANS is a visceral efferent system (meaning it sends motor impulses to the visceral organs as a means of controlling them), and is extensively involved in the unction of virtually every organ in the body. It functions automatically and continuously, without conscious effort, to innervate smooth muscles, cardiac muscles, and glands. Through its actions, it influences or directly affects heart rate, breathing rate, blood pressure, body temperature, and other visceral activities, working together with these organs to maintain homeostasis (Blackwell, 2003).

Within the somatic motor pathways, there is typically only one neuron that extends from the brain or spinal cord to the effector. Autonomic pathways, on the other hand, have two neurons between the central nervous system (CNS) and the visceral

effector (e.g., organ). The first neuron's pre-ganglionic fiber begins in the CNS and synapses and terminates in the autonomic ganglion. The axon of the second neuron, the post-ganglionic fiber, runs from the ganglion to the effector organ (Applegate, 2000; Chen, 2002).

The ANS is divided into the *sympathetic division* and the *parasympathetic division*. Many visceral organs are supplied with fibers from both divisions (dual innervation). In these cases, one division stimulates and the other inhibits. This antagonistic functional relationship serves as a means to maintain balance/homeostasis (Benarrach, 1997; Chen, 2002).

The Sympathetic Nervous System (SNS)

This division of the ANS is concerned with preparing the body for stressful or emergency situations. Controlling what is called the "fight-or-flight response," it is an energy-producing system. That is, it stimulates the responses that are needed to meet the emergency and inhibits the visceral activities that can be delayed momentarily. For example, during an emergency the sympathetic system increases breathing rate, heart rate, and blood flow to skeletal muscles. At the same time it decreases activity in the digestive tract because digestion is not part of an appropriate response to a survival situation/emergency. Characteristics of the SNS are listed in Table 2, page 46.

The sympathetic pre-ganglionic fibers arise from the thoracic and lumbar regions of the spinal cord, a region also termed the thoracic lumbar division. These fibers almost immediately terminate in one of the paravertebral ganglia. A chain of these ganglia, the sympathetic chain, extends longitudinally along each side of the vertebral column. Some fibers synapse in collateral ganglia outside the ganglia and outside the sympathetic chain,

but still close to the vertebral column. The sympathetic division and the pre-ganglionic fibers are short, but the post-ganglionic fibers making contact with the effector organ are long (Chen, 2002; Blackwell, 2003).

Structure	Sympathetic Stimulation	Parasympathetic Stimulation
Pupil of eye	Dilates	Contracts
Ciliar muscle	Relaxes, accommodates for distance vision	Contracts, accommodates for close-up vision
Bronchial tubes	Dilates	Constricts
Stomach muscles	Depresses activity	Increases activity
Glands	Alters secretion	Increases secretion
Liver	Stimulates glycogenolysis	
Visceral muscle of intestine	Depresses peristalsis	Increases peristalsis
Adrenal medulla	Causes secretion of epinephrine	
Sweat glands	Increases activity	Decreases activity
Coronary arteries	Dilates	Constricts
Abdominal and pelvic viscera	Constricts	
Peripheral blood vessels	Constricts	
External genitalia	Constricts blood vessels	Dilates blood vessels, causes erection

(Dossey, 1997, p.80)

Table 2. Sympathetic and Parasympathetic Characteristics

Pre-ganglionic neurons in the SNS utilize the chemical *acetylcholine* as a neurotransmitter and are therefore known as *cholinergic neurons* ("Cholinergic" means to work by choline). For this reason they are also called *acetylcholine neurons*. The transmissions at these ganglionic synapses are termed *nicotinic* because the synapses respond to nicotine in a manner that is similar to their response to acetylcholine. Most of the post-ganglionic neurons utilize the organic chemical noradrenaline (norepinephrine) as their neurotransmitters and are therefore said to be *adrenergic neurons*. The noradrenaline is released at the effector synapse (Applegate, 2000; Blackwell, 2003).

The Effect of Reiki on The Autonomic Nervous System

Noradrenaline and adrenaline stimulate two types of adrenergic receptors within the ganglia called alpha and beta receptors, with noradrenaline having a more pronounced effect on the alpha-receptors. Stimulation of the different receptor types can produce different results. For example, stimulation of the alpha-receptors on capillaries causes vasoconstriction while stimulation of the beta-receptors causes vasodilation (Blackwell, 2003; Applegate, 2000).

The post-ganglionic fibers of the SNS then go to numerous organs to ensure that a stimulus has a broad and comprehensive effect. At the synapses in the ganglia, the pre-ganglionic fibers release the neurotransmitters acetylcholine. For this reason they are called cholinergic fibers. Most of the post-ganglionic fibers release norepinephrine and are sometimes referred to as adrenoepinephrine fibers. Because norepinephrine is inactivated rather slowly, these fibers provide a long- lasting effect (Benarrach, 1997; Chen, 2002; Blackwell, 2003).

The post-ganglionic neurons are adrenergic; however, those that serve the sweat glands are, in fact, cholinergic, using action acetylcholine as a neurotransmitter. The exceptions to this rule are the sweat glands on the palm of the hands, which are adrenergic. This accounts for why people can get sweaty palms when they are nervous (Applegate, 2000; Chen, 2003; Blackwell, 2003).

The SNS reacts rapidly to a perceived survival situation through a broad range of chemical and nervous reactions. Under these conditions, the SNS and adrenal glands release massive amounts of adrenaline and noradrenaline into the bloodstream. The ultimate purpose of such an action is to allow the individual to run faster, fight harder, and think more efficiently, far beyond the “normal” or “at rest” capabilities of the body.

The Effect of Reiki on The Autonomic Nervous System

A few of the more pronounced physiological reactions include an increase in the basal metabolism rate (sometimes by more than one hundred percent), rerouting the flow of blood to essential organs and skeletal muscles, strengthening levels of muscular contractions, and enlarging the airway to improve breathing (Applegate, 2000; Blackwell, 2003).

The Parasympathetic Nervous System (PNS)

The parasympathetic division is most active under ordinary, everyday, "relaxed" conditions. It is also responsible for bringing the body's systems back to a "normal" state after an emergency by slowing the heart and respiratory rates, decreasing blood pressure, decreasing blood flow to the skeletal muscles, and increasing digestive tract activity. Sometimes called the "rest-and-digest system," it is an energy-conserving system. Characteristics of the PNS are also listed in Table 2, page 46.

The parasympathetic pre-ganglionic fibers run between the brain stem and the sacral region of the spinal cord. Because of this physical arrangement, the parasympathetic division of the ANS is also are sometimes called the *craniosacral division*. The ganglia, called terminal ganglia, are located near or within the visceral organs, and the fibers are cholinergic (Chen, 2002; Blackwell, 1997; Benarrach, 1997). In contrast to the SNS, the pre-ganglionic fibers of the PNS are long and the post-ganglionic fibers are short. Typically, parasympathetic pre-ganglionic fiber synapses with only a few post-ganglionic fibers provide the localized effect. Unlike adrenaline and noradrenaline, which takes the body around ninety minutes to metabolize, acetylcholine is rapidly broken down after release of the enzyme cholinesterase (Applegate, 2000).

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The neurotransmitters used by the PNS target specific receptors in the effector organs. The receptors are usually proteins with which the neurotransmitters can combine. The result is a change in the plasma membrane of the effector organ's cells, causing the desired effect—the release of hormones and a reduction in muscular tension (Chen, 2002; Benarrach, 1997).

Summary

The ANS is the control system of the body, maintaining balance as needed and responding appropriately to stimuli. The sympathetic and parasympathetic nervous systems are seen as antagonistic, or working at crossed purposes. One example of this is the heart's response to signals from each system; an increase in sympathetic activity increases the heart rate while an increase in parasympathetic activity results in a decrease in heart rate (Applegate, 2000). While the ANS is generally considered to be an "involuntary" system, that reference is not entirely valid. It is possible to exert a certain amount of conscious control over the ANS. Elmer Green conducted a study on the Swami Rama. When the Swami placed himself into a false hibernation or altered sleep state, his heart rate and oxygen consumption decreased measurably (Green, 1999, pp. 46-51).

According to Green, "Every change in the physiological state is accompanied by an appropriate change in the mental emotional state, conscious or unconscious, and conversely, every change in the mental emotional state, conscious or unconscious, is accompanied by an appropriate change in the physiological state" (Green, 1977, p 59). Green characterizes the entirety of the internal body's reaction to physical, emotional,

perceived, or imagined threats as a simple, never-ending loop of action and reaction. This endless loop is also a representation of the body's response to stress.

The Swami is not alone in his abilities. Throughout recorded history, many have claimed and/or demonstrated, through drugs or force of will, the ability to change their physical states as the result of altering their mental states. As we shall see in the next section, stress is a significant contributor to many disease states. Learning to control one's internal processes to alleviate the stress (and stress responses) is a goal that most healthcare providers and patients/clients desire to achieve (Schiller, 2003).

Stress

Definition of Stress

According to the *Gale Encyclopedia of Medicine*, stress is an organism's total response to environmental demands or pressures placed upon the body (Fry, 2002). Stress can be experienced on a physical, psychological (mental), emotional, and/or spiritual level (Leidy, 1989). Stress is now so prevalent in everyday life that it has innumerable personal definitions as well, incorporating the concepts and experiences of those experiencing what they consider to be stress. It is common to hear someone complain about how "stressed out" s/he is. The scientific community has been assiduous in its attempts to more rigorously define stress in specific, technical terms, not only to better understand what it is, but also to be able to evaluate its causes, responses, and cures (Leidy, 1989; Selye, 1974).

Looking at stress from a purely objective and clinical view, the multiple physiologic effects of stress (regardless of their root cause) can be measured and assessed. The client who is experiencing stress can also furnish subjective information

that the researcher otherwise be unable to observe but that could nonetheless be important (Leidy, 1989).

Hans Selye was a creative scientist best known for his innovative discovery of stress in the early 1930s and is considered "the father of stress" as the result of his pioneering and insightful research (Berczi, 1998). As a young medical student in 1926, Selye began to notice what he termed a *sick syndrome* in hospital patients (Selye, 1973, p. 61). He was able to correlate this new disease with the symptomology that threatened homeostasis (Selye, 1974), and presented his new theory in the journal Nature in 1935 (Selye, 1974). His groundbreaking work brought stress into the laboratory setting of detectable and measurable physiological and biochemical responses (Leidy, 1989). When Selye's work exploded onto the global scientific arena, it was found that many languages had no word for stress, and so was coined, "le stress" (France) and "der stress" (Germany), among others. As Dr. Brian Gorman pointed out, Selye, "is therefore, without a doubt, the founder of the concept of stress" (Gorman, 2003).

Continuing his research until his death in 1982, Selye devoted all of his energy and resources to investigating all aspects of stress, authoring more than 39 books and 1,700 articles on the topic of stress (Selye, 1985, p. 3). It is safe to say that nearly all research investigations into stress today begin with Hans Selye.

In 1936 Selye created the definition of stress: "Stress is the nonspecific response of the body to any demand made upon it" (Selye, 1979, p.562). Stress occurs when an organism is called upon to readjust or adapt in order to maintain normalcy. As such, it is a useful defense mechanism that nature developed in the course of evolution (Selye, 1976).

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Working separately, in 1926, Walter Cannon defined what he termed the "fight or flight" response to characterize the body's reaction to a perceived threatening stimulus. Cannon focused his attention on strong emotions such as fear; and noted that anger will also ignite physiologic responses that prepare one for flight or flight – known at that time as preparing the body to flee, in anticipation of an incident of injury (Cannon, 1926).

While the genesis of the stressor may differ, the stress response itself is referred to by Selye as the General Adaptation Syndrome (GAS), and is manifested in a specific and characteristic pattern of systemic biologic change. The GAS is seemingly universal in nature. As outlined by Selye; it does not exclude the uniqueness and individuality in stress reaction (Selye, 1985). In physics, stress is use to denote the force-resistance interaction. In a similar vein, it can be said that stress is the consequence of the interaction that takes place between the stimulus and the response, essentially a biologic resistance to an applied external force (Mason, 1975; Selye, 1975).

Types of Stress

By Selye's theories, the characteristics of the stressor may not play a dominant role in determining the nature of the stress response, nor in the subsequent health-related outcome(s).

The characteristics (e.g., type, nature, intensity, frequency, and duration) of the stressor do not define a set of universal response(s), nor do they have a predictable cause-effect relationship to subsequent health-related outcomes. In fact, due to individual variances, the nature of a stressor *can't* be used to accurately determine what response an individual might have, nor whether that response will be good or bad for the individual's state of health. That which could generally be called a "normal, well-tolerated degree of

stress," (Selye, 1979, p. 564) for one individual may become pathogenic for others with vulnerable body systems.

The premise that stress is the nonspecific response of the body to any demand made upon it is valid regardless of whether the cause is perceived by the recipient as being good or bad, and regardless of whether the effect actually has a good or bad result on the recipient's health. As with any subjective evaluation, the concepts of "good" and "bad" can vary dramatically between individuals. Selye thought that stress was not inherently "good" or "bad," but rather that it could (and usually did) embody both positive and negative concepts and aspects (Selye, 1974). Selye resolved this by referring to stress that was beneficial to the recipient as *eustress*, and stress that was harmful as *distress* (Selye, 1974, p. 31). By definition, eustress causes less damage to biological systems than distress, and, in moderation, often actually promotes a healthy or healing condition (Selye, 1975, p. 26).

The brain's perception that a stimulus is "good" or "bad" is highly subjective, but can, in many instances, correlate to eustress and distress, respectively. For example, negative perceptions such as a feeling of loss, a threat to survival or well-being, uncertainty, and an inability to ensure a positive outcome or prevent a negative one all tend to elicit a stress response that one could term distress (Dossey, 1997). Similarly, positive emotions such as love, happiness, and a sense of accomplishment and belonging, and physical feelings and activities that the participant finds enjoyable, such as sports and sex, generally result in eustress. However, these examples are not universal. As the old adage reminds us, one *can* have too much of a good thing.

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Personal perceptions and definitions of stress aside, Selye believed that stress itself was an ambiguous state (Selye, 1979). He did not feel that the body had a set reaction to a specific stressor. "Qualitatively different agents of equal toxicity do not elicit the same potency (ability to elicit adrenocorticotropic hormone and corticoid production), and do not cause the same syndrome in different people" (Selye, 1976, p. 44). Furthermore, he noted that, "The same degree of stress does not induce the same reaction in different people at or about the same time. How the body reacts to stress is based on an individual occurrence that depends on the personality of the stressor" (Selye, 1976, p. 44).

Today, the term stress is ambiguous in most common use; it means different things to different people. Clearly, a person's perception of the nature of the stress plays a key role in determining if the stress ultimately has a good or bad effect on the body.

Stress Response

Stress is a consequence of the interaction between the stimulus and the response. Prehistoric man suffered many physical and mental hardships, including exhaustion during hunting, territorial and tribal dysfunctions, and poor health from malnutrition, illness, and physical injury. "Civilized" man experiences many of the same stressors: exhaustion from working too hard and from not enough exercise and rest, societal and interpersonal pressures and expectations, and poor health from malnutrition, illness, and physical injury – just updated to a more modern context (Selye, 1979). Today's is a fast-paced world with ballooning population growth, changing living conditions and occupations, and few outlets for the relief of stress.

The Effect of Reiki on The Autonomic Nervous System

Tolerating a normal degree of stress for an abnormal amount of time can become pathogenic and lead to what Selye called a general adaptation syndrome (GAS). In a GAS, the body perceives the abnormal state of stress that it is experiencing as normal, and responds by selectively affecting pre-disposed areas of the body (Selye, 1976). The GAS is seen as a purposeful, coordinated effort among interdependent biologic systems to defend the body against potential disease (Selye, 1976). The GAS itself involves three phases of adaptation and resistance: an initial (also known as acute alarm) phase, a resistance stage, and finally a exhaustion stage (Selye, 1974, 1976).

In an alarm reaction, the body shows the changes characteristic of the first exposure to a stressor: a deviation in functional norms and a pronounced decline in vitality (Toussaint et al., 2000), as well as depression of the sympathetic nervous system, altered hematology of the blood, altered electrolytes, and excess protein catabolism (Selye, 1976; Chrousos, 1998). If the stressor persists, the organism transitions from the alarm phase to the resistance phase (Leidy, 1989; Selye, 1976). As exposure to the stressor continues, resistance is diminished; if the stressor is sufficiently strong (e.g., severe burns or extreme hyper- or hypothermia), death may result.

Early in the resistance stage, the body's reactions are characterized by a rise in the level of resistance to the stressor and a comparable "fight or flight" reaction associated with stimulation of the sympathetic nervous system (Cannon, 1929). During this stage the SNS is activated, with a resultant rise in epinephrine and norepinephrine (Cannon, 1926). Hemodynamic consequences include coronary artery dilation and increased myocardial contractility, heart rate, and cardiac output. Selective vasoconstriction diverts blood flow away from digestive organs to the brain, heart, and skeletal muscle.

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Aldosterone secretion from the adrenal cortex and anti-diuretic hormones originating from the posterior pituitary result in an increased blood volume and elevation of systolic blood pressure through retention of sodium and water (Leidy, 1989; Chrousos, 1998).

Alterations in body immune response take place during the resistance stage as well. Cortisol secreted in increased quantities from the adrenal cortex suppresses lymphocyte and antibody formation (Leidy, 1989; Chrousos, 1998). Macrophage activity as well as the activation and conduct of the *complement system* are adversely affected by the altered plasma concentration of corticosteroids. The maturation of T-cells is also altered (Stein, Keller, & Schleifer, 1985; Chrousos, 1998).

Greater quantities of glucocorticoids result in higher levels of fibrinogen, and an increase in the production and adhesiveness of platelets and more rapid clotting times. Ventricular fibrillation thresholds are lowered in the presence of higher circulating levels of catecholamines (Engel, 1978; Chrousos, 1998). The SNS activation results in increased skeletal muscle tone contractility (Leidy, 1989).

Note that resistance ensues if continued exposure to the stressor is compatible with adaptation. The body signs characteristic of alarm reactions virtually disappear and resistance rises above normal (Selye, 1974). The stage of exhaustion is reached after long, continued exposure to the same stress. At first, the body adjusts, but eventually adaptation ceases. The signs of the alarm reactions reappear, but they are, at this point, irreversible, and the individual dies (Selye, 1974, p. 39).

According to Selye (1976), every individual possesses a genetically determined amount of adaptive energy. This energy, if expended sparingly, could promote a longer life, but if it is expended with reckless abandon, then it could be used up relatively

quickly. Depleting this adaptive energy leads to the third stage of GAS, the stage of exhaustion. Selye's conception of the exhaustion stage is physiologically comparable to an inverted alarm reaction. It begins with resistance, which gives way to manifestations of shock and ends in intense systemic damage, general system failure, and death. The timing and locality of the breakdown, which vary from person to person, are dependent upon the interaction between the primary stressor, the presence of concurrent stressors, and the location of the weak link in the system (body) (Leidy, 1989).

