

The history and future of KAATSU Training

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KAATSU training involves the restriction of blood flow to exercising muscle and is the culmination of nearly 40 years of experimentation with the singular purpose of increasing muscle mass. KAATSU Training consists of performing low-intensity resistance training while a relatively light and flexible cuff is placed on the proximal part of one's lower or upper limbs, which provides appropriate superficial pressure. KAATSU Training should not be confused with training under ischemic conditions which has previously been reported (Sundberg, 1994). KAATSU Training does not induce ischemia within skeletal muscle, but rather promotes a state of blood pooling in the capillaries within the limb musculature. Applied basic and clinical research conducted over the past 10 years has demonstrated that KAATSU Training not only improves muscle mass and strength in healthy volunteers, but also benefits patients with cardiovascular and orthopedic conditions.

Key words: muscle hypertrophy, restriction of muscular venous blood flow, rehabilitation, Kaatsu Master

INTRODUCTION

It is expected that by the year 2014 one quarter of the Japanese population will be at least 65 years old (National Institute of Population and Social Security Research, 2004). Due to the potential enormous burden in federal health care costs associated with the increased number of older adults, the Japanese government has made it a priority to address these age-related health issues. Moreover, changes in federal health care regulations are expected to increase the number of older individuals categorized as requiring nursing care, which will increase the number of bed-ridden older adults. These changes in health care regulations are being hotly contested, since the reclassifications will increase the number of physically inactive older adults who will ultimately rely more on the health care system in Japan.

It is my opinion, based on personal experience with parents who required nursing care, that the number of dependent older Japanese should decrease, not increase. Personal observations regarding the positive effects associated with KAATSU Training have included the witnessing an older wheelchair-bound individual regain the use of his legs as well as another individual regaining sensation, both of which have helped me realize my role in this process. I am confident that KAATSU Training may be the ultimate prophylactic against physical disabilities, and that it will contribute significantly toward the government's goal of preventing a surge in the number of older individuals who require long-term nursing care in Japan (Sato, 2004b). In this brief overview, the history of KAATSU Training including important past events, theoretical and technological issues related to

training methodology, and future plans are presented.

Numbness Induced by Sitting Straight

I started my own form of resistance training during my first year of junior high school after seeing a body builder on TV for the first time. In the fall of 1966, which was my last year at high school, I received the inspiration for KAATSU Training while attending a Buddhist memorial. During the mass my leg became numb as a result of the position I was sitting in (straight back while kneeling on the floor). I started massaging my calf and noticed that the swelling and discomfort in my calf area was similar to the sensation I experienced after performing strenuous calf-raise exercises. I attributed this swelling sensation to decreased blood flow and theorized that this muscle swelling and altered sensation may be caused by, or associated with reduced blood flow to the muscle (Sato, 2004a).

Repeated experimentation was required to determine the optimal position of where to apply pressure in order to reduce blood flow to an active muscle. When too much pressure is applied, the skin may turn pale, and if exercise is continued while too much pressure is being applied, thrombosis may occur. It is quite difficult to reduce blood flow by the appropriate amount in order to achieve beneficial effects. It is important to remember that this technique should not be tried without thorough knowledge of how to correctly apply the KAATSU Training protocol because too much pressure may be deleterious. Six months of experimentation was required before I was able to achieve a significant "pump up" effect with KAATSU Training.



Figure 1

Failure Becomes Progress

A turning point in my personal training technique came in 1967, when I was freshman in college. Numbness in my leg due to my reckless KAATSU Training routine became so severe that I was hospitalized. Up to that point I had ignored the numbness in my legs during KAATSU Training and continued with my training despite the discomfort. At one point, however I began experiencing an acute attack of shortness of breath. I went to the emergency room and was diagnosed with a pulmonary embolism. Once the physician who was treating me learned of my training methods he warned me to immediately discontinue my KAATSU Training. Undiscouraged, I continued to work hard in order to determine the appropriate pressure for successful KAATSU Training so as to avoid visiting the hospital again. After numerous modifications, I began to accumulate knowledge of how pressure and training interact, which led to the foundation of the current KAATSU Training methodology. Within a year, I had established a safe and effective method of applying appropriate pressure for KAATSU Training. Moreover, I was able to expand the KAATSU Training technique to the upper extremities. Four years after my initial inspiration for KAATSU Training, the basic training manual was complete (Figure 1).