In his extensive writings, Selye goes to great lengths to make the reader aware of what stress is not. For example:

- **Nervous tension is not stress.** Stress can be reproduced under deep anesthesia and in a cell dish in the laboratory (Selye, 1985).
- **A rush of adrenaline is not stress.** "An adrenaline discharge is frequently seen in acute stress affecting the whole body, but it plays no conspicuous role in generalized stress affecting the whole body" (Selye, 1985, p.2).
- **The secretion of corticoids does not cause stress.** ACTH can stimulate the pituitary gland to discharge these hormones without producing any evidence of stress (Selye, 1985).
- **Stress is not exclusively the result of damage.** A kiss and watching an exciting sporting event are both capable of evoking considerable stress without causing any type of damage (Selye, 1985, p.2).
- **Stress is not the deviation from homeostasis,** the state of body balance (Selye, 1985).

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- **Stress is not that which causes the alarm state or a reaction to one specific thing.** Stress itself is a nonspecific reaction (Selye, 1985).
- **Stress is not identical to the alarm reaction or to the GAS reaction as a whole.** These are aspects characterized by certain measurable organ changes, which are caused by stress (Selye, 1985).

There have been several attempts to test and either prove or disprove Selye's GAS theory. Most notably, one research group, Pacak, et al (1998), undertook a study to test the stress concept by comparing the magnitude of the responses to different stress intensities. Their assumption was that the magnitude of a resistance varied directly with the intensity of the stress stimulus. They predicted that the ratio of neuroendocrine to different levels of stress would remain relatively constant.

Measurements of ACTH, norepinephrine, and epinephrine were taken after exposure to the stressor. Exposure to cold evoked large norepinephrine responses, insulin evoked epinephrine responses, and hemorrhage evoked small norepinephrine and epinephrine responses. Conditions of twenty-five and ten percent hemorrhage were induced. The ACTH response to the larger hemorrhage was twice that of the smaller hemorrhage. The ACTH response to a four percent formaldehyde solution was twice the response to a one percent formaldehyde solution, and the epinephrine response to the stronger formaldehyde was four times that of the weaker solution (Pacak et al., 1998). Based on this information, Pacak, et al concluded that their results were inconsistent with Selye's theory of non-specificity and the existence of a unitary stress syndrome. They theorized that their findings were more consistent with the concept that each stressor has its own neurochemical and peripheral neuroendocrine signature.

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Selye's last article on stress was an expansion of his original article in the journal *Nature*. In *"The Nature of Stress,"* he presented a review of how far stress research had come (Selye, 1985).

> When I wrote the first paper on the stress syndrome in 1936, I tried to demonstrate that stress is not a vague concept, somehow related to the decline in the influences of traditional codes of behavior, dissatisfaction with the world, or the rising cost of living, but rather that it is clearly a definable biological medical phenomenon whose mechanisms can be objectively identified and with which we can cope much better once we know how to handle it. I believe that in order to work through stress one must understand what it is and what it is not (Selye, 2003, p.3).

Stress and Pathology

In our modern society and culture, stress has evolved from what started as a basic reaction to what is now a debilitating process. For regardless of the organism, any activation of the stress system is, by definition, an extraordinary event. However, when the emergency ends, the system must quickly be turned off, enabling the affected organ(s) to recover. If external circumstances stimulate the stress system repeatedly, it never stops reacting, and organs are never given sufficient time to recuperate. Chronic stress wears the body down, increasing its potential vulnerability to damage. In his theories, Selye believed that a certain amount of stress (eustress) was good for the body. However, studies and research on stress today are showing that there are a tremendous number of recorded cases of chronic stress illness, and that this value is on the rise. We are no longer cave dwellers of old who had to hunt to survive; today, we are a complex,

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rich society exposed to a wide range of stressors that are constantly tearing at our very fiber (Selye, 1985: McCraty, 1998).

Neurosurgeon and researcher, C. Norman Shealy has devoted a large portion of his present practice and the resources of his research center to the continued study of stress. Shealy endorses the notion that the best way to approach stress management and relief is to treat it *before* it becomes a negative pathology (Shealy, 1999). Shealy postulates that stress-related illness is replacing infections as the disease with the higher morbidity rate. He now believes (and teaches) that using the mind to control autonomic functions is an effective means of treating stress, or at least the stress response (Shealy, 1999). Autogenetic training teaches mind-over-body principles and techniques. Shealy interest and present work was inspired by Green and Green, who wrote the aforementioned study of a Swami's demonstrated ability to control aspects of his body functions normally regulated by the ANS (Green, 1999). While this research study is not on autogenetic training per se, it is interested in assessing the efficacy of non-invasive methods of stress management.

Stress overtly manifests itself in dozens of disorders. A common one is a migraine headache. In 1966, research conducted by Green and Green discovered a statistical correlation between the simultaneous presence of these headaches and the temperature of the sufferer's hands being colder than normal. Cold hands are a byproduct response to over-stimulation of the SNS. Migraine participants' normal hand temperature was eighty-four to ninety degrees Fahrenheit, and was seldom less than room temperature (seventy-two degrees Fahrenheit). This early study utilized biofeedback (autogenetic training) to teach the participants to raise the temperature of their hands at

will ten degrees. Out of the seventy-four participants in the Greens' study, fifty-six saw positive results in reduction of the intensity of the migraine.

In the past, a person's socioeconomic status was believed to be a valid indicator of his/her potential for physical stress and illness. A low socioeconomic status was generally considered to be associated with distress (along with many other disorders), placing this demographic in a higher risk category for health problems. While belief in this concept has waxed and waned over the years, what remains consistent is the persistent belief that there was (and remains) a constant, unwavering and unhealthily high level of stress present in those people whose quality of life is less than the norm (Baum, Garofalo & Yali, 1999).

This study suggests that the relatively high level of ambient stress is due to a constant perceived threat in the living and working environment. This stress produces a persistent alarm state. For the body to successfully deal with the stress response, it must have a recovery period. However, due to the pervasive and persistent nature of the stressor, the recovery period is almost non-existent, leading to exhaustion and ultimately setting this population up for long-term illness. According to Selye, the body is unable to function in a hostile environment when encountering a chronic pathology (Selye, 1985). Thus, a hostile environment causes a stress-related problem that becomes chronic because the hostile environment persists, not allowing the stress state to be relieved.

Hands-on Healing Techniques and Stress

If one can't manage the source of stress, there are still viable options for dealing with the resultant pathology. Hands-on healing modalities such as Reiki, Healing Touch and Therapeutic Touch claim to be able to offer healing for the latter and tacitly suggest

that they can help somewhat with the former. These modalities teach one to center and ground, decreasing the stress (or at least their effects) and they provide healing energy to reverse the accumulated effects.

Usui taught that the various hand placements associated with Reiki decreased "the strain of life" (Usui & Petter, 2003). In modern terms, this can be translated to: Reiki hand positions and energy treatments reduce stress.

Reiki has been noted to alter stress levels in individuals. Kay Brennan a fourth year medical student wrote a review of Reiki and stress (Brennan, 2003). During a Reiki session, many of the subjects reported experiencing a profound sense of relaxation and were observed to have lower blood pressure and heart rate (Brennan. 2003).

Several articles have linked the use of Reiki to stress reduction, but few of the researchers appear willing to subject their data to public scrutiny. This lack of "proof" continues to inhibit produces and enhances the inability to prove with some amount of certainly that Reiki reduces stress.

According to Selye, stress is associated with the pain response according to (1985). At Harborview Medical Center, Nassim Assefi is conducting a $304,808 grant from the National Institute of Health (NIH) to study the possible benefits of Reiki to health consumers who suffers from chronic muscle pain caused by Fibromyalgia. This disease process affects some 6 million patients in the United States (Vuong, 2003). In the study (which is still in progress), a Reiki practitioner followed a scripted set of hand positions on half of the test subjects while the other half received distant Reiki. The subjects are interviewed before and after the treatment to assess the amount of pain reduction (if any) that they experienced after receiving Reiki (Vuong, 2003).

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Summary

Selye's original body of work and results remain largely true and relevant after almost 80 years. However, how stress is perceived has undergone many changes in the intervening time. Popular terms such as "burn-out," "stressed out," "over-stressed," and "chronic stress," all mean roughly the same thing. Stress is the classic double-edged sword. On the one hand, stress experienced in moderation is beneficial (and indeed, necessary).

Prolonged, intense stress, especially at levels where one fears for one's life, is destructive and can cause an adverse or unhealthy pathology to emerge. This pathology continues to grow if the source of the stress is not brought under control. Autogenetic training may provide some relief in this area, but other options need to be established.

Stress is real and concrete. Indeed, its effects are clearly measurable as precise changes in the body's functioning (Selye, 1985). Stress is a mechanism of complex reactions to different stressors. Some examples of stressors would be running up stairs, fighting a viral infection, or a dancing. All elicit a reaction to the stressor. The reaction may arrive in the form of a nervous impulse and/or an alteration of metabolic response. However, because science "knows nothing about its nature" (Selye, 1985, p.3), what is not known is whether stress is a gathering of stressors or a gathering of reactions which take place in a predictable cause-and-effect manner. It is possible that various derangements of homeostasis can activate the stress mechanism, but for Selye, these questions were still valid as of his final article in 1985 (Selye, 1985).

At any time, everyone is under some amount of stress. It is part of life. Selye felt that the only time one was without stress was in death (Selye, 1985, p.3).

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Measuring Stress as Autonomic Nervous System Balance

This section covers general methods of measuring stress, and then focuses on that used in this study, heart rate variability (HRV). It defines and explains the physiology behind HRV and addresses some of the present and future applications of HRV as a clinical tool.

Background Measuring Stress

While Selye studied the actual wear on the body organs at time of death, today many other methods are available (Selye, 1974). There are several methods of measuring the body's stress response, many of which can be performed simultaneously to arrive at a clearer picture of the body's overall health. A classic example is the archetypal image of a subject running on a treadmill with wires and tubes connecting the subject to banks of machines to measure heart and lung functions, blood flow throughout the body, temperature, and skeletal muscle endurance. Specific sensors and measurement tools include, but are not limited to, those listed in the example above, plus chemical measurement of hormone levels and banks of standardized self- or PI-conducted evaluations. However, due to cost and time limitations, most of these measurements were not feasible for this study. Furthermore, it would have been impractical on several levels to perform the Reiki over the body of an exercising subject. As a consequence, heart rate variability and the Freeze Framer program from HeartMath was selected as the sole measurement tool.

Heart Rate Variability

To understand HRV, it is first necessary to establish the process by which the heart beats.

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Heart physiology.

Unlike voluntary muscles, cardiac muscles do not require any nervous stimulation in order to contract. As a rule, the heart is controlled by the vagus nerve, which inhibits heart rate and manages force of contractions. Within the heart, the initial impulse originates in the sinoatrial (SA) node near the top of the right atrium (Applegate, 2000, p. 250). This triggers a cascade reaction throughout the neighboring atrial cells, transmitted by direct electrical contacts, causing a wave of contraction (followed by depolarization) to spread out over the atria. The atrial contraction/depolarization wave eventually reaches the atrioventricular (AV) node, located at the top of the hearts interventricular septum. Just as the SA node is the initiating control for atrial contraction, so too does the AV node in controlling the ventricular contractions (Applegate, 2000, p. 245. The electrical impulse signal from the AV node is carried to the ventricles by a specialized bundle of conducting tissue (the bundle of HIS), which divides into several bundle branches within the interventricular septum, resulting in contraction of the ventricles. See Figure 3, page 66, for a diagram of the heart illustrating the location of these components (Applegate, 2000, p. 251).

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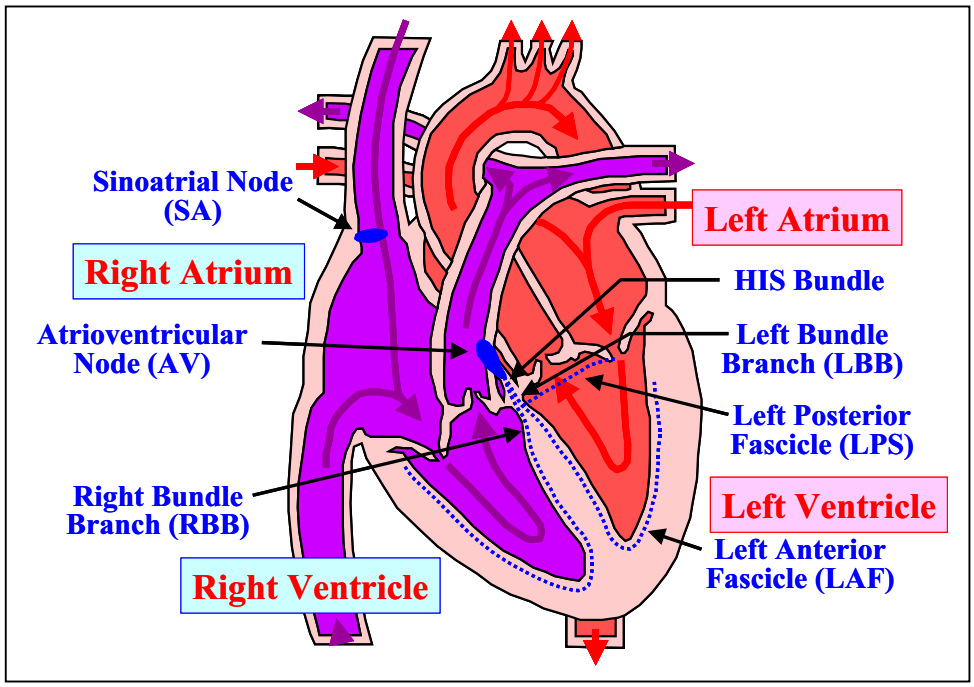

Figure 3. Cardiac Conduction System

Measuring heart beats.

Electrocardiograms (EKGs) and other pulse-detection devices that measure heart beat characteristics tend to capture and measure time differences between certain phases of a normal pulse. Figure 4, page 67 illustrates the shape and key elements of a generic normal cardiac cycle known as a sinus rhythm (Applegate, 2000. p. 245). Amplitude (strength of the signal) is measured in millivolts. Often, information in the time domain such as interval and duration data can be given either in frequency (i.e., beats per minute) or time (i.e., seconds or milliseconds) (Malik, 2000, ch. 84). Figure 5, page 68, depicts a portion of a full twelve-lead EKG (Grauer & Cavallaro, 1993, p. 95-105).

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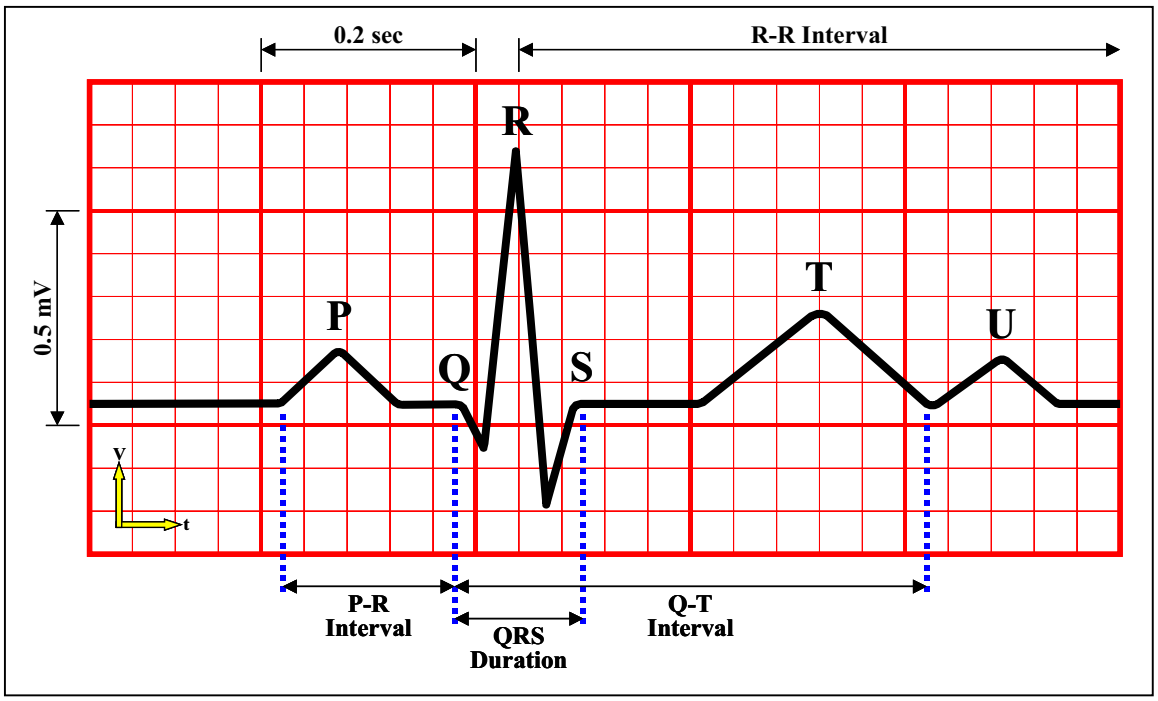

Figure 4. Normal Sinus Rhythm

In general, the letters P through U in Figure 4 each represent the component waves (contractions) that, when combined, make up the basic heartbeat. "P" is atrial excitation; "Q" is atrial systole; "R" is atrial diasystole; "S" is ventricle excitation; "T" is ventricle systole; and "U" is ventricle diasystole. The P wave represents atrial activation; the PR interval (from the beginning of the P wave to the beginning of the QRS duration) is the time from onset of atrial activation to onset of ventricular activation. The QRS complex represents ventricular activation; the QRS duration is the duration of ventricular activation. The ST wave represents ventricular re-polarization. The QT interval (from the beginning of QRS to the end of the T wave) is the duration of ventricular activation and recovery (Grauer & Cavallaro, 1993, p. 96). The U wave is generally considered to represent the "after depolarization" period in the ventricles (Malik, 2000, ch. 84).

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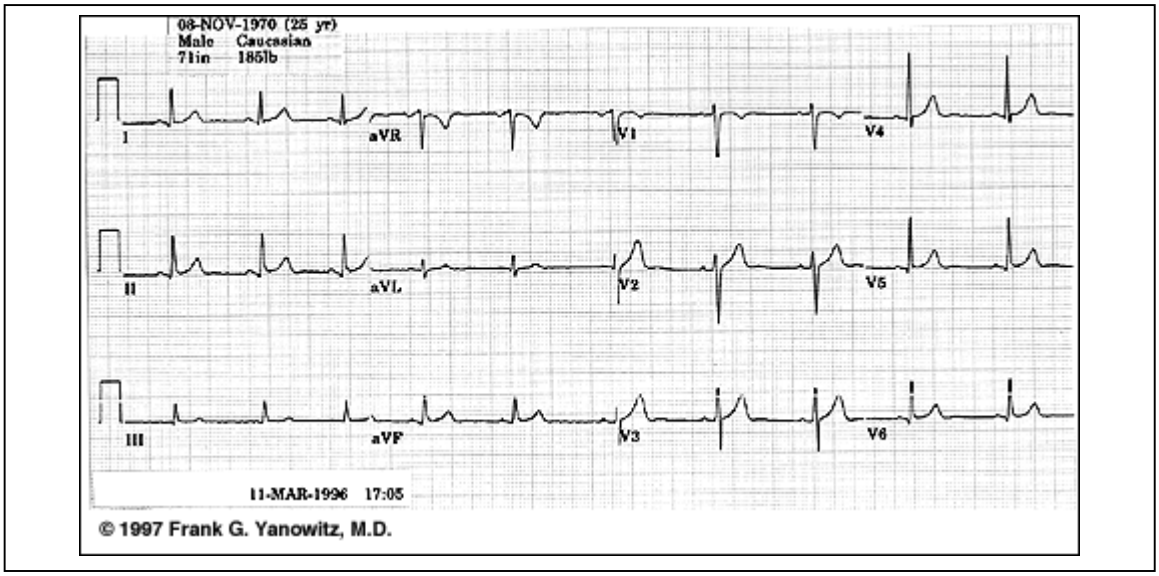

Figure 5. Twelve-lead EKG Reading

Pulse is most commonly measured at the R wave. The R-to-R ratio (R-R interval) is the time between sequential R waves, measured in seconds or milliseconds. Heart rate (HR) is simply the number of pulse beats (R waves) in one minute. Therefore, R-R can be used to calculate HR by the following equation:

HR (beats per minute) = 60/RR (in seconds).

Figure 6, page 69, illustrates the measurement of HR superimposed onto a generic pulse train. In this case, where HR is not averaged out over any of the previous beats, it varies inversely with the R-R interval. Thus an R-R interval of 0.731 seconds equates to a heart or pulse rate of 82 beats per minute (Malik, 2000, ch. 84).

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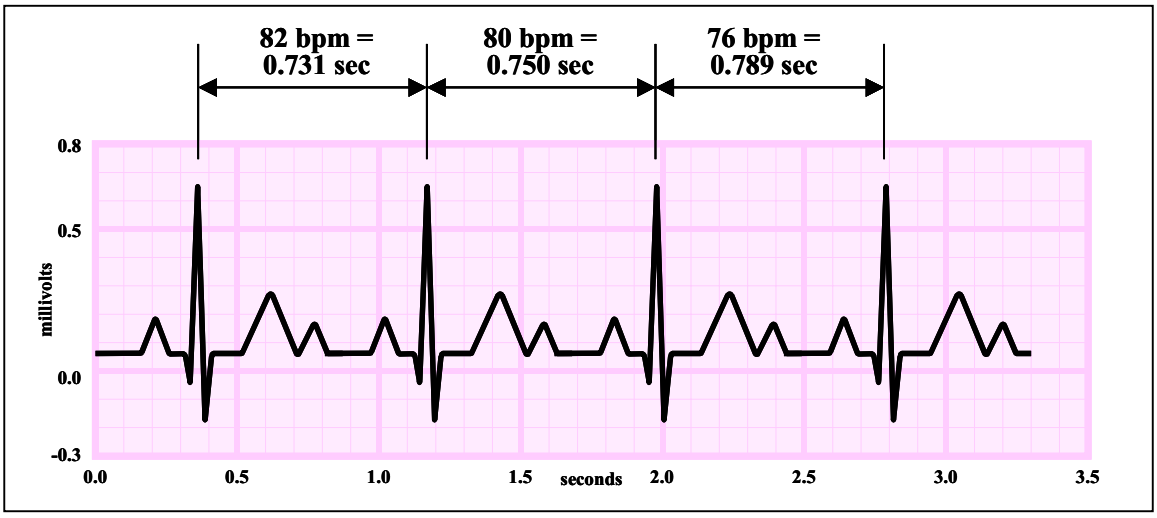

Figure 6. Generic Pulse Train

Measuring Heart Rate Variability

In general, HRV refers to the regulation of the SA node, the natural pacemaker of the heart, by the sympathetic and parasympathetic divisions of the ANS. In its calculation, it is simply the difference (variation) in normal sinus rhythm R-R intervals (also known as N-N intervals) over a set time period. However, what is actually being measured is the variability of "normal" cardiac cycles (Malik, 2000, ch. 84). To use the example above (illustrated in Figure 6, page 69), HR would be the difference in successive R-R intervals, or 0.019 seconds for the first and second R-R intervals and 0.039 seconds for the second and third. In real-world measurements, HRV is not taken from pulse to pulse, but is typically averaged out over a given time interval. Perhaps the best way to determine the R-R interval is to divide 300 by the number of large boxes (seconds on the printed trace) in the R-R interval (Grauer & Cavallaro, 1993.p 95).

The most common means of measuring HR is in the time domain, where data elements are defined in units of time (e.g., *absolute time*, such as when an event occurs,

and *relative time*, such as time difference between when two events) rather than the amplitude, slope, or other characteristic of the pulse train. Relatively straightforward statistical methods can then be applied to the data to determine mean, standard deviation, root mean square standard deviation, etc. Note, however, that, due to the consequences of applying these statistical functions, many of the results will increase in value with the measured time interval (or rather, the number of interval measurements being incorporated); therefore, it is not recommended that HRV data taken from different time intervals be compared directly. Other methods of measurement and analysis are possible, but time-domain analysis is not only simpler and more trusted, but it is the method employed by the equipment used in the study (Freeze Framer).

Valid HRV measurements are heavily dependant on the quality of the measurements taken. This generally demands sufficient signal clarity and consistency to both identify the proper signal and to accurately measure the time-dependent components. To achieve this, the following conditions must be met:

- The digital signal must be of sufficient quality that (a) the QRS complexes of each cardiac cycle can be identified as belonging to normal sinus rhythms or others, and (b) that there is (ideally) no loss of signal throughout the recording period.
- All R-R intervals must be included, but only R-R intervals associated with a normal sinus rhythm should be included.

HRV as a tool to measure stress.

As discussed earlier, a number of stress reactions have direct or indirect couplings to cardiac functions (e.g., increasing heart rate, blood pressure, and muscle strength).

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HRV as a tool for measuring stress is based on the presumption that the beat-to-beat fluctuations in the rhythm of the heart provide an indirect measure of heart health as defined by the degree of balance between the SNS and vagus nerve activity (Applegate, 2000, p. 176). In general, lower values of variability imply more stable, consistent HR, a state commonly associated with relaxation (reduction of stress) (Grauer & Cavallaro, 1993, p. 44).

One added benefit to using HRV to measure stress is the equipment itself. HRV measurement tends to be non-invasive, in that a simple sensor (e.g., a finger probe) can be used to obtain the necessary data (van Ravenswaaij-Arts, 1993). For example, in the case of Freeze Frame, all that is required to touch the subject is an infrared sensor placed on the subject's forefinger and a small lead wire from the sensor to the computer.

Entrainment of Heart Rate Variability

Entrainment is the concept of two non-linear oscillating systems becoming synchronized through some form of coupling. A common example is that of two adjacent pendulums, where the frequency of one of the two pendulums slowly changes to match that of the other (dominant) pendulum frequency. A perhaps more relevant example is the electro-stimulation process that directs the contractions of the heart muscles, as effected by the SA and AV nodes (McCraty, et al., 1996).

One application of HRV entrainment is to measure the success of biofeedback techniques to reduce stress. These are employed in both physiological and psychological settings as a stress monitoring and management tool (McCraty, 2002). The Freeze Framer product is one such tool. It measures the entrainment of the SA and AV node functions and, for the time interval being tested, identifies how much of that time the

HRV was in a low (L), medium (M) , or high (H) state of entrainment (where the values of L, M, and H add up to one hundred percent). In general, high is considered the optimum state for reduction of stress (McCraty, 2002). This study seeks to determine if application of Reiki in an intervention group can cause a decrease in the state of cardiovascular stress. Observing the L value to decrease and/or the M and H values to increase should be an adequate indicator of this reduction in stress.

Heart Rate Variability as a Clinical Tool

HRV is a credible and established tool for measuring and assessing the status of cardiac ANS functions (Malik, 2000, chap. 84). Consequently, the preponderance of applications for HRV measurements are associated with attempts to measure or predict stress and health/disease states that affect or are reflected in (in some measurable manner) cardiac functions (Hejjel & Gal, 2001; Childre & McCraty, 2001). These include physiological testing and psychological testing. In fact, the Freeze Framer product used in this study was marketed as a means of providing a form of biofeedback to those who would use it to help reduce stress (McCraty, 2000).

Although more popular in Europe, within the U.S. the measurement of HRV is not embraced by mainstream cardiology. Low HRV has a negative prognostic implication in a variety of clinical situations. HRV has been used to predict death following a myocardial infarction (Bigger, 1995. p195). HRV has proven to be a valuable tool to investigate the ANS especially with diabetic and post cardiac event patients (van Ravenswaaij, 1003). Further research and a more complete understanding of the autonomic effects in an individual subject are needed in order to postulate definite

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pathologies causally related to low HRV (Goldberger, Challapalli & Roderick et al, 2001, p. 9).

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CHAPTER 3: RESEARCH

This chapter discusses the experimental methodology and tools used in this research study. It also describes the participants/subjects involved in the study.

Methodology

Participants

Selection Process

The recruitment of study participants took place at a local family practice office in Springfield, Missouri. The nurse there asked each client she saw for five days if the client would like to take part in a dissertation study associated with stress. Those interested signed a sheet at the front desk and chose a day and time to arrive at the Holos Research Annex, also located in Springfield. Potential participants were advised to allow one and a half hours at the Research Annex for the testing. At this initial sign-up, each potential participant was also given two forms to complete, a Profile Sheet and an Informed Consent sheet. Copies of these forms are reproduced in **Appendix C** as Figure 14 (page 115) and Figure 15 (page 116), respectively.

The one-page Participant Profile Sheet asked for key medical information and demographics. The Principal Investigator (PI) later reviewed these sheets to determine whether or not the potential participant met the inclusion requirements. These were that each potential participant had to (1) be eighteen years of age or older (required for liability purposes), (2) be a native English speaker (required to ensure that the potential participant fully understood the Informed Consent and to reduce as much as possible any

miscommunications between the PI and the subject during testing), and (3) have a healthy cardiovascular system with no abnormal rhythms.

The PI also reviewed the potential participant's exclusion criteria based on the information provided in the participant's Profile Sheet. Exclusion criteria included a history of heart catheterization, any distortion in heart rate, or any open-heart surgery (including heart transplant). The exclusion criteria also included anyone who used calcium channel blockers or lanoxin, and any current medications related to potassium, chloride, and magnesium replacement.

After receiving and reviewing the Profile sheets, the PI conducted a follow-up phone call with each participant that met all of the inclusion and exclusion criteria. AT this time, they were also asked to provide a list of all of the medications that they were currently taking when they came in for the testing. Since the Profile sheet had initially assumed that the potential participant knew of the purpose and effects of any medication that the participant was taking (a potentially erroneous situation), the PI intended to use this list of medications to double-check the initially provided data to ensure that only those with a "normal," healthy heart were tested.

Participants were randomly assigned to either the control or intervention group and their demographics compiled to permit comparison within and between the groups in terms of gender, race, education, and physical and psychological characteristics.

Demographics

The participants in the study ranged in age from eighteen to seventy-six years, with a mean age of thirty-six years (SD=16 years). Age and sex groupings for each of the groups is listed in Table 3, page 76. A breakdown between the intervention and control

groups shows that the two groups were not significantly different with respect to age, with intervention participants averaging thirty four years of age, and control participants averaging thirty-eight years of age **(t(38)=0.79, p=.43)**.

Age Groups	**Intervention Group**	**Control Group**	**Total**
18-19	2	1	3
20-29	7	8	15
30-39	2	2	4
40-49	6	4	10
50-59	3	3	6
60-69	0	0	0
70-79	0	2	2
Total	*20*	*20*	*40*
Sex	**Intervention Group**	**Control Group**	**Total**
Male	6	13	19
Female	14	7	21
Total	*20*	*20*	*40*

Table 3. Participant Age and Sex Demographics

About fifty-two percent of participants were female, and forty-eight percent were male. There was a significantly different distribution of genders among the intervention and control groups, with nearly a mirror image emerging. That is, as shown in Table 3, page 76, and Figure 7 (page 77), about twice as many females as males were in the intervention group, and about twice as many males as females were in the control group. This difference in distributions did reach statistical significance **(Chi-Square (1)=4.9, p=0.03)**. "Raw" data for the participant demographics is listed in **Appendix G**.

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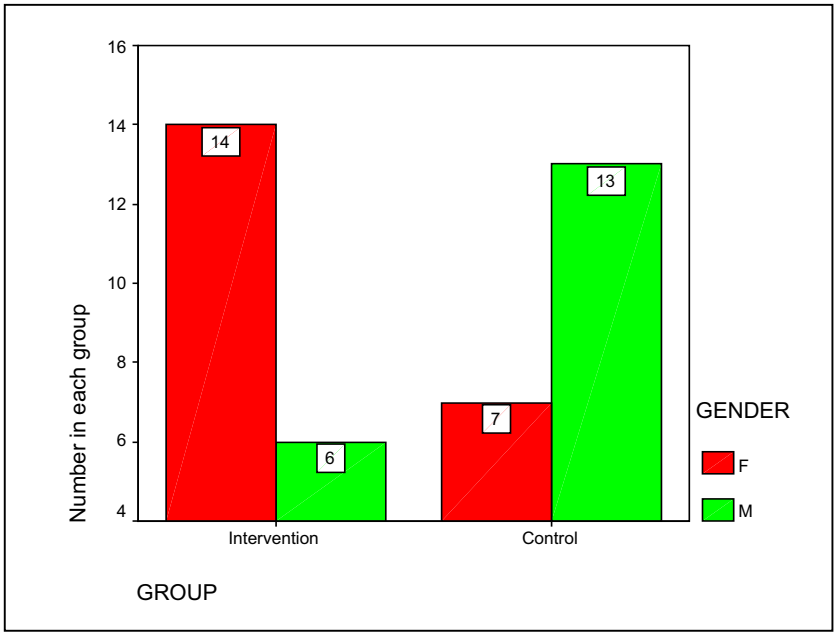

Figure 7. Distribution of Gender Among Intervention and Control Groups

Apparatus

The PI chose a computer-based analysis program, Freeze-Framer™, designed and marketed by HeartMath™ (located in Boulder, Colorado) to measure the subject's HRV during the study. Dr. Shealy, as President of Holos University and Seminary School, obtained from Rollins McCraty, Director of Research at HeartMath, permission to use this program in the study. A copy of this letter of permission is found in **Appendix D**, Figure 16, page 117.

The Freeze Framer "device" consists of an infrared sensor that was to be placed on the subject's left index finger in order to record pulse data and a program to receive, record, and process the raw data. It also included cabling to connect the two. The program was designed to run on almost any MS-DOS/Windows-based computer. The algorithm within the program converted the heart rate (pulse) data into a measurement of

the time of the RR interval. This algorithm has been thoroughly tested and evaluated (and patented) by HeartMath.

According to studies by HeartMath and others, there is a heart rate ratio that corresponds to a prescribed "entrainment" zone that, in turn, is indicative of a physiological state occurring in the body that is defined as an ideal healing state (McCraty, 2000). This is important HeartMath markets this device as a means of helping the user to recognize the presence of and reduce stress (McCraty, 2000). The entrainment zone data was broken down into three categories that reflected the percentage of the total time of measurement that the subject was in each of the low, medium, and high entrainment zones. (While healing is acknowledged as a good thing, the goal of using Freeze Framer in this study was to obtain a direct measurement of HRV in order to indirectly measure the response of the subject's ANS to Reiki as a means of reducing chronic stress. Examples of Freeze Framer screen displays and outputs are shown in **Appendix E**, Figure 17, page 118, Figure 18, page 119, and Figure 19, page 120.

The information that accompanied the Freeze Framer program did not explain how this equipment was to be calibrated or returned to a neutral position as is normal for a 12-lead EKG. In a phone call to Mike Atkins, one of the two primary researchers for HeartMath, the PI discovered that not only was calibration unnecessary, but it was actually impossible to do, as the sensor didn't need calibration and the program/algorithm couldn't be modified.

An eight-foot cable ran from the computer to the left side of the massage table, terminating in the finger probe/pulse sensor. The pulse sensor was to be attached to the subject's left index finger by Velcro. All signal and power cables were securely taped to

the floor to ensure a safe and secure environment and to prevent inadvertent interruption of data collection.

Experimental Procedures

Procedures

Pre-testing procedures

At the appointed time of testing, the PI conducted a personal interview with each subject. The purpose of this interview was to verbally review and confirm the subject's medical history as provided in the Profile Sheet and to answer any questions that the subject might have regarding the study in general and in particular the upcoming procedures that s/he was about to undergo. The subject was then asked to re-read and, if s/he had not already done so, sign the Informed Consent form.

The review and selection process yielded forty qualified subjects. However, following the arrival and interview process, one subject was discovered to be taking medication that could potentially influence normal heart rhythm and rate. This participant was thanked for the time spent in the evaluation process but excluded from testing.

Subjects were randomly assigned to a treatment or control group at the time of testing. In doing so, any observed differences in the subject population could then be attributed to the experimental treatment (Rosenthal & Rosnow, 1991). The treatment rooms were also randomly assigned at this time. The PI accomplished this by having each subject draw a single piece of three-inch square paper from a small (four inches by eight-inches inner dimensions) box that contained forty such pieces. Half of these pieces had an image of a balloon drawn on them and the remaining twenty had that of a star.

The image corresponded to which group and treatment room to which the subject would be assigned. The PI recorded the image on the subject's profile and then escorted the subject a short distance from the interview room to the treatment room that corresponded to the image on the piece of paper that the subject had drawn.

Random assignment immediately prior to testing was an attempt to eliminate any possible influence that the PI's subconscious might have otherwise interjected into the pre-testing environment (Rosenthal & Rosnow, 1991, p. 70). It was also an attempt to negate any environmental factors that could possibly affect the outcome of the testing.

When the subject entered the treatment room, the PI had the subject get on the massage table and put on a blindfold. The purpose of the blindfold was to prevent the subject from being able to determine when and if the Reiki practitioner was performing Reiki procedures. It also aided in preventing distractions. The PI then attached the pulse sensor to the subject's left index finger and covered the subject from the neck down with a light blanket to help him/her to relax and be comfortable. Prior to leaving the room, the PI directed the subject to remain as still as possible for the remainder of the testing. The PI then left the room and shut the door. The door remained closed for the duration of the testing period except when the Reiki Practitioner entered and exited the room in the course of performing the intervention.

Intervention group testing procedures

An initial fifteen-minute baseline pulse reading was obtained and labeled. Over the next hour, each subject in the intervention group had four consecutive fifteen-minute pulse readings. Reiki was applied to the subject in an A-B-A-B sequence; that is, the subject experienced two back-to-back alternating periods of no treatment followed by

treatment. The subject was left alone and untreated for the first fifteen minutes. Then a Reiki Practitioner entered the room and applied the pre-defined intervention for fifteen minutes before leaving. The subject was left alone for another fifteen minutes before receiving his/her final fifteen-minute pre-defined intervention.

The interventions were the same for each subject and for each time the subject received them. The Reiki Practitioner used the DKM symbol and performed six hand positions on the intervention subject. These positions were performed in the order listed above and in **Appendix B**. The practitioner placed her over the subject's body a few inches (vice touching it), and held each position approximately two and a half minutes.

The same room was used for all intervention group subjects.

Control group testing procedures

The control group received no interventions during the one-hour testing period. Also, the Reiki Practitioner did not enter the room at any time during the testing period.

The same room was used for all control group subjects.

Post-testing procedures

At the conclusion of the testing period, the PI entered the room and removed the blanket, blindfold, and sensor from the subject. The PI then escorted the subject out of the treatment room. No post-test interview was conducted. However, statements voluntarily offered by the subjects after the test were recorded as anecdotal information.