Figure 2

Second Turning Point of My Training Methodology

The second turning point came in 1973 after I suffered a fortunate accident. On a skiing trip with club members, I had crashed and seriously injured myself; fracturing both ankles and tearing cartilage and the medial collateral ligament in my right knee. Despite my orthopedist's diagnosis requiring immediate surgery and hospitalization, I refused in part because I just started my own fitness club and I could not afford to close the business to accommodate my untimely injury. Instead, I pleaded with another doctor to place my legs in casts. Faced with the prospect of muscle atrophy, which is the natural consequence of the casting, I gambled with my health and began using KAATSU Training. Shortly after implementing KAATSU Training, I immediately noticed positive results as my leg began that familiar swelling. When the sensation of tightness was felt in my leg, I would reduce the pressure. After a brief period, I would reapply the pressure. I repeated this "pressurizing and depressurizing" procedure for 2 weeks. At that point, however, my leg appeared abnormally swollen and I was worried that something was wrong with my leg and decided to visit the doctor. Surprisingly, my doctor at the bone-reduction clinic was surprised to see that not only was the typical muscle atrophy prevented, but quite the opposite, the muscle had hypertrophied. The doctor's amazement indicated to me that I had established the fundamental technique for KAATSU Training. Two month after the accident, the casts were removed. It happened that at that time I was planning to endure a severe weight lifting task of carrying a portable shrine on my shoulder for a local festival. Even though my leg appeared healed from its outside appearance, I was concerned that it was not completely healed on the inside. To determine the status of my leg, I went to see the



Figure 3



Figure 4

orthopedist for a checkup. His diagnosis was that the bones had completely fused and the knee ligament was healing well. Thus relieved, I successfully participated in the festival (Figure 2).

Training Methodology for the General Public

Because I was able to treat and heal my injured leg alone, I was confident that KAATSU Training actually worked. The story of my amazing recovery from the serious skiing injury spread among the members in the fitness club, and people started asking me for instructions for KAATSU Training. Because of my personal experience with the potential health risks associated with this form of training, I decided to instruct people under the condition that they fully understand the associated potential risks associated with this method and obtained consent from each individual prior to their instruction in KAATSU Training. It was more difficult than I originally thought. My original difficulty of being able to apply the appropriate pressure to the limb had resurfaced since each individual required unique attention which I attributed to differences not only in the age of the individual, but also in variations in the size of limbs and blood vessels, the amount of adipose tissue on their limbs, and their current muscular and physical strength. I struggled and worked hard to gain more knowledge in KAATSU Training and began following up on students who had completed a year of KAATSU to monitor their health. Ten years later and several hundred thousand students later, the methods of KAATSU Training were generalized for public use in 1983. It was during that time that I discarded the bicycle tubing and began working on a prototype of a flexible pressurizing cuff with pressure sensor (Figure 3).

The Popularity of KAATSU Training

The KAATSU Training method gained popularity in the athletic world and many athletes proved its effectiveness by enhancing their performance with this training. At the same time, collaboration of research efforts with Professor Naokata Ishii began. The research projects focused on the effect of acute low-intensity KAATSU exercise on blood growth hormone and the chronic effect on muscle hypertrophy and strength gains (Takarada et al., 2000), as well as the effects of KAATSU Training on muscle size and strength in athletes (Takarada et al., 2002). The results were published in prestigious research journals which drew enormous attention from the public.

By the end of 1994, I applied for a patent on the KAATSU Training method in Japan. By the following year, I had also applied for patents in England, Germany, France, Italy and the United States. In June 1997, I received a patent from the Patent Office in Japan to protect and promote KAATSU Training, valued as “high technological invention utilizing the laws of nature”. It is noteworthy that the approval of this type of patent is difficult to receive. Soon thereafter I obtained patents in Europe and America. I then began training instructors in the proper and safe techniques of KAATSU Training. Since KAATSU Training requires a specific pressurizing instrument, instructors are required to complete an authorized course and obtain a license which requires intensive training with a particular focus on blood flow restriction (Figure 4). Currently, KAATSU Training instructors include physicians, manipulative therapists, acupuncture therapists, moxa therapists, athletic trainers of top athletes and an owner of a judo hall. Today, nearly 240 KAATSU Training specialists exist in Japan, representing approximately 140 institutions making KAATSU Training available to the general public (Sato, 2004a).