The information collected in each computer for each subject was logged with a study number for each of the four readings taken. This data was then saved to the main hard drive for temporary storage.

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At the conclusion of the study, all subject data was consolidated on a single computer and analyzed using the Statistical Package for the Social Sciences (SPSS) data analysis program.

Environment

Interview Room

The interview room was roughly twelve feet square. Its furniture consisted of a small writing desk and two chairs, one at the desk for the PI and one to the side of the desk for the subject. There was also an examination table in the room, although it was not used. The room was light blue in color and had a dark gray tile floor. A 100-watt bulb provided overhead lighting. Noise was limited to the participants and the PI in the room. Temperature ranged from sixty-two to sixty-six degrees, Fahrenheit. A rough layout of the interview room is shown in **Appendix F**, Figure 20, page 121.

Treatment Rooms

Two nearly identical treatment rooms were used in this study. They were roughly six feet by eight feet in size, and contained a massage table (on which the subject would lie), a chair at the head of the massage table (for the Reiki Practitioner to use during the intervention), and a small desk with a chair on the side of the room opposite of the massage table (that was unused). Heavy curtains covered the window in one of the rooms (the other room had no window). One room was located near the center of the building while the other was on the periphery. On the door of each treatment room was an image of either a star or balloon to correspond with the symbol drawn at random by the subject. A rough layout of the treatment rooms is shown in **Appendix F**, Figure 21 (page 121).

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A small computer desk was located immediately outside of the treatment room. This was used to support one of the two computers used in the data collection portion of the study. The first computer was a Toshiba™ laptop while the other was a Compaq™ desk model.

The walls and windows covered with heavy cloth to reduce noise and distraction. The wall clocks were removed from each of the treatment rooms to reduce distraction and prevent the subject from knowing how much time had elapsed during the study.

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CHAPTER 4: RESULTS

Statistical Results

The PI executed a quantitative research design for this study that included all of the necessary elements, those being randomization, control, and manipulation. The hypothesis of the experiment was that application of specific Reiki treatments over two fifteen-minute periods with the intent of balancing the ANS would alter the functioning of the recipient's ANS in a manner that could be measured via a shift to higher ratio levels of entrainment of HRV. Technically speaking, this study sought to determine if the application of Reiki energy would be sufficient to override the signals produced by the SA node of the intervention subject's heart. The study's dependent variables were HR and HRV (as measured by three entrainment values – high, medium, and low). The independent variable was the Reiki intervention, that is, the application of Reiki at specific time periods.

The F ratio is one of the best methods available to researchers to determine group differences, and interactions of group differences. It is a measure of variability between the means of two or more groups relative to the variability of the means in each group. It is used to separate the systematic differences (experimental error) by accounting for mathematical variations.

For each of the following calculations, the alpha level was set at $\alpha=0.05$, meaning that we have 5 chances in 100 of making a type I error. Statistically speaking, the null hypothesis was that there would be no difference between the means of each group. The hypothesis would be proved if the null hypothesis was disproved. The null hypothesis

would be disproved if the $F > F_{.05}$ (the critical F ratio, or $F_{critical}$) or if $p<0.05$. Failing to disprove the null hypothesis ($F < F_{critical}$ or $p>0.05$) would not necessarily mean that the hypothesis was invalid; merely that the patterns of data that had been collected during the test didn't differ significantly enough between the groups for there to be a proven correlation.

Table 4, page 85, depicts a summary of the statistical results of the acquired data as processed by SPSS. Each of these group differences is covered individually in the following pages. **Appendix G** contains the "raw" data obtained during the experiment. **Appendix H** contains the full statistical details.

Intervention Group (hands on) vs. Control Group (hands off)		
Measurement	**# Measurement Intervals**	**Results**
HR	4	F(3,20)=0.32, p=0.81
Low	4	F(3,20)=1.20, p=0.336
Medium	4	F(3,120)=1.35, p=0.338
High	4	F(3,120)=1.35, p=0.917

Table 4. Summary of Results

In summary, none of the data collected indicated a significant statistical difference between the control and intervention groups, as in each case $p>>0.05$.

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There was no significant interaction of groups (hands-on vs. no hands-on) by repeated measured ($F(3,20)=0.32$, $p=0.81$). Stated differently, the treatment and control groups did not differ significantly from each other in their patterns of HRV over the time span of four measurement intervals. See Figure 8 for a graph of this data.

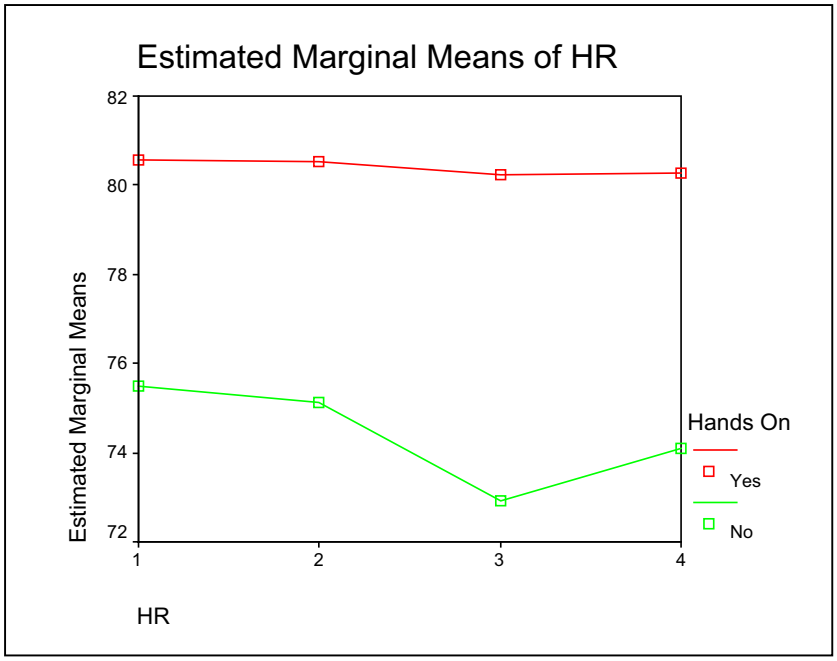

Figure 8. Group Differences in HRV Based on HR

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There was no significant interaction of groups (hands-on vs. no hands-on) by repeated measures ($F(3,120)=1.20$, $p=0.336$). Stated differently, the treatment and control groups did not differ significantly from each other in their patterns of HRV over the time span of four measurement intervals. See Figure 9 for a graph of this data.

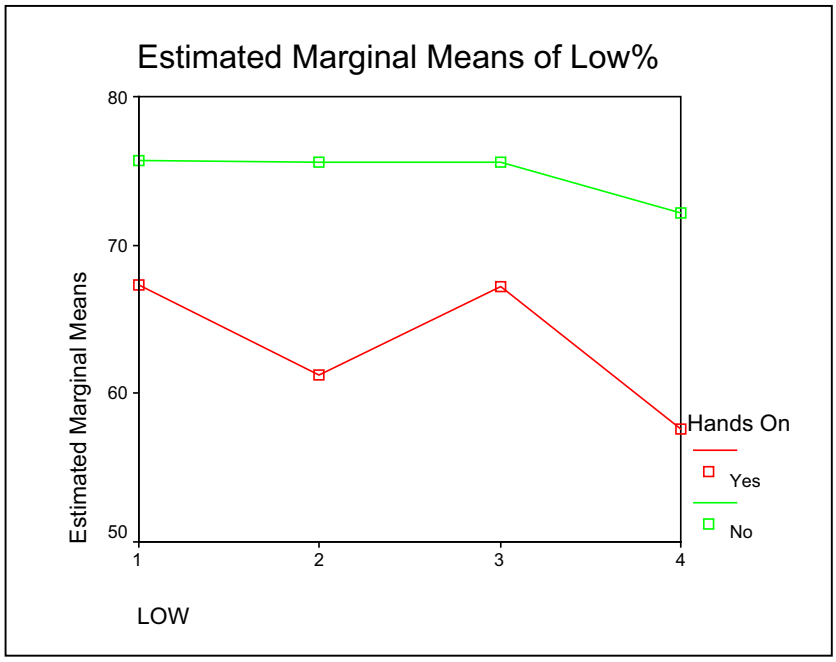

Figure 9. Group Differences in HRV Based on Low HRV Entrainment

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There was no significant interaction of groups (hands-on vs. no hands-on) by repeated measured ($F(3,20)=1.35$, $p=0.338$). Stated differently, the treatment and control groups did not differ significantly from each other in their patterns of HRV over the time span of four measurement intervals. See Figure 10 for a graph of this data.

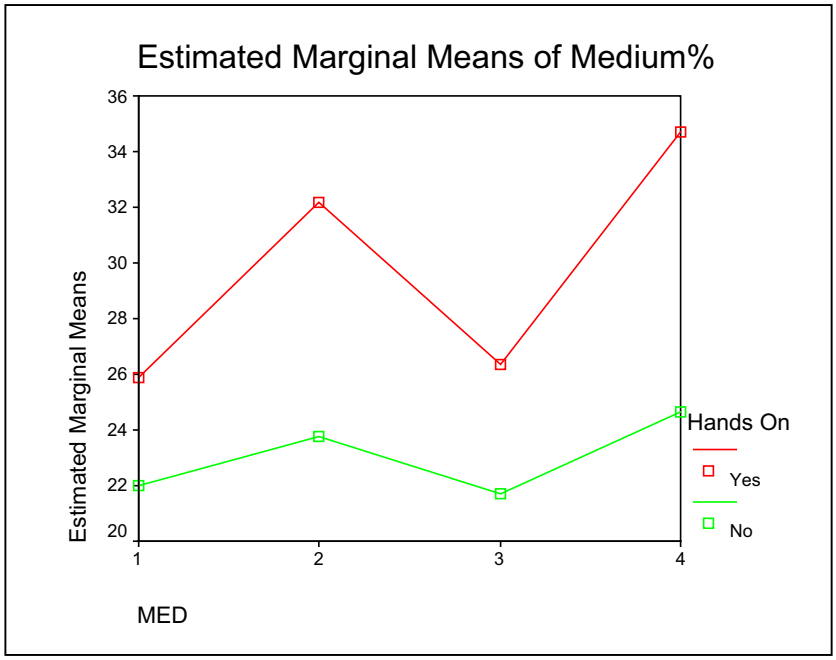

Figure 10. Group Differences in HRV Based on Medium HRV Entrainment

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There was no significant interaction of groups (hands-on vs. no hands-on) by repeated measures ($F(3,120)=1.35$, $p=0.917$). Stated differently, the treatment and control groups did not differ significantly from each other in their patterns of HRV over the time span of four measurement intervals. See Figure 11 for a graph of this data.

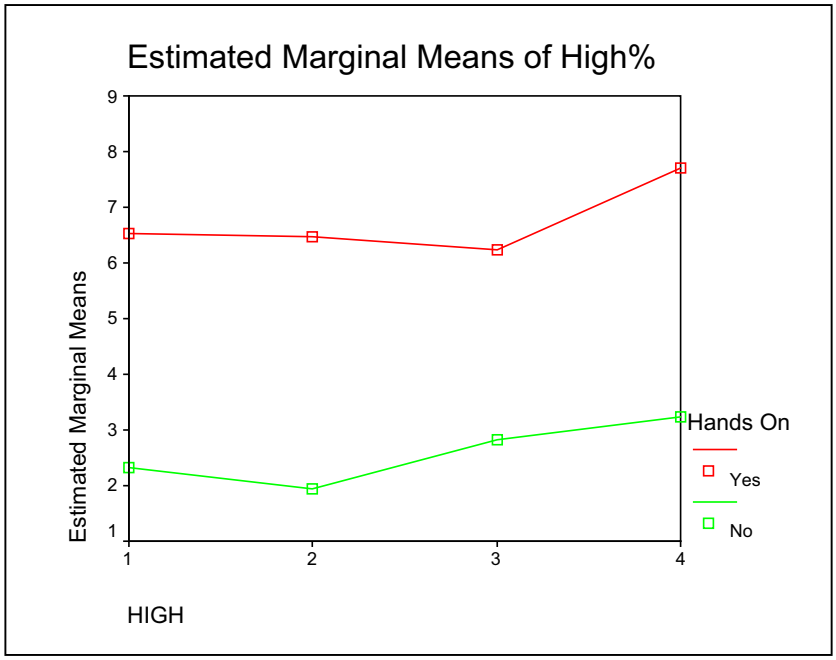

Figure 11. Group Differences in HRV Based on High HRV Entrainment

Anecdotal Results

After the experiment session was over, the PI received ad hoc verbal feedback from several of the subjects pertaining to the conduct of the experiment. These included:

- Many of the subjects had no prior knowledge of what Reiki was or how it was practiced. Most indicated that they thought it was a form of prayer (e.g., faith healing), while others believed it was some form of massage. These individuals were expecting to feel the Reiki Master touch them in the course of the experiment and were somewhat disappointed when that didn't happen.
- Several participants commented that they felt so relaxed that they fell asleep during the experiment.
- Several of the subjects stated that they thought they knew when someone was in the room with them. This was unexpected and disconcerting, as only subjects in the control group made these statements.
- None of the subjects experienced any physical discomfort due to or seemed to mind in any way the HeartMath finger sensor used in the experiment.

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CHAPTER 5: DISCUSSION

Recap of Findings

The results of the experiment did not show significant statistical evidence that the application of specific Reiki techniques could alter cardiovascular autonomic nervous system (ANS) functions as measured by heart rate variability (HRV). Specifically, there was no statistical correlation between the control and intervention groups, nor was there any statistical correlation between time periods when the intervention group subjects were receiving Reiki and when they were not.

Discussion of Results and Suggestions for Future Experiments

Measurement of Cardiovascular Functions

EKG vs. HeartMath

A pilot study was performed prior to the experiment to test concepts and procedures. The pilot study on ten subjects used a twelve-lead EKG to measure the effects of Reiki energy as measured by the subjects' SA node (i.e., the QRS interval). In the study, a Reiki Master performed the intervention using the Master Reiki Symbol. Two three-inch quartz crystals were cleaned by running water over them (an approved procedure) and then were imprinted by the Reiki Master with the Reiki Master Symbol. The crystal was placed on the chest of the subjects, then removed, and then emplaced once more. EKG data was collected in an A-B-A-B design, where the A represented no crystal and the B represented the presence of the Reiki-imprinted crystal on the subject. Random selection with repeated measures was used. Each of the EKGs was reviewed by a Cardiologist and found to have no significant variation in QRS. Clearly, the EKG did

not measure what was intended. At this point, it was apparent to the PI that the RR ratio, not the QRS interval needed to be measured, indicating that HRV needed to be measured.

This change in the experimental method led to the use of the HeartMath sensor and program to measure HRV rather than the twelve-lead EKG to measure QRS. It is possible that methods used in this experiment to measure HRV (HeartMath sensor and program) were not adequate or appropriate, and that another device might have been more effective at measuring the subtle changes in ANS functioning that the PI sought.

The decision to switch from the twelve-lead EKG to the HeartMath sensor was discussed with and approved by a Cardiologist; the PI believed that HRV was the best choice of measurement at the time the experiment was conducted. However, it is also possible that the measurement tool was not the issue, but rather that HRV itself was not a suitable measurement to be taking, and that there might be another heart measurement that would better meet the goals of this experiment.

Future experiments should investigate other ANS functions, and measurements of those functions, to determine if another is more suitable to this type of study.

Averaging of Data

The data that was obtained from each of the subjects was an average of the HRV over each of four fifteen-minute periods. It is possible that there could have been a function of change in HRV that included time since treatment began and/or duration of treatment. For example, it is possible that HRV would change as a causal result of the application of Reiki only after some unknown period of time, and the results would last for some other period after the intervention was over. However, if such were the case, the way that the data was collected would prevent detecting and measuring such effects;

the data for each period was "binned" into the four fifteen-minute periods when Reiki was and was not applied, and then the data within those bins averaged into a single set of values for the entire period. Any possible carry over of an effect from one period to the next was thus truncated and/or averaged out. Future experiments should strongly consider employing some means of capturing all of the raw data and their time component and then applying some statistical methods to analyze any changes over time frames beyond just those of when Reiki was and was not applied.

Experimental Methods

There were several areas of the experiment that the PI believes could be modified to improve how the experiment was conducted.

Interaction Between the Reiki Master and Subject

In this experiment, the Reiki Master entered and left the room just prior to and immediately after giving Reiki to the intervention group subjects. No one entered the rooms of the control groups during the testing period. This procedure was used because of time constraints and a lack of additional research assistants to take part in the experiment.

Although the subjects were blindfolded, It is possible that the intervention group subjects were aware of the presence of the Reiki Master as she entered and left the room. This could have in some way influenced the outcome by eliminating the independence of the data taken when the Reiki Master was in the room and when she was not. In a similar vein, the Reiki Master did not enter the room of the control subjects at all. Even though they were blindfolded, subjects in the control group might have been able to determine

that no one had entered their room during the experiment, and therefore somehow influenced the data taken.

An additional problem was the layout of the treatment rooms. They were relatively small and cramped, and the door (which opened inward) could not be opened all of the way due to the presence of the chair in which the Reiki Master sat when giving treatments. It is possible that, in the process of entering the room and getting into and out of the chair, the Reiki Master made sufficient noise that the intervention subjects could tell roughly when they were getting treatment and when they were not. This awareness by the subjects could have influenced the experiment in some way.

Future experiments should use a room that has sufficient space in which to move about, and should have the Reiki Master remain in the room of both control and intervention subjects for the entire duration of the experiment, and sitting in the chair as much as possible during this time to reduce detectable movement. If it is not feasible for the Reiki Master to be in the room of the control group, then an actor or surrogate should take the Reiki Master's place so that the subject perceives someone s/he believes to be the Reiki Master to be in the room with him/her. In this manner, the subjects would have fewer overt cues to indicate whether or not they are receiving treatment.

Ambient Noise

There were a number of environmental distractions that could have contributed to the subjects being distracted during the experiment. The two rooms used were on the side of the facility that faced a very busy road. Even though the PI insulated the walls and windows with heavy fabric and covered the nearby entryway and back door to the

facility, the ambient noise appeared to disturb some of the patients. Future experiments should strive to create as distraction-free environment as possible.

Subjects falling asleep

It was the intent of the PI to provide as distraction-free an environment as possible for the subjects. However, more than half of the subjects fell asleep, probably due to being blindfolded, placed on a comfortable massage table, covered with a blanket, and left unbothered. Although in theory, Reiki treatments should be as effective on a sleeping person as on one that is awake, it is possible that there was some aspect of being asleep that could have caused a discrepancy in the results. No data was taken or correlated on whether or not the subjects fell asleep during the testing period, or for how long. Future experiments should endeavor to keep the subjects in a constant state of wakefulness. And, if a subject falls asleep, that fact and the duration of the sleeping period should be noted for future correlation.

Subjects' Pre-testing Knowledge of Reiki

The PI did not conduct an in-depth discussion with the subjects regarding what Reiki was and how it was practiced. As a consequence, most indicated that they thought it was some form of prayer or faith healing while others commented that they thought it was some form of massage and were expecting to feel the touch of the researcher. It was the PI's original intent not to provide such education so as not to bias the subjects with any preconceived notions as to what manner of treatment was (or was not) going on. However, clearly there were expectations on the part of the subjects that could have influenced the results in some manner. Future studies should strongly consider providing

a handout and/or a rehearsed script identifying what Reiki was so that the subjects would not form their own opinions.

Subjects' Pre-Testing Analysis of Cardiovascular Health

It is possible that there is a correlation to cardiovascular health (and specifically the health of the heart) and the amount of response that could be expected from a given application of Reiki. While the PI did screen the medical questionnaire to eliminate those volunteers that had a history of heart disease or were taking medications that could affect heart rate, the PI did not conduct an in-depth pre-testing interview or other measurements with the subjects to determine their general state of cardiovascular health and then rate them accordingly for follow-on analysis of variables. Future experiments should consider performing some form of pre-test measurement of relative cardiovascular health.

Post-Testing Debrief

The PI did not conduct an in-depth post-testing interview with the subjects. Some ad hoc information was offered by the subjects, which was recorded, but there was no standard battery of questions asked to possibly identify the subjects' perceived state of health and/or relaxation, or to identify if any of the variables that the PI attempted to control (such as when treatment was being given) were actually successful. Future experiments should consider using an exit interview to gather anecdotal data in a more standardized manner so that such data can be analyzed along with the measurement data collected during the testing period.

Implications of the Results

The results of this study were inconclusive, in that the hypothesis could be neither proved nor disproved using accepted statistical methods. The conclusions drawn by the

PI are that future testing should concentrate on increasing the time of Reiki treatment and considering another means of measuring the results of the application of Reiki than HRV (or at least as measured by the Freeze Framer). Reiki is growing in popularity and use, mainly through anecdotal reports, but this "evidence" will not stand up to modern medical scrutiny. Significant laboratory research under controlled conditions is needed to further this area of study.

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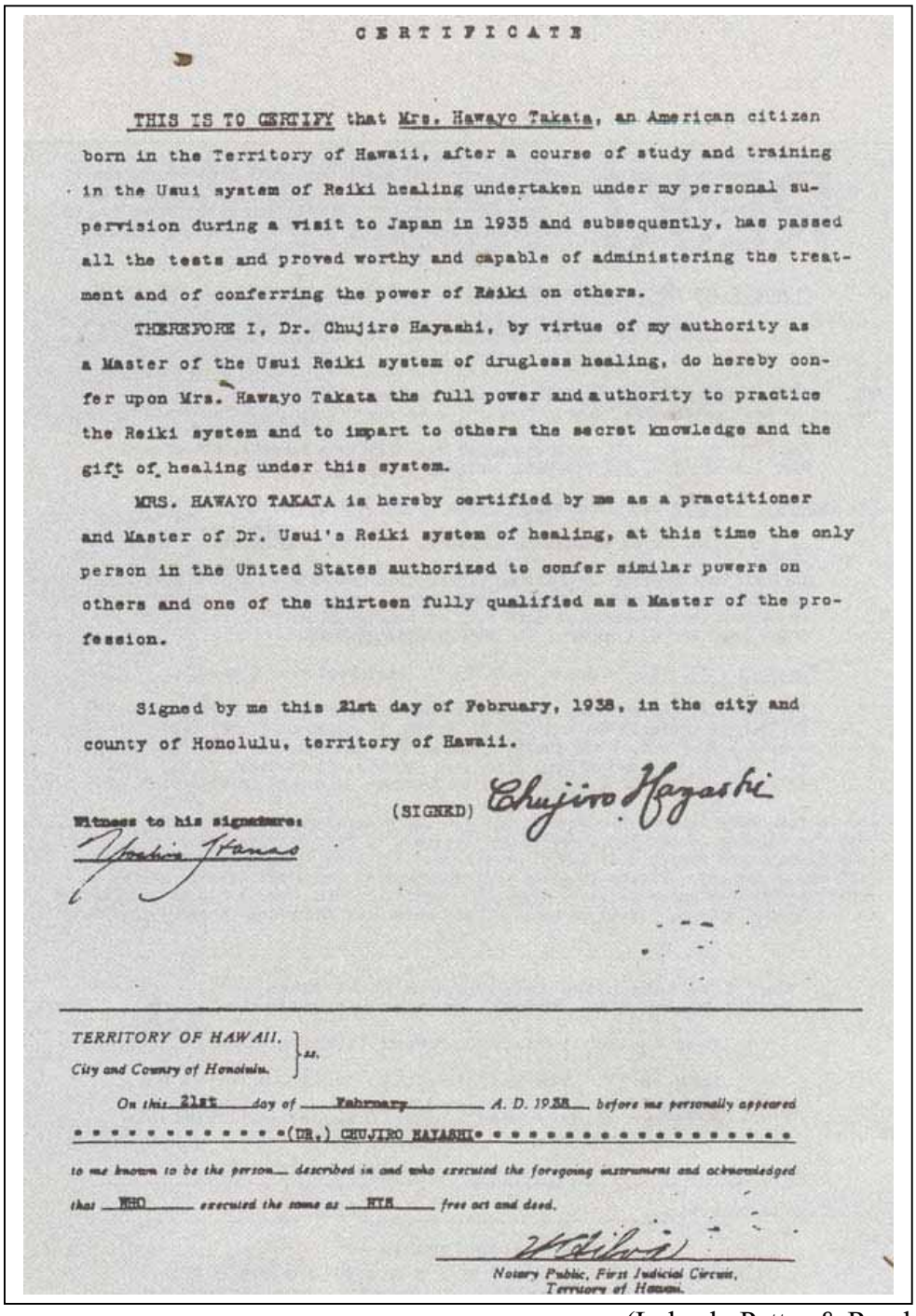
APPENDIX A: DATA RELATED TO THE HISTORY OF REIKI



CERTIFICATE

THIS IS TO CERTIFY that Mrs. Hawayo Takata, an American citizen born in the Territory of Hawaii, after a course of study and training in the Usui system of Reiki healing undertaken under my personal supervision during a visit to Japan in 1935 and subsequently, has passed all the tests and proved worthy and capable of administering the treatment and of conferring the power of Reiki on others.

THEREFORE I, Dr. Chujiro Hayashi, by virtue of my authority as a Master of the Usui Reiki system of drugless healing, do hereby confer upon Mrs. Hawayo Takata the full power and authority to practice the Reiki system and to impart to others the secret knowledge and the gift of healing under this system.

MRS. HAWAYO TAKATA is hereby certified by me as a practitioner and Master of Dr. Usui's Reiki system of healing, at this time the only person in the United States authorized to confer similar powers on others and one of the thirteen fully qualified as a Master of the profession.

Signed by me this 21st day of February, 1938, in the city and county of Honolulu, territory of Hawaii.

(SIGNED) Chujiro Hayashi

Witness to his signature: Yoshiko Tanaka

TERRITORY OF HAWAII, City and County of Honolulu. } ss.

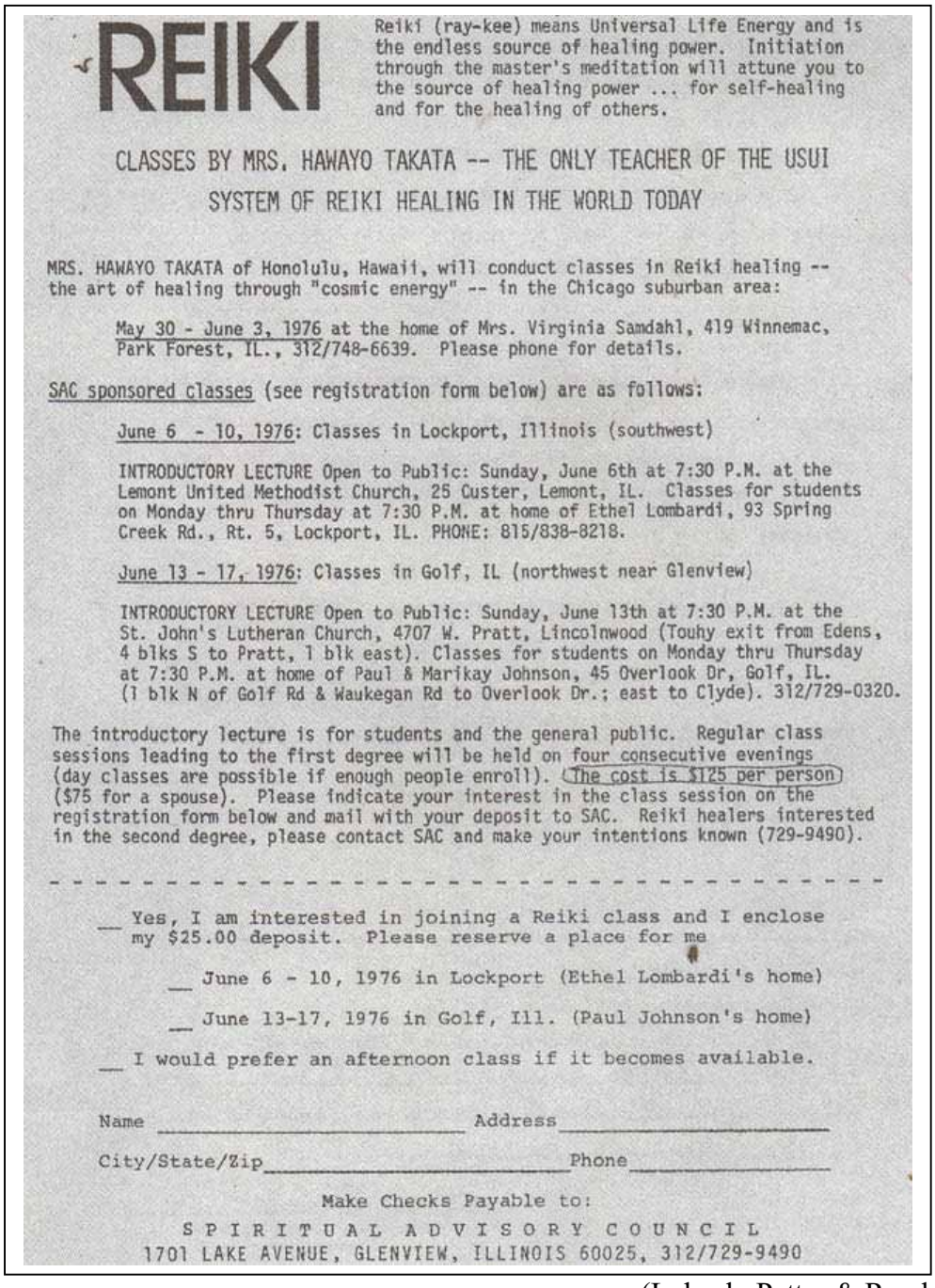
On this 21st day of February A. D. 1938 before me personally appeared (DR.) CHUJIRO HAYASHI to me known to be the person described in and who executed the foregoing instrument and acknowledged that WHO executed the same as HIS free act and deed.

Notary Public, First Judicial Circuit, Territory of Hawaii.

(Lubeck, Petter & Rand, 2003)

Figure 12. Copy of Takata's Reiki Master Certificate (Shinpiden)

The Effect of Reiki on The Autonomic Nervous System



REIKI

Reiki (ray-kee) means Universal Life Energy and is the endless source of healing power. Initiation through the master's meditation will attune you to the source of healing power ... for self-healing and for the healing of others.

CLASSES BY MRS. HAWAYO TAKATA -- THE ONLY TEACHER OF THE USUI SYSTEM OF REIKI HEALING IN THE WORLD TODAY

MRS. HAWAYO TAKATA of Honolulu, Hawaii, will conduct classes in Reiki healing -- the art of healing through "cosmic energy" -- in the Chicago suburban area:

May 30 - June 3, 1976 at the home of Mrs. Virginia Samdahl, 419 Winnemac, Park Forest, IL., 312/748-6639. Please phone for details.

SAC sponsored classes (see registration form below) are as follows:

June 6 - 10, 1976: Classes in Lockport, Illinois (southwest)

INTRODUCTORY LECTURE Open to Public: Sunday, June 6th at 7:30 P.M. at the Lemont United Methodist Church, 25 Custer, Lemont, IL. Classes for students on Monday thru Thursday at 7:30 P.M. at home of Ethel Lombardi, 93 Spring Creek Rd., Rt. 5, Lockport, IL. PHONE: 815/838-8218.

June 13 - 17, 1976: Classes in Golf, IL (northwest near Glenview)

INTRODUCTORY LECTURE Open to Public: Sunday, June 13th at 7:30 P.M. at the St. John's Lutheran Church, 4707 W. Pratt, Lincolnwood (Touhy exit from Edens, 4 blks S to Pratt, 1 blk east). Classes for students on Monday thru Thursday at 7:30 P.M. at home of Paul & Marikay Johnson, 45 Overlook Dr, Golf, IL. (1 blk N of Golf Rd & Waukegan Rd to Overlook Dr.; east to Clyde). 312/729-0320.

The introductory lecture is for students and the general public. Regular class sessions leading to the first degree will be held on four consecutive evenings (day classes are possible if enough people enroll). The cost is $125 per person ($75 for a spouse). Please indicate your interest in the class session on the registration form below and mail with your deposit to SAC. Reiki healers interested in the second degree, please contact SAC and make your intentions known (729-9490).

- -

__ Yes, I am interested in joining a Reiki class and I enclose my $25.00 deposit. Please reserve a place for me

__ June 6 - 10, 1976 in Lockport (Ethel Lombardi's home)

__ June 13-17, 1976 in Golf, Ill. (Paul Johnson's home)

__ I would prefer an afternoon class if it becomes available.

Name _____ Address _____

City/State/Zip _____ Phone _____

Make Checks Payable to:

S P I R I T U A L A D V I S O R Y C O U N C I L

1701 LAKE AVENUE, GLENVIEW, ILLINOIS 60025, 312/729-9490

(Lubeck, Petter & Rand, 2003)

Figure 13. Copy of Flyer for Takata's Initial Reiki Training in the U.S.

The Effect of Reiki on The Autonomic Nervous System

APPENDIX B: REIKI HAND POSITIONS

Hand Position 1	
	
Area of general focus:	The front of the face.
Specific position/ orientation of the hands:	Place the hands lightly and open to the right and left of the nose. The hands extend from the forehead to the eyes, and level to the nose.
Usui's correlation:	Anatomy and physiology relax the treats the neurolymphatic reflex zone of the stomach meridian on the frontal eminences.
Expected outcome:	Relax and dissolve the body's internal fear and stress.
Reiki process:	The sinus area received energy for sinus problems, eye, teeth, and jaw alignment. The Reiki energy works to balance the pineal and pituitary glands.
Source:	(Lubeck et al., 2003, pp. 211, 217-218)

Table 5. Hand Position 1

The Effect of Reiki on The Autonomic Nervous System

Position 3	
	
Area of general focus:	Over the ears with a gentle or light application.
Specific position/ orientation of the hands:	Cover the ears while extending the fingertips to the ear lobes while cupping the hands over the main part of the ears. This is done on both sides of the head at the same time.
Usui's correlation:	The ears are the location at which the body opens itself up to the application of Reiki throughout the body.
Expected outcome:	Enhance the body's ability to remain in a state of equilibrium. Decrease the stress mechanism of the body.
Reiki process:	To relax the client creating a sense of internal balance
Source:	(Lubeck et al., 2003, pp. 211, 219)

Table 6. Hand Position 3

The Effect of Reiki on The Autonomic Nervous System

Position 4	
	
Area of general focus:	The back of the head.
Specific position/ orientation of the hands:	Place the open-palmed hands up under the back of the head. This position allows the client to relax the head and neck as the head rests literally in the palms of the healer's hands. Allowing the client to melt into the healer's palms.
Usui's correlation:	The normalization of many unconscious body functions prompted through the medulla oblongata.
Expected outcome:	Temperature regulation for the body, also an exchange of information between the ANS and the hypothalamus is believed to occur. The client achieves a deep level of relaxation and often falls asleep.
Reiki process:	The body provides a intense exchange of information between the body organs and the temperature regulations center (hypothalamus) of the body.

Source: (Lubeck et al., 2003, pp. 211, 220-221)

Table 7. Hand Position 4

The Effect of Reiki on The Autonomic Nervous System

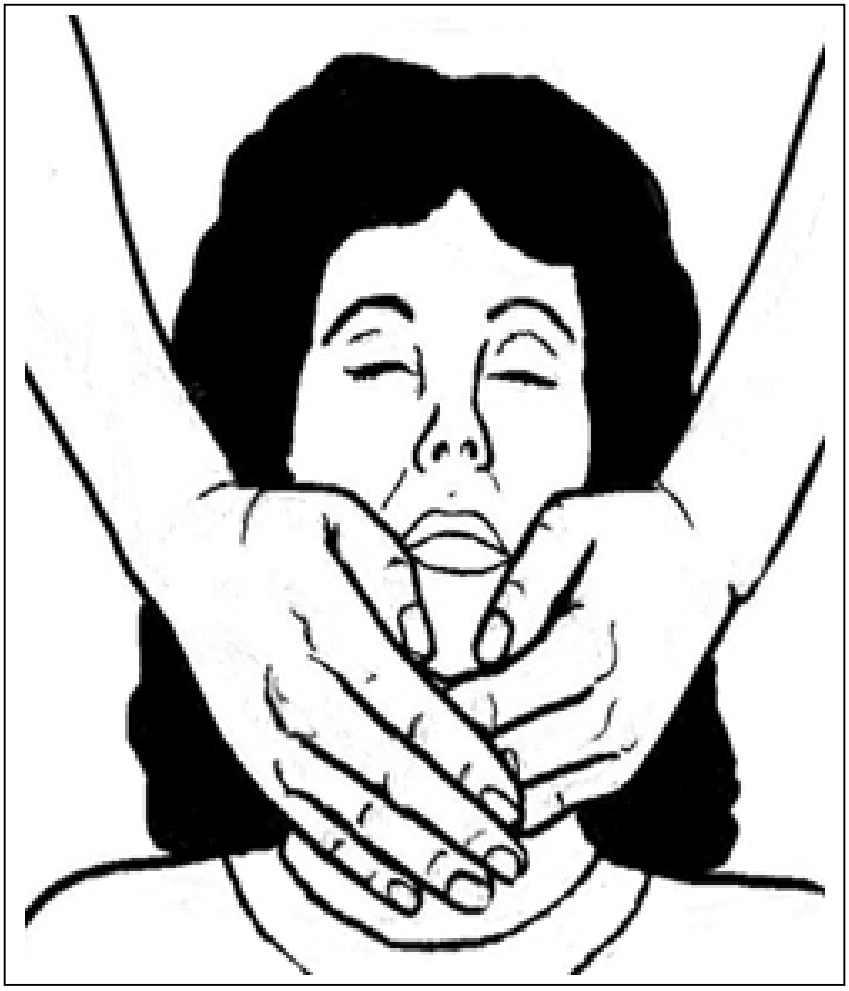
Position 5	
	
Area of general focus:	The throat thyroid and parathyroid glands along with vocal cords larynx and some lymph nodules. The carotid arteries that are responsible for blood flow to the brain and rest of body.
Specific position/ orientation of the hands:	Put the hands once again in a cupping fashion, this time covering the front of the throat. Give special attention not to touch the throat. Maintain a gentle touch in this area.
Usui's correlation:	Release of tension and
Expected outcome:	More relaxation and a release of tension in an appropriate way. Decrease in blood pressure during treatment. Client may feel free to express values and ideas more freely.
Reiki process:	Treats this area to release subtle energies and clear communications of self-expression.
Source:	(Lubeck et al., 2003, pp. 212, 220-221)