Development of KAATSU Athletic Wear

In 2002, it became even easier for the general public to participate in KAATSU Training. Sato Sports Plaza Co. started collaboration with PHENIX Co., which designs general athletic sportswear, to develop a specific athletic garment for KAATSU Training. Highly absorptive, dry-fitting apparel was developed specifically for KAATSU instrumentation. Compared with the previously developed KAATSU Training instruments, the maximum pressure that could be applied was adjusted to a lower pressure setting in order to increase the safety of KAATSU Training. Sales advisory staff personally fit each KAATSU belt and pressure cuff to each customer. Today there are close to 900 sales advisory staff selling KAATSU Training garments.

Current Advancements and Joint Research of KAATSU Training

Sato Sports Plaza Co. and Japan Manned Space Systems Co. (which collaborates with Japan Aerospace Exploration Agency, JAXA), have agreed to a joint developmental research project testing the hypothesis that KAATSU Training may prevent muscular atrophy during prolonged space flight. The specific aim of this project was to evaluate the effects of KAATSU Training on muscular atrophy and osteoporosis associated with unloading on land and during space flight. If KAATSU training proves effective, further development will be implemented to include this type of training in the space station. It is possible in the future that KAATSU Training may be used by astronauts to prevent the loss of muscle mass and strength as well as the loss of bone density frequently experienced while in space (Yamazaki, 2004).

In May of 2003, Nissey Dowa General Insurance Co. established liability insurance for KAATSU Training. Approval of the liability insurance is a good example of recognition regarding the reliability of the training methodology used in KAATSU Training.

In December 2003, we developed a new KAATSU Training device (KAATSU Master(tm)) which allows

more precise pressure control and safer training instruction (Figure 5). Furthermore, joint projects now include collaboration with Tokyo University Technology Licensing Organization, Ltd. (CASTI); basic research on biochemical and molecular mechanisms associated with KAATSU Training (headed by Dr. Naokata Ishii of The University of Tokyo); applied research on the effect of acute KAATSU Training on muscular hypertrophy which could be used for the prevention of disability among the elderly (headed by Dr. Takashi Abe of The Tokyo Metropolitan University); animal research on the use of KAATSU Training on racehorses for injury prevention and rehabilitation (headed by Dr. Kenneth H. McKeever, Rutgers University, Equine Science Center); and medical research on the use of KAATSU Training for functional rehabilitation from cerebrovascular disorder (Dr. Yoshiharu Yokogawa, Shinshu University, School of Medicine). These projects are ongoing with many promising preliminary results being reported (Abe et al., 2004a 2004b; Kawada et al., 2004; Yasuda et al., 2004).

The University of Tokyo Hospital's "22nd Century Medical Center" Project

In 2004, Sato Sports Plaza Co. took part in The 22nd Century Medical Center project directed by The University of Tokyo Hospital, establishing a division within The University of Tokyo Hospital. "Sato Sports Plaza KAATSU Training: Division of Ischemia and Circulatory Physiology" started at The University of Tokyo Hospital in October 2004. In this division, the focus is placed on: 1) the study of the direct or secondary effects of KAATSU Training by prescribing it to patients with various medical disorders, and 2) to compare the effects of KAATSU Training with traditional rehabilitation methods. As with healthy individuals, patients with numerous medical disorders may benefit from KAATSU Training. KAATSU Training appears to stimulate endogenous hormonal responses including growth hormone, and direct improvements on some of the patients may also be observed. The 22nd Century Medical Center is an institution developed for the initiation of collaborative research between leading companies from industry and The University of Tokyo Hospital. It is hoped that participation in this project will further facilitate the recognition of the effectiveness and safety of KAATSU Training among medical field personnel.

As I mentioned initially, Japan is facing a major health care crisis as the number of older individuals requiring long-term nursing care increase. It is my hope that KAATSU Training may help alleviate the forthcoming financial and health care burden and bring a hopeful future to Japan.



Figure 5

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