Table 8. Hand Position 5

The Effect of Reiki on The Autonomic Nervous System

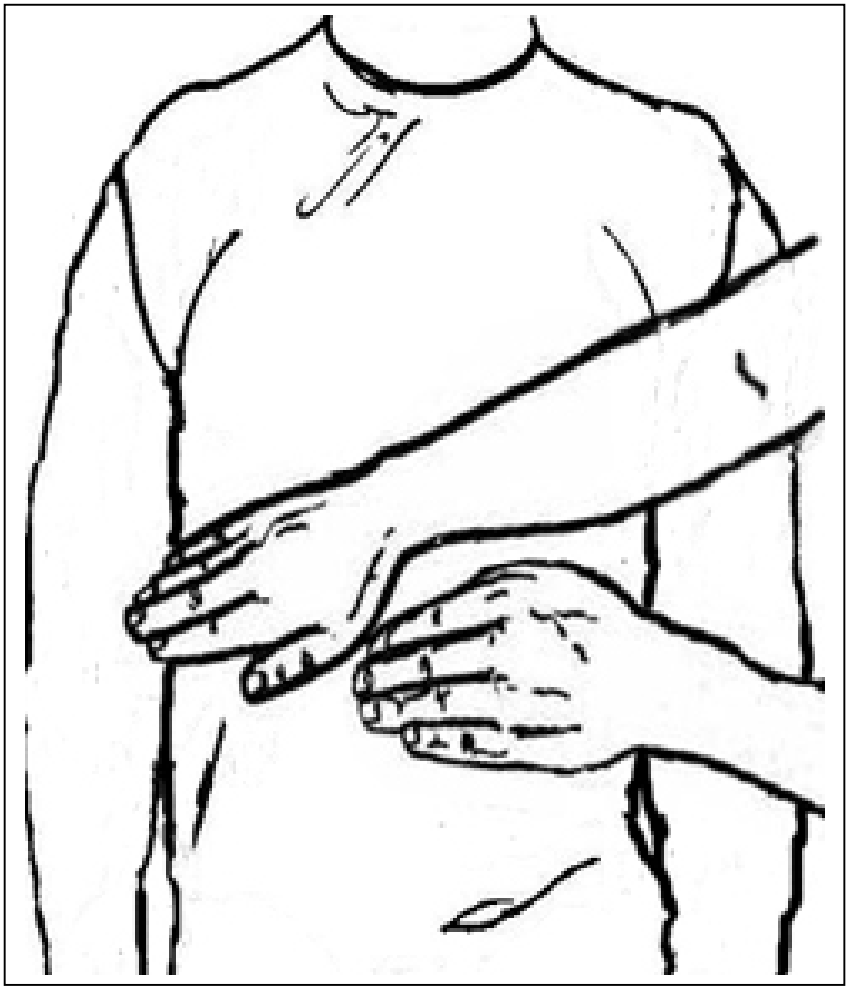
Position 7	
	
Area of general focus:	The upper-med abdomen, lower thoracic region
Specific position/ orientation of the hands:	Allow one hand to cover the lower ribs on the left side, extending over the center of the body and at the edge of the ribs.
Usui's correlation:	Relax breathing and digestion along with intestinal secretion and motility
Expected outcome:	Normal relaxed breathing, normal digestion.
Reiki process:	Increased sense of calm or dampen the excitation of the ANS.
Source:	(Lubeck et al., 2003, pp. 212, 222)

Table 9. Hand Position 7

The Effect of Reiki on The Autonomic Nervous System

Position 9	
	
Area of general focus:	The heart, aorta, sternum and bronchus and thoracic spine.
Specific position/ orientation of the hands:	Place the hands directly below the throat horizontally on the thymus gland, at the center of the body, and the other hand vertically on the heart area.
Usui's correlation:	Produce calmness of the hearts emotions/breath of life.
Expected outcome:	Produce calm regular heart and respiratory rate.
Reiki process:	Clear the heart of sadness, discontent. Feeling of being centered.

Table 10. Hand Position 9

The Effect of Reiki on The Autonomic Nervous System

APPENDIX C: PARTICIPANT FORMS

The following two pages depict the form used to screen and track the data associated with the participants in the study and the consent form.

The Effect of Reiki on The Autonomic Nervous System

Participant Profile Form

Date of interview _____ Time _____ ❑ AM ❑ PM

Interviewer _____

Are you a native English speaker? ❑ Yes ❑ No

Do you understand and read English? ❑ Yes ❑ No

In the following questions regarding health, answer the question in reference to you and your immediate family members Use the following to complete the form:
(M) Mother (F) Father (S) Sister (B) Brother

History of any heart problems

_____

_____

Congestive Heart Failure _____

Abnormal Heart Rate _____

Heart cath (PTCA) balloon procedure _____

Heart transplant _____

Death due to heart-related illness _____

Elevated cholesterol levels _____

Abnormal Magnesium _____ Chloride _____ Potassium _____

On medications to sustain normal heart rate and/or blood pressure _____

_____

Have you taken any stimulants or depressants or any other medication, including over-the-counter medication in the last 48 hours? ❑ Yes ❑ No

If so, what were they? _____

I have reviewed all above information as provided to the interviewer and believe it to be correct to the best of my knowledge.

Name (print) _____ Sign _____ Date _____

For Staff use only below this line

Accepted ❑ Yes ❑ No _____ Study Number-CR- _____

Study Group ❑ Star ❑ Balloon

Denied Reason _____

1

Figure 14. Participant Profile Form

The Effect of Reiki on The Autonomic Nervous System

Consent Form

Holos University Graduate Seminary supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you with to participate in the present study. You should be aware that even if you agree to participate, you are free to change your mind at any time prior to the collection for information without penalty.

The purpose of this study is to examine whether hare rate variability (which will be monitored by placing a clip probe on your left index finger) is influenced by application of a subtle energy.

You should know the following:

- Your personal information will only be confidential and may only be accessed by a group of four faculty members at Holos University Seminary for use in student pilot and dissertation study by one graduate student, Vickie L Nutter R.N.
- Your personal information will remain in a locked file cabinet.
- Your personal information will **not** be shared with anyone or any agency or another study group.
- Your personal data will be collected and be added to data collected from others. It is this aggregated date that will be reported as the study findings, not any information that we find out about any particular individual.
- We assure you that your name will not be associated in any way with the research findings.
- The time frame for subject participation is approximately one hour.

Your participation is solicited, although strictly voluntary. Your consent will expire a year from the date on which it was signed.
If you would like any additional information concerning this study, before or after it is complete, please feel free to contact us by phone or mail.

Vickie L Nutter R.N
Principal Investigator
19404 TWP Rd 297
Caldwell, Ohio 43724
417-865-5940
Vickienutter01@aol.com

Paul Thomlinson Ph.D.
Faculty Chair
Holos University Graduate Seminaries
5607 S. 222nd Rd.
Fair Grove, Mo 65648-8192
417-267-4625
Paul.Thomlinson@CoxHealth.com

_____ Date _____
Signature of subject agreeing to participate

With my signature I affirm that I am at least 18 years of age, understand and have received a copy of the consent form to keep.

2

Figure 15. Participant Consent Form

The Effect of Reiki on The Autonomic Nervous System

APPENDIX D: HEARTMATH CONSENT LETTER

Figure 16 (below) is a copy of the letter giving permission to use the HeartMath™ system in the study (File, C. Normal Shealy, 2002).

Institute of HeartMath
A NONPROFIT CORPORATION

A Change of Heart Changes Everything

December 17, 2002

Dear Norm,

Thank you for your letter of December 10 asking permission for Holos Universit students to use the Freeze-Framer in research projects. You are correct in your statement that you thought this was understood and was one of the goals in my providing you with the device.

I was not aware that this statement was on any of our web sites. I can only make assumptions as to why this statement was added at this point, however, I will find out more details.

As it was and is my intention to grant all Holos University students permission to use the Freeze-Framer in research or dissertation projects, this letter specifically grants such permission to your students. I apologize for any inconvenience or misunderstanding.

Please let me know if I can be of any further assistance. I do hope to visit family members who live in your area this coming year and plan to visit you if at all possible.

Have a wonderful holiday season.

Heartfully,

Rollin McCraty, Ph.D.

Figure 16. HeartMath™ Letter

The Effect of Reiki on The Autonomic Nervous System

APPENDIX E: HEARTMATH FREEZE FRAMER READINGS

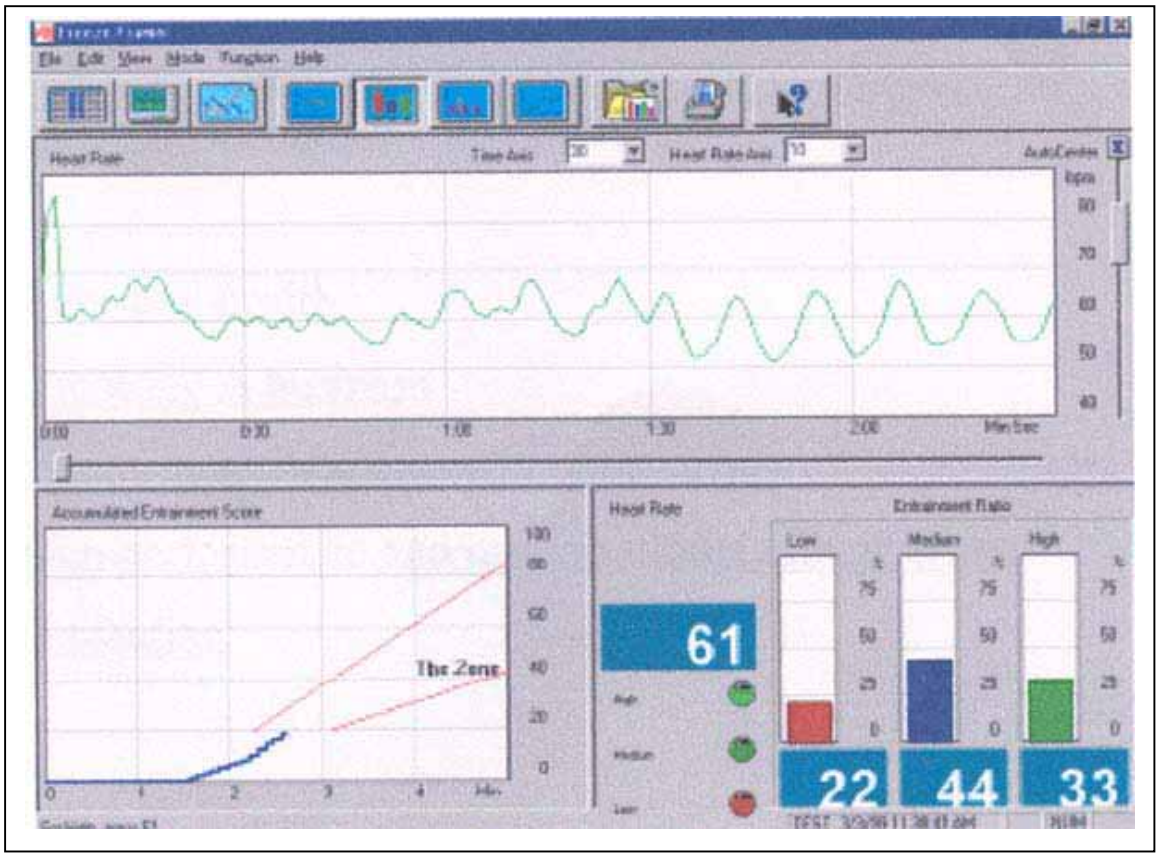


Figure 17. Entrainment Grid

The heart rate seen in the trace at the top of Figure 17 (above) moves quickly from a saw tooth or jagged waveform on the left to a smooth consistent waveform on the right. This is a sample of a subject that achieved a HRV in the entrainment zone, as depicted in the graph in the lower left of the figure. The data in the lower right of the figure reflects hear rate and overall entrainment statistics. In this case, raw heart rate is sixty-one, the low level of entrainment is twenty-two percent, medium is forty-four percent, and high is thirty-three percent. Larger numbers in the medium and high levels represent desired target values.

The Effect of Reiki on The Autonomic Nervous System

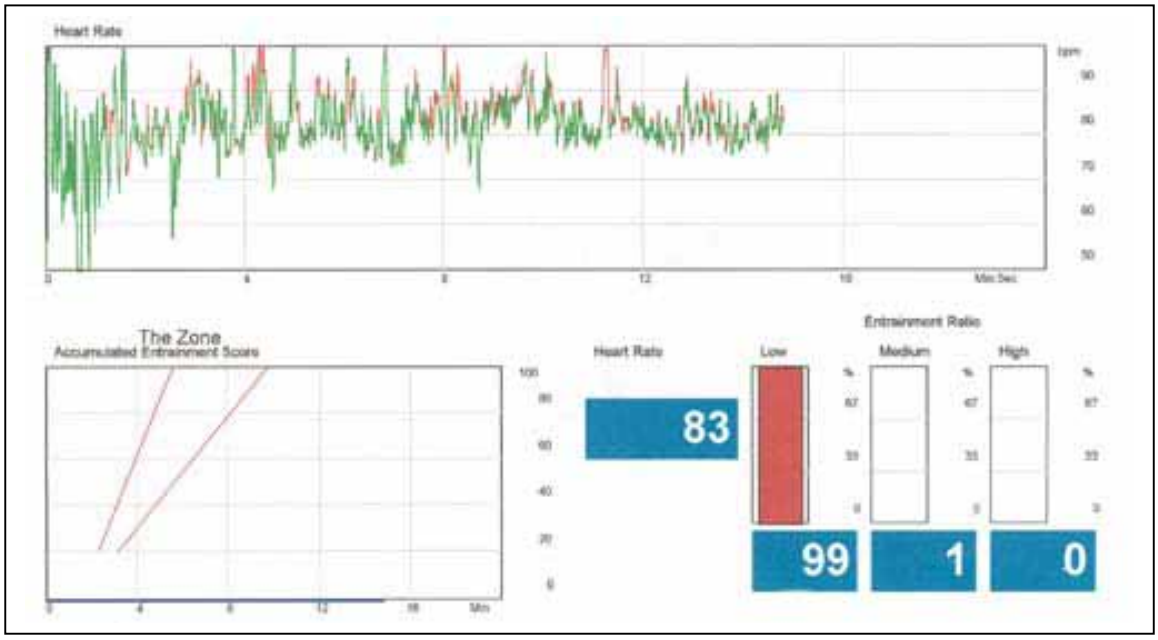


Figure 18. Example of Poor Heart Rate Waveform and Entrainment

The waveform tracing at the top of Figure 18 (above) is very tight and jagged. This type of waveform is not the desired consistency for accurately evaluating HR. In order to measure HRV, it is necessary to achieve some degree of normal heart rate (as illustrated in a more normal waveform tracing – see Figure 19, page 120). Consequently, according to Freeze Framer, this participant remained in the low level of entrainment. The graph to the left plainly shows that this participant did not reach entrainment zone. The bar graphs on the right side show that for the preponderance of the testing period (ninety-nine percent) the subject was in low levels of entrainment. The subject spent only one percent of the time at the medium level and no time at all at the high level.

The Effect of Reiki on The Autonomic Nervous System

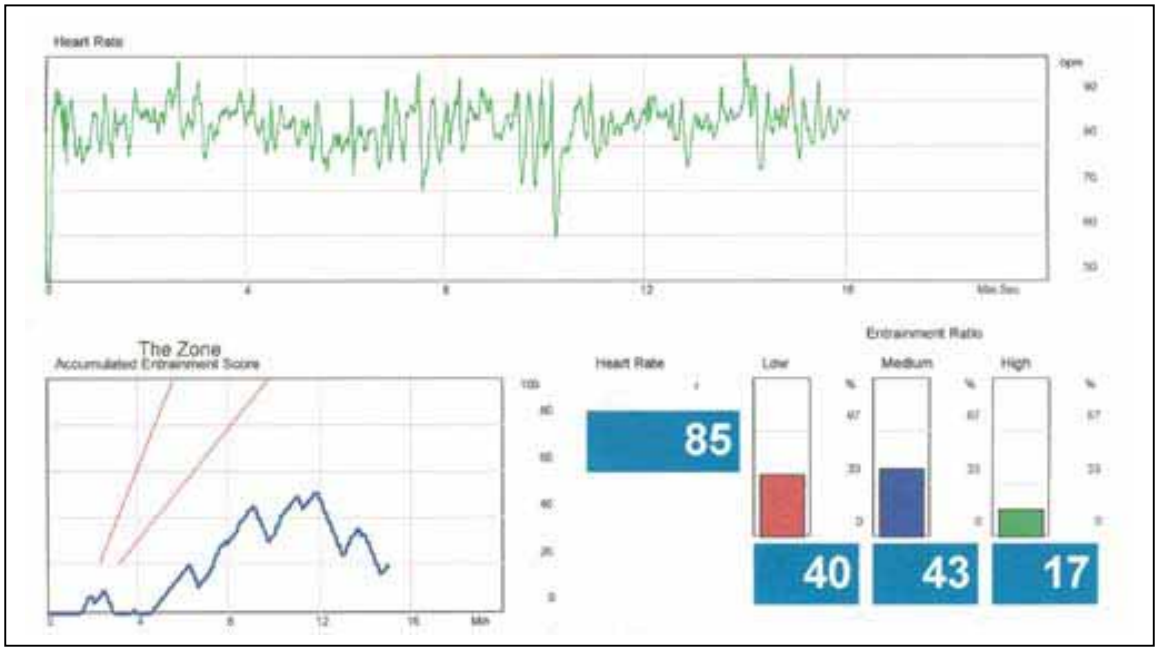


Figure 19. Example of Good Heart Rate Waveform and Entrainment

The waveform tracing at the top of Figure 19 (above) is slightly saw toothed. It does, however, maintain a consistent normal waveform. This again enables the program to accurately measure HRV or entrainment time. The graph to the left shows a short period of time in the entrainment zone and a migration of HRV into it. The bar graphs on the right show the heart rate at 85 and the levels of entrainment at forty percent for low, forty-three percent for medium, and seventeen percent for high. This participant is in a good entrainment space showing a migration of HRV in and out of entrainment space.

The Effect of Reiki on The Autonomic Nervous System

APPENDIX E: STUDY ROOM LAYOUTS

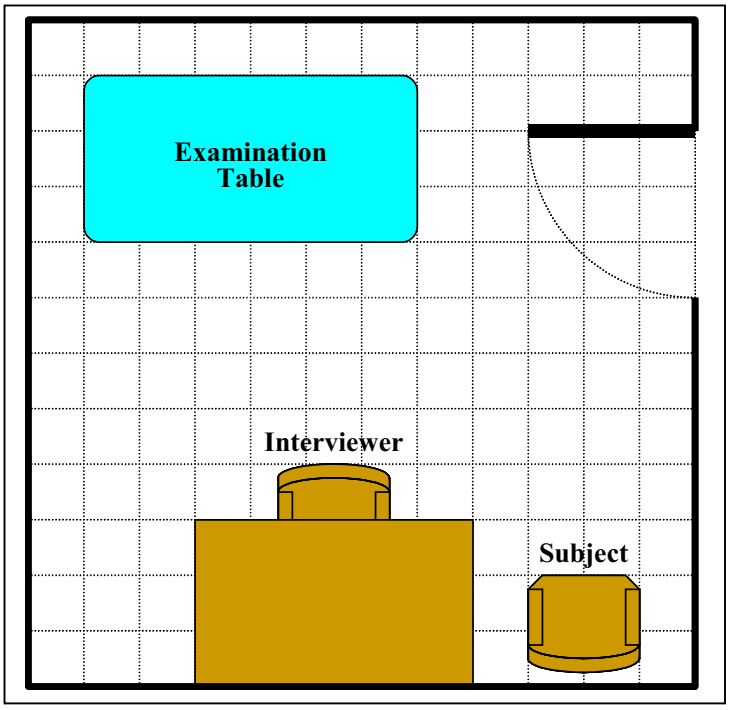


Figure 20. Interview Room Layout

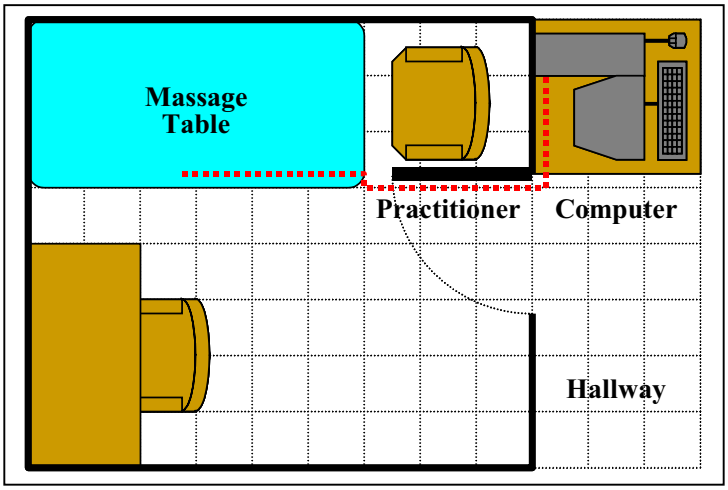


Figure 21. Treatment Room Layout

The Effect of Reiki on The Autonomic Nervous System

APPENDIX G: DATA

The following tables contain the results data obtained in this experiment.

Intervention Group Data														
Subject	Age	Gender	HR	Low	Med	High		Subject	Age	Gender	HR	Low	Med	High
1001A	42	F	81	81	18	1		1011A	34	M	84	73	26	1
1001B	42	F	80	54	29	7		1011B	34	M	80	53	41	6
1001AA	42	F	80	85	15	0		1011AA	34	M	84	57	41	3
1001BB	42	F	69	49	36	15		1011BB	34	M	85	45	46	9
1002A	45	F	73	90	10	0		1012A	20	M	89	82	16	2
1002B	45	F	92	69	27	3		1012B	20	M	87	58	39	2
1002AA	45	F	78	95	5	0		1012AA	20	M	105	67	33	1
1002BB	45	F	86	42	42	16		1012BB	20	M	97	62	35	3
1003A	18	F	86	65	29	3		1013A	54	F	83	99	1	0
1003B	18	F	86	60	32	8		1013B	54	F	85	64	29	7
1003AA	18	F	85	64	38	8		1013AA	54	F	82	35	49	16
1003BB	18	F	80	59	33	8		1013BB	54	F	83	52	39	9
1004A	23	M	79	92	7	2		1014A	20	F	87	69	28	3
1004B	23	M	74	93	6	1		1014B	20	F	87	92	8	0
1004AA	23	M	74	83	14	3		1014AA	20	F	84	90	10	0
1004BB	23	M	76	64	29	7		1014BB	20	F	92	88	12	0
1005A	55	M	64	70	26	4		1015A	21	F	54	85	14	1
1005B	55	M	71	52	37	11		1015B	21	F	50	91	9	0
1005AA	55	M	71	45	42	12		1015AA	21	F	50	77	19	4
1005BB	55	M	69	41	55	4		1015BB	21	F	53	85	14	1
1006A	44	F	90	69	31	0		1016A	41	F	83	99	1	0
1006B	44	F	94	66	28	6		1016B	41	F	77	93	7	0
1006AA	44	F	87	67	32	1		1016AA	41	F	75	96	4	0
1006BB	44	F	92	60	32	8		1016BB	41	F	73	99	1	0
1007A	47	M	47	53	36	11		1017A	49	F	59	92	8	0
1007B	47	M	48	26	50	24		1017B	49	F	70	87	13	0
1007AA	47	M	50	79	21	0		1017AA	49	F	69	96	4	0
1007BB	47	M	47	65	29	6		1017BB	49	F	69	91	9	0
1008A	20	F	85	40	43	17		1018A	24	F	59	92	8	0
1008B	20	F	64	69	31	0		1018B	24	F	70	87	13	0
1008AA	20	F	62	93	7	0		1018AA	24	F	70	96	4	0
1008BB	20	F	75	86	14	0		1018BB	24	F	69	91	9	0
1009A	18	F	85	40	43	17		1019A	32	F	85	92	8	0
1009B	18	F	82	35	49	16		1019B	32	F	82	91	6	4
1009AA	18	F	86	34	39	27		1019AA	32	F	82	89	11	0
1009BB	18	F	83	53	39	9		1019BB	32	F	76	95	5	0
1010A	23	F	56	90	10	0		1020A	54	M	98	97	3	0
1010B	23	F	55	67	33	0		1020B	54	M	94	81	17	2
1010AA	23	F	57	88	12	0		1020AA	54	M	100	99	1	0
1010BB	23	F	52	51	45	5		1020BB	54	M	90	95	5	0

Table 11. Data Recorded for Intervention Group Subjects.

The Effect of Reiki on The Autonomic Nervous System

Control Group Data													
Subject	Age	Gender	HR		Med	High	Subject	Age	Gender	HR		Med	High
2001A	23	F	81	49	41	10	2011A	36	M	66	79	17	4
2001B	23	F	82	54	38	7	2011B	36	M	60	79	21	0
2001AA	23	F	79	53	28	18	2011AA	36	M	64	76	20	4
2001BB	23	F	82	48	43	8	2011BB	36	M	62	72	28	0
2002A	19	F	73	43	56	1	2012A	47	M	90	77	22	1
2002B	19	F	73	49	48	3	2012B	47	M	85	74	24	2
2002AA	19	F	67	39	50	11	2012AA	47	M	83	51	41	7
2002BB	19	F	69	35	49	16	2012BB	47	M	79	67	26	7
2003A	45	F	62	90	10	0	2013A	24	M	84	33	52	15
2003B	45	F	62	86	11	2	2013B	24	M	81	60	33	7
2003AA	45	F	62	57	43	0	2013AA	24	M	83	51	41	8
2003BB	45	F	59	59	40	1	2013BB	24	M	79	67	26	7
2004A	59	F	84	45	37	18	2014A	42	F	77	64	25	11
2004B	59	F	82	43	48	9	2014B	42	F	78	72	27	1
2004AA	59	F	83	49	40	11	2014AA	42	F	103	67	24	8
2004BB	59	F	85	40	44	16	2014BB	42	F	101	56	39	6
2005A	20	M	84	71	19	9	2015A	37	M	95	74	23	3
2005B	20	M	82	67	30	3	2015B	37	M	90	67	26	8
2005AA	20	M	77	67	27	6	2015AA	37	M	89	64	26	10
2005BB	20	M	74	72	28	0	2015BB	37	M	95	43	51	7
2006A	29	F	84	89	11	0	2016A	50	M	82	72	22	6
2006B	29	F	83	86	14	0	2016B	50	M	87	44	49	6
2006AA	29	F	85	90	10	0	2016AA	50	M	87	72	22	6
2006BB	29	F	83	96	4	0	2016BB	50	M	90	49	39	11
2007A	48	M	83	34	49	15	2017A	20	M	64	46	48	5
2007B	48	M	79	34	23	9	2017B	20	M	56	14	79	7
2007AA	48	M	83	79	21	0	2017AA	20	M	55	44	51	6
2007BB	48	M	82	66	27	7	2017BB	20	M	52	16	83	1
2008A	20	M	67	70	30	0	2018A	76	M	88	52	40	8
2008B	20	M	71	89	11	0	2018B	76	M	91	51	41	8
2008AA	20	M	67	88	12	0	2018AA	76	M	89	52	29	18
2008BB	20	M	84	87	13	0	2018BB	76	M	88	48	46	6
2009A	76	F	79	67	23	9	2019A	51	M	94	80	18	2
2009B	76	F	82	54	41	6	2019B	51	M	87	82	46	2
2009AA	76	F	80	53	32	14	2019AA	51	M	79	73	26	2
2009BB	76	F	75	22	3	0	2019BB	51	M	79	60	31	9
2010A	21	M	66	79	17	4	2020A	22	M	102	92	8	0
2010B	21	M	60	79	21	0	2020B	22	M	97	92	21	0
2010AA	21	M	64	76	20	4	2020AA	22	M	70	66	29	5
2010BB	21	M	62	72	28	0	2020BB	22	M	78	81	16	3

Table 12. Data Recorded for Control Group Subjects.

The Effect of Reiki on The Autonomic Nervous System

APPENDIX H: STATISTICAL RESULTS

Results from SPSS

ANOVA Data for Heart Rate (HR)

General Linear Model

Notes

Output Created		22-JUL-2003 09:27:22
Comments		
Input	Data	C:\Documents and Settings\pthomli\Desktop\heartmath reiki nutter data.sav
	Filter	<none>
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	Split File	<none>
	N of Rows in Working Data File	43
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		GLM hra hrb hraa hrbb BY hands_on /WSFACTOR = hr 4 Polynomial /METHOD = SSTYPE(3) /POSTHOC = hands_on (LSD) /PLOT = PROFILE(hr*hands_on) /CRITERIA = ALPHA(.05) /WSDESIGN = hr /DESIGN = hands_on .
Resources	Elapsed Time	0:00:00.06

Within-Subjects Factors

Measure: MEASURE_1

HR	Dependent Variable
1	HRA
2	HRB
3	HRAA
4	HRBB

Between-Subjects Factors

		Value Label	N
Hands On	1	Yes	21
	2	No	21

Multivariate Tests(b)

Effect		Value	F	Hypothesis df	Error df	Sig.
HR	Pillai's Trace	.027	.346(a)	3.000	38.000	.792
	Wilks' Lambda	.973	.346(a)	3.000	38.000	.792
	Hotelling's Trace	.027	.346(a)	3.000	38.000	.792
	Roy's Largest Root	.027	.346(a)	3.000	38.000	.792
HR * HANDS_ON	Pillai's Trace	.017	.225(a)	3.000	38.000	.879
	Wilks' Lambda	.983	.225(a)	3.000	38.000	.879
	Hotelling's Trace	.018	.225(a)	3.000	38.000	.879
	Roy's Largest Root	.018	.225(a)	3.000	38.000	.879

a Exact statistic

b Design: Intercept+HANDS_ON Within Subjects Design: HR

The Effect of Reiki on The Autonomic Nervous System

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
HR	Sphericity Assumed	54.905	3	18.302	.550	.649
	Greenhouse-Geisser	54.905	1.979	27.747	.550	.577
	Huynh-Feldt	54.905	2.133	25.738	.550	.590
	Lower-bound	54.905	1.000	54.905	.550	.463
HR * HANDS_ON	Sphericity Assumed	31.667	3	10.556	.317	.813
	Greenhouse-Geisser	31.667	1.979	16.003	.317	.727
	Huynh-Feldt	31.667	2.133	14.844	.317	.743
	Lower-bound	31.667	1.000	31.667	.317	.577
Error(HR)	Sphericity Assumed	3995.429	120	33.295		
	Greenhouse-Geisser	3995.429	79.151	50.479		
	Huynh-Feldt	3995.429	85.329	46.824		
	Lower-bound	3995.429	40.000	99.886		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	HR	Type III Sum of Squares	df	Mean Square	F	Sig.
HR	Linear	29.719	1	29.719	.489	.488
	Quadratic	6.881	1	6.881	.469	.497
	Cubic	18.305	1	18.305	.748	.392
HR * HANDS_ON	Linear	14.405	1	14.405	.237	.629
	Quadratic	5.357	1	5.357	.365	.549
	Cubic	11.905	1	11.905	.487	.490
Error(HR)	Linear	2429.876	40	60.747		
	Quadratic	586.762	40	14.669		
	Cubic	978.790	40	24.470		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1006571.524	1	1006571.524	1882.280	.000
HANDS_ON	1512.000	1	1512.000	2.827	.100
Error	21390.476	40	534.762		

Profile Plots

(See Figure 8, page 86)

The Effect of Reiki on The Autonomic Nervous System

ANOVA Data for Low Heart Rate Variability (HRV) Entrainment Zone

General Linear Model

Notes

Output Created		22-JUL-2003 09:29:21
Comments		
Input	Data	C:\Documents and Settings\pthomli\Desktop\heartmath reiki nutter data.sav
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	43
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		GLM lowa lowb lowaa lowbb BY hands_on /WSFACTOR = low 4 Polynomial /METHOD = SSTYPE(3) /POSTHOC = hands_on (LSD) /PLOT = PROFILE(low*hands_on) /CRITERIA = ALPHA(.05) /WSDESIGN = low /DESIGN = hands_on .
Resources	Elapsed Time	0:00:00.02

Within-Subjects Factors

Measure: MEASURE_1

LOW	Dependent Variable
1	LOWA
2	LOWB
3	LOWAA
4	LOWBB

Between-Subjects Factors

		Value Label	N
Hands On	1	Yes	21
	2	No	21

Multivariate Tests(b)

Effect		Value	F	Hypothesis df	Error df	Sig.
LOW	Pillai's Trace	.194	3.049(a)	3.000	38.000	.040
	Wilks' Lambda	.806	3.049(a)	3.000	38.000	.040
	Hotelling's Trace	.241	3.049(a)	3.000	38.000	.040
	Roy's Largest Root	.241	3.049(a)	3.000	38.000	.040
LOW * HANDS_ON	Pillai's Trace	.075	1.021(a)	3.000	38.000	.394
	Wilks' Lambda	.925	1.021(a)	3.000	38.000	.394
	Hotelling's Trace	.081	1.021(a)	3.000	38.000	.394
	Roy's Largest Root	.081	1.021(a)	3.000	38.000	.394

a Exact statistic

b Design: Intercept+HANDS_ON Within Subjects Design: LOW

The Effect of Reiki on The Autonomic Nervous System

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
LOW	Sphericity Assumed	1231.065	3	410.355	3.568	.016
	Greenhouse-Geisser	1231.065	2.810	438.130	3.568	.019
	Huynh-Feldt	1231.065	3.000	410.355	3.568	.016
	Lower-bound	1231.065	1.000	1231.065	3.568	.066
LOW * HANDS_ON	Sphericity Assumed	393.446	3	131.149	1.140	.336
	Greenhouse-Geisser	393.446	2.810	140.026	1.140	.334
	Huynh-Feldt	393.446	3.000	131.149	1.140	.336
	Lower-bound	393.446	1.000	393.446	1.140	.292
Error(LOW)	Sphericity Assumed	13800.738	120	115.006		
	Greenhouse-Geisser	13800.738	112.393	122.790		
	Huynh-Feldt	13800.738	120.000	115.006		
	Lower-bound	13800.738	40.000	345.018		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	LOW	Type III Sum of Squares	df	Mean Square	F	Sig.
LOW	Linear	591.696	1	591.696	3.965	.053
	Quadratic	128.625	1	128.625	1.418	.241
	Cubic	510.744	1	510.744	4.861	.033
LOW * HANDS_ON	Linear	84.868	1	84.868	.569	.455
	Quadratic	.149	1	.149	.002	.968
	Cubic	308.430	1	308.430	2.936	.094
Error(LOW)	Linear	5969.386	40	149.235		
	Quadratic	3628.976	40	90.724		
	Cubic	4202.376	40	105.059		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	801090.482	1	801090.482	803.297	.000
HANDS_ON	5497.149	1	5497.149	5.512	.024
Error	39890.119	40	997.253		

Profile Plots

(See Figure 9, page 87)

The Effect of Reiki on The Autonomic Nervous System

ANOVA Data for Medium Heart Rate Variability (HRV) Entrainment Zone

General Linear Model

Notes

Output Created		22-JUL-2003 09:30:14
Comments		
Input	Data	C:\Documents and Settings\pthomli\Desktop\heartmath reiki nutter data.sav
	Filter	<none>
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	Split File	<none>
	N of Rows in Working Data File	43
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		GLM meda medb medaa medbb BY hands_on /WSFACTOR = med 4 Polynomial /METHOD = SSTYPE(3) /PLOT = PROFILE(med*hands_on) /CRITERIA = ALPHA(.05) /WSDESIGN = med /DESIGN = hands_on .
Resources	Elapsed Time	0:00:00.05

Within-Subjects Factors

Measure: MEASURE_1

MED	Dependent Variable
1	MEDA
2	MEDB
3	MEDAA
4	MEDBB

Between-Subjects Factors

		Value Label	N
Hands On	1	Yes	21
	2	No	21

Multivariate Tests(b)

Effect		Value	F	Hypothesis df	Error df	Sig.
MED	Pillai's Trace	.238	3.954(a)	3.000	38.000	.015
	Wilks' Lambda	.762	3.954(a)	3.000	38.000	.015
	Hotelling's Trace	.312	3.954(a)	3.000	38.000	.015
	Roy's Largest Root	.312	3.954(a)	3.000	38.000	.015
MED * HANDS_ON	Pillai's Trace	.074	1.015(a)	3.000	38.000	.397
	Wilks' Lambda	.926	1.015(a)	3.000	38.000	.397
	Hotelling's Trace	.080	1.015(a)	3.000	38.000	.397
	Roy's Largest Root	.080	1.015(a)	3.000	38.000	.397

a Exact statistic

b Design: Intercept+HANDS_ON Within Subjects Design: MED

The Effect of Reiki on The Autonomic Nervous System

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
MED	Sphericity Assumed	1041.286	3	347.095	4.225	.007
	Greenhouse-Geisser	1041.286	2.864	363.582	4.225	.008
	Huynh-Feldt	1041.286	3.000	347.095	4.225	.007
	Lower-bound	1041.286	1.000	1041.286	4.225	.046
MED * HANDS_ON	Sphericity Assumed	279.762	3	93.254	1.135	.338
	Greenhouse-Geisser	279.762	2.864	97.683	1.135	.337
	Huynh-Feldt	279.762	3.000	93.254	1.135	.338
	Lower-bound	279.762	1.000	279.762	1.135	.293
Error(MED)	Sphericity Assumed	9858.952	120	82.158		
	Greenhouse-Geisser	9858.952	114.559	86.060		
	Huynh-Feldt	9858.952	120.000	82.158		
	Lower-bound	9858.952	40.000	246.474		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	MED	Type III Sum of Squares	df	Mean Square	F	Sig.
MED	Linear	365.376	1	365.376	3.841	.057
	Quadratic	27.524	1	27.524	.353	.556
	Cubic	648.386	1	648.386	8.839	.005
MED * HANDS_ON	Linear	114.405	1	114.405	1.203	.279
	Quadratic	2.381	1	2.381	.031	.862
	Cubic	162.976	1	162.976	2.222	.144
Error(MED)	Linear	3804.619	40	95.115		
	Quadratic	3120.095	40	78.002		
	Cubic	2934.238	40	73.356		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	117131.524	1	117131.524	178.106	.000
HANDS_ON	1920.381	1	1920.381	2.920	.095
Error	26306.095	40	657.652		

Profile Plots

(See Figure 10, page 88)

The Effect of Reiki on The Autonomic Nervous System

ANOVA Data for High Heart Rate Variability (HRV) Entrainment Zone

General Linear Model

Notes

Output Created		22-JUL-2003 09:33:26
Comments		
Input	Data	C:\Documents and Settings\pthomli\Desktop\heartmath reiki nutter data.sav
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	43
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		GLM higha highb highaa highbb BY hands_on /WSFACTOR = high 4 Polynomial /METHOD = SSTYPE(3) /PLOT = PROFILE(high*hands_on) /CRITERIA = ALPHA(.05) /WSDESIGN = high /DESIGN = hands_on .
Resources	Elapsed Time	0:00:00.02

Within-Subjects Factors

Measure: MEASURE_1

HIGH	Dependent Variable
1	HIGHA
2	HIGHB
3	HIGHAA
4	HIGHBB

Between-Subjects Factors

		Value Label	N
Hands On	1	Yes	21
	2	No	21

Multivariate Tests(b)

Effect		Value	F	Hypothesis df	Error df	Sig.
HIGH	Pillai's Trace	.054	.724(a)	3.000	38.000	.544
	Wilks' Lambda	.946	.724(a)	3.000	38.000	.544
	Hotelling's Trace	.057	.724(a)	3.000	38.000	.544
	Roy's Largest Root	.057	.724(a)	3.000	38.000	.544
HIGH * HANDS_ON	Pillai's Trace	.010	.133(a)	3.000	38.000	.940
	Wilks' Lambda	.990	.133(a)	3.000	38.000	.940
	Hotelling's Trace	.010	.133(a)	3.000	38.000	.940
	Roy's Largest Root	.010	.133(a)	3.000	38.000	.940

a Exact statistic

b Design: Intercept+HANDS_ON Within Subjects Design: HIGH

The Effect of Reiki on The Autonomic Nervous System

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
HIGH	Sphericity Assumed	39.351	3	13.117	.824	.483
	Greenhouse-Geisser	39.351	2.733	14.401	.824	.474
	Huynh-Feldt	39.351	3.000	13.117	.824	.483
	Lower-bound	39.351	1.000	39.351	.824	.370
HIGH * HANDS_ON	Sphericity Assumed	8.065	3	2.688	.169	.917
	Greenhouse-Geisser	8.065	2.733	2.952	.169	.903
	Huynh-Feldt	8.065	3.000	2.688	.169	.917
	Lower-bound	8.065	1.000	8.065	.169	.683
Error(HIGH)	Sphericity Assumed	1911.333	120	15.928		
	Greenhouse-Geisser	1911.333	109.303	17.487		
	Huynh-Feldt	1911.333	120.000	15.928		
	Lower-bound	1911.333	40.000	47.783		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	HIGH	Type III Sum of Squares	df	Mean Square	F	Sig.
HIGH	Linear	25.030	1	25.030	1.441	.237
	Quadratic	14.292	1	14.292	1.133	.294
	Cubic	.030	1	.030	.002	.968
HIGH * HANDS_ON	Linear	.030	1	.030	.002	.967
	Quadratic	1.339	1	1.339	.106	.746
	Cubic	6.696	1	6.696	.376	.543
Error(HIGH)	Linear	694.790	40	17.370		
	Quadratic	504.619	40	12.615		
	Cubic	711.924	40	17.798		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3649.339	1	3649.339	61.079	.000
HANDS_ON	725.006	1	725.006	12.134	.001
Error	2389.905	40	59.748		

Profile Plots

(See Figure 11, page 89)

The Effect of Reiki on The Autonomic Nervous System

Results from Excel

The following tables represent the raw test data for heart rate (HR), low heart rate variability (HRV) entrainment (L), medium HRV entrainment (M), and high HRV entrainment (H). ANOVA functions were applied to the runs in the following manner: Intervention Group (IG) vs. Control Group (CG) for each of the following pairs of periods: A-B, AA-BB, and A-BB. A was the first fifteen-minute period (when Reiki was not applied to the IG); B was the next fifteen-minute period (when Reiki was applied to the IG); AA was the next fifteen-minute period (when Reiki was not applied to the IG); and BB was the final fifteen-minute period (when Reiki was once again applied to the IG).

In most of the cases, there appears to be no statistical correlation between periods of hands-on (application of Reiki) and hands-off (no application of Reiki). However, there appears to be some potential correlation in the HRV-M and HRV-L categories within the columns ($p<0.05$).

The Effect of Reiki on The Autonomic Nervous System

ANOVA Data for High Heart Rate (HR)

IG-HR				CG-HR			
A	B	AA	BB	A	B	AA	BB
81	80	80	69	81	82	79	82
73	92	78	86	73	73	67	69
86	86	85	80	62	62	62	59
79	74	74	76	84	82	83	85
64	71	71	69	84	82	77	74
90	94	87	92	84	83	85	83
47	48	50	47	83	79	83	82
85	64	62	75	67	71	67	84
85	82	86	83	79	82	80	75
56	55	57	52	66	60	64	62
84	80	84	85	66	60	64	62
89	87	105	97	90	85	83	79
83	85	82	83	84	81	83	79
87	87	84	92	77	78	103	101
54	50	50	53	95	90	89	95
83	77	75	73	82	87	87	90
59	70	69	69	64	56	55	52
59	70	70	69	88	91	89	88
85	82	82	76	94	87	79	79
98	94	100	90	102	97	70	78

Table 13. Raw HR Data

Anova: Two-Factor With Replication			
SUMMARY	IG-HR	CG-HR	Total
A			
Count	20	20	40
Sum	1527	1605	3132
Average	76.35	80.25	78.3
Variance	208.55526	123.46053	165.65128
B			
Count	20	20	40
Sum	1528	1568	3096
Average	76.4	78.4	77.4
Variance	188.14737	128.56842	155.32308
Total			
Count	40	40	
Sum	3055	3173	
Average	76.375	79.325	
Variance	193.26603	123.6609	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	16.2	1	16.2	0.0998872	0.7528314	3.9667611
Columns	174.05	1	174.05	1.0731711	0.3035152	3.9667611
Interaction	18.05	1	18.05	0.1112941	0.7395943	3.9667611
Within	12325.9	76	162.18289			
Total	12534.2	79				

Table 14. ANOVA – HR: A-B

The Effect of Reiki on The Autonomic Nervous System

Anova: Two-Factor With Replication			
SUMMARY		CG-HR	Total
AA			
Count	20	20	40
Sum	1531	1549	3080
Average	76.55	77.45	77
Variance	208.26053	135.83947	167.84615
BB			
Count	20	20	40
Sum	1516	1558	3074
Average	75.8	77.9	76.85
Variance	189.22105	150.62105	166.69487
Total			
Count	40	40	
Sum	3047	3107	
Average	76.175	77.675	
Variance	193.7891	139.60962	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	0.45	1	0.45	0.0026318	0.9592202	3.9667611
Columns	45	1	45	0.2631802	0.6094317	3.9667611
Interaction	7.2	1	7.2	0.0421088	0.8379611	3.9667611
Within	12994.9	76	170.98553			
Total	13047.55	79				

Table 15. ANOVA – HR: AA-BB

Anova: Two-Factor With Replication			
SUMMARY		CG-HR	Total
A			
Count	20	20	40
Sum	1527	1605	3132
Average	76.35	80.25	78.3
Variance	208.55526	123.46053	165.65128
BB			
Count	20	20	40
Sum	1516	1558	3074
Average	75.8	77.9	76.85
Variance	189.22105	150.62105	166.69487
Total			
Count	40	40	
Sum	3043	3163	
Average	76.075	79.075	
Variance	193.86603	134.94295	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	42.05	1	42.05	0.2503506	0.6182742	3.9667611
Columns	180	1	180	1.0716552	0.3038546	3.9667611
Interaction	16.2	1	16.2	0.096449	0.7569835	3.9667611
Within	12765.3	76	167.96447			
Total	13003.55	79				

Table 16. ANOVA – HR: A-BB

The Effect of Reiki on The Autonomic Nervous System

ANOVA Data for Low Heart Rate Variability (HRV) Entrainment Zone

IG-L				CG-L			
A	**B**	**AA**	**BB**	**A**	**B**	**AA**	**BB**
81	54	85	49	49	54	53	48
90	69	95	42	43	49	39	35
65	60	64	59	90	86	57	59
92	93	83	64	45	43	49	40
70	52	45	41	71	67	67	72
69	66	67	60	89	86	90	96
53	26	79	65	34	34	79	66
40	69	93	86	70	89	88	87
40	35	34	53	67	54	53	22
90	67	88	51	79	79	76	72
73	53	57	45	79	79	76	72
82	58	67	62	77	74	51	67
99	64	35	52	33	60	51	67
69	92	90	88	64	72	67	56
85	91	77	85	74	67	64	43
99	93	96	99	72	44	72	49
92	87	96	91	46	14	44	16
92	87	96	91	52	51	52	48
92	91	89	95	80	82	73	60
97	81	99	95	92	92	66	81

Table 17. Raw HRV-Low Data

Anova: Two-Factor With Replication			
SUMMARY	IG-L	CG-L	Total
A			
Count	20	20	40
Sum	1570	1306	2876
Average	78.5	65.3	71.9
Variance	332.47368	344.22105	374.34872
B			
Count	20	20	40
Sum	1388	1276	2664
Average	69.4	63.8	66.6
Variance	392.25263	430.69474	408.9641
Total			
Count	40	40	
Sum	2958	2582	
Average	73.95	64.55	
Variance	374.30513	378.1	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	561.8	1	561.8	1.4984909	0.224685	3.9667611
Columns	1767.2	1	1767.2	4.713658	0.0330455	3.9667611
Interaction	288.8	1	288.8	0.7703171	0.3828851	3.9667611
Within	28493.2	76	374.91053			
Total	31111	79				

Table 18. ANOVA – HRV-Low: A-B

The Effect of Reiki on The Autonomic Nervous System

Anova: Two-Factor With Replication			
SUMMARY	IG-L	CG-L	Total
AA			
Count	20	20	40
Sum	1535	1267	2802
Average	76.75	63.35	70.05
Variance	425.77632	207.71316	354.6641
BB			
Count	20	20	40
Sum	1373	1156	2529
Average	68.65	57.8	63.225
Variance	408.02895	423.95789	435.51218
Total			
Count	40	40	
Sum	2908	2423	
Average	72.7	60.575	
Variance	423.0359	315.63526	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	931.6125	1	931.6125	2.5428251	0.1149469	3.9667611
Columns	2940.3125	1	2940.3125	8.0255476	0.0059024	3.9667611
Interaction	32.5125	1	32.5125	0.0887425	0.7665948	3.9667611
Within	27844.05	76	366.36908			
Total	31748.488	79				

Table 19. ANOVA – HRV-Low: AA-BB

Anova: Two-Factor With Replication			
SUMMARY	IG-L	CG-L	Total
A			
Count	20	20	40
Sum	1570	1306	2876
Average	78.5	65.3	71.9
Variance	332.47368	344.22105	374.34872
BB			
Count	20	20	40
Sum	1373	1156	2529
Average	68.65	57.8	63.225
Variance	408.02895	423.95789	435.51218
Total			
Count	40	40	
Sum	2943	2462	
Average	73.575	61.55	
Variance	385.63526	388.6641	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	1505.1125	1	1505.1125	3.9905372	0.0493353	3.9667611
Columns	2892.0125	1	2892.0125	7.6676551	0.0070604	3.9667611
Interaction	27.6125	1	27.6125	0.0732096	0.7874531	3.9667611
Within	28664.95	76	377.17039			
Total	33089.688	79				

Table 20. ANOVA – HRV-Low: A-BB

The Effect of Reiki on The Autonomic Nervous System

ANOVA Data for Medium Heart Rate Variability (HRV) Entrainment Zone

IG-M				CG-M			
A	B	AA	BB	A	B	AA	BB
18	29	15	36	41	38	28	43
10	27	5	42	56	48	50	49
29	32	38	33	10	11	43	40
7	6	14	29	37	48	40	44
26	37	42	55	19	30	27	28
31	28	32	32	11	14	10	4
36	50	21	29	49	23	21	27
43	31	7	14	30	11	12	13
43	49	39	39	23	41	32	3
10	33	12	45	17	21	20	28
26	41	41	46	17	21	20	28
16	39	33	35	22	24	41	26
1	29	49	39	52	33	41	26
28	8	10	12	25	27	24	39
14	9	19	14	23	26	26	51
1	7	4	1	22	49	22	39
8	13	4	9	48	79	51	83
8	13	4	9	40	41	29	46
8	6	11	5	18	46	26	31
3	17	1	5	8	21	29	16

Table 21. Raw HRV-Medium Data

Anova: Two-Factor With Replication			
SUMMARY	IG-M	CG-M	Total
A			
Count	20	20	40
Sum	366	568	934
Average	18.3	28.4	23.35
Variance	182.22105	219.09474	221.66923
B			
Count	20	20	40
Sum	504	652	1156
Average	25.2	32.6	28.9
Variance	207.01053	272.46316	247.63077
Total			
Count	40	40	
Sum	870	1220	
Average	21.75	30.5	
Variance	201.83333	244	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	616.05	1	616.05	2.7977174	0.0985107	3.9667611
Columns	1531.25	1	1531.25	6.9539886	0.0101368	3.9667611
Interaction	36.45	1	36.45	0.1655333	0.685256	3.9667611
Within	16735	76	220.19737			
Total	18918.75	79				

Table 22. ANOVA – HRV-Medium: A-B

The Effect of Reiki on The Autonomic Nervous System

Anova: Two-Factor With Replication			
SUMMARY	IG-M	CG-M	Total
AA			
Count	20	20	40
Sum	401	592	993
Average	20.05	29.6	24.825
Variance	241.83947	131.83158	205.43013
BB			
Count	20	20	40
Sum	529	664	1193
Average	26.45	33.2	29.825
Variance	265.52368	328.06316	300.86603
Total			
Count	40	40	
Sum	930	1256	
Average	23.25	31.4	
Variance	257.67949	227.37436	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	500	1	500	2.0677009	0.1545532	3.9667611
Columns	1328.45	1	1328.45	5.4936745	0.0217008	3.9667611
Interaction	39.2	1	39.2	0.1621077	0.6883536	3.9667611
Within	18377.9	76	241.81447			
Total	20245.55	79				

Table 23. ANOVA – HRV-Medium: AA-BB

Anova: Two-Factor With Replication			
SUMMARY	IG-M	CG-M	Total
A			
Count	20	20	40
Sum	366	568	934
Average	18.3	28.4	23.35
Variance	182.22105	219.09474	221.66923
BB			
Count	20	20	40
Sum	529	664	1193
Average	26.45	33.2	29.825
Variance	265.52368	328.06316	300.86603
Total			
Count	40	40	
Sum	895	1232	
Average	22.375	30.8	
Variance	235.16346	272.47179	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	838.5125	1	838.5125	3.3712344	0.070255	3.9667611
Columns	1419.6125	1	1419.6125	5.7075435	0.0193731	3.9667611
Interaction	56.1125	1	56.1125	0.2256	0.6361679	3.9667611
Within	18903.15	76	248.72566			
Total	21217.388	79				

Table 24. ANOVA – HRV-Medium: A-BB

The Effect of Reiki on The Autonomic Nervous System

ANOVA Data for High Heart Rate Variability (HRV) Entrainment Zone

IG-H			
A	B	AA	BB
1	7	0	15
0	3	0	16
3	8	8	8
2	1	3	7
4	11	12	4
0	6	1	8
11	24	0	6
17	0	0	0
17	16	27	9
0	0	0	5
1	6	3	9
2	2	1	3
0	7	16	9
3	0	0	0
1	0	4	1
0	0	0	0
0	0	0	0
0	0	0	0
0	4	0	0
0	2	0	0

CG-H			
A	B	AA	BB
10	7	18	8
1	3	11	16
0	2	0	1
18	9	11	16
9	3	6	0
0	0	0	0
15	9	0	7
0	0	0	0
9	6	14	0
4	0	4	0
4	0	4	0
1	2	7	7
15	7	8	7
11	1	8	6
3	8	10	7
6	6	6	11
5	7	6	1
8	8	18	6
2	2	2	9
0	0	5	3

Table 25. Raw HRV-High Data

Anova: Two-Factor With Replication			
SUMMARY	IG-High	CG-High	Total
A			
Count	20	20	40
Sum	62	121	183
Average	3.1	6.05	4.575
Variance	29.042105	31.418421	31.686538
B			
Count	20	20	40
Sum	97	80	177
Average	4.85	4	4.425
Variance	39.502632	11.578947	25.071154
Total			
Count	40	40	
Sum	159	201	
Average	3.975	5.025	
Variance	34.178846	22.025	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	0.45	1	0.45	0.0161374	0.8992497	3.9667611
Columns	22.05	1	22.05	0.7907328	0.3766847	3.9667611
Interaction	72.2	1	72.2	2.5891568	0.111744	3.9667611
Within	2119.3	76	27.885526			
Total	2214	79				

Table 26. ANOVA – HRV-High: A-B

The Effect of Reiki on The Autonomic Nervous System

Anova: Two-Factor With Replication			
SUMMARY	IG-High	CG-High	Total
AA			
Count	20	20	40
Sum	75	138	213
Average	3.75	6.9	5.325
Variance	49.881579	30.515789	41.712179
BB			
Count	20	20	40
Sum	100	105	205
Average	5	5.25	5.125
Variance	25.684211	26.618421	25.496795
Total			
Count	40	40	
Sum	175	243	
Average	4.375	6.075	
Variance	37.214744	28.532692	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	0.8	1	0.8	0.0241145	0.8770055	3.9667611
Columns	57.8	1	57.8	1.7422758	0.1908127	3.9667611
Interaction	42.05	1	42.05	1.2675207	0.263775	3.9667611
Within	2521.3	76	33.175			
Total	2621.95	79				

Table 27. ANOVA – HRV-High: AA-BB

Anova: Two-Factor With Replication			
SUMMARY	IG-High	CG-High	Total
A			
Count	20	20	40
Sum	62	121	183
Average	3.1	6.05	4.575
Variance	29.042105	31.418421	31.686538
BB			
Count	20	20	40
Sum	100	105	205
Average	5	5.25	5.125
Variance	25.684211	26.618421	25.496795
Total			
Count	40	40	
Sum	162	226	
Average	4.05	5.65	
Variance	27.587179	28.438462	

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample	6.05	1	6.05	0.2146091	0.6445025	3.9667611
Columns	51.2	1	51.2	1.816196	0.1817705	3.9667611
Interaction	36.45	1	36.45	1.2929755	0.2590728	3.9667611
Within	2142.5	76	28.190789			
Total	2236.2	79				

Table 28. ANOVA – HRV-High: A-BB