AN IMAGERY INTERVENTION FOR HIGHLY SKILLED JUDO ATHLETES

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ABSTRACT

Perhaps one of the most widely researched intervention strategies to date has been the use of mental imagery. Findings from several previous studies support the benefit of conducting interventions aimed at teaching athletes the importance of using imagery, and how to effectively incorporate it into their regular training. However, research on imagery interventions with judo athletes is scarce. In addition, very few studies have focused on describing the learning process of the athletes during imagery interventions.

The main purpose of this study was to investigate the effect of an imagery intervention on highly skilled judo athletes` subsequent use of imagery and imagery ability. The intervention aimed at increasing the overall imagery ability and imagery use of the athletes, as well as to change their attitudes towards imagery training. In addition, this study aimed at describing the learning process of the athletes.

The study consisted of a pre-intervention assessment, an intervention phase and evaluation. Participants were 5 elite judo athletes, training at the Pajulahti Sport Institute, Finland. The intervention phase consisted of a lecture, 7 guided imagery training sessions, unsupervised imagery training and individual imagery training programs and lasted 8 weeks. The Sport Imagery Ability Measure was used to measure athletes´ imagery ability and the Sport Imagery Questionnaire was used to measure athletes´ use of imagery. Both instruments were used before and after the intervention. The athletes also recorded the frequency, duration, content, and effectiveness of their imagery use in an imagery-training diary. Finally, a post-intervention questionnaire was used to assess the athletes´ attitudes towards imagery training.

The imagery intervention resulted to an enhancement of the overall imagery ability of the athletes. In addition, results indicated that judo athletes used imagery more frequently after the 8-week imagery intervention than before the intervention. Regarding the patterns of imagery use, the use of cognitive specific imagery increased by all the athletes. An analysis of the post-intervention questionnaires revealed that after the intervention, the judo athletes believed the imagery training to be both valuable and effective.

Keywords: imagery, intervention, mental skill, training, judo, SIAM, SIQ

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1. INTRODUCTION

Applied sport psychology has grown and will continue to grow in the coming years. Much research has been done in order to help athletes and coaches to achieve their goals and the importance of mental skills for success in sport is generally accepted. When an athlete is skilful both physically and mentally, the result will be an exceptional performance (Weinberg & Gould, 2007). Perhaps one of the most widely researched and popular intervention strategies to date has been the use of mental imagery (Cumming, Hall & Shambrook, 2004). Through imagery, you can re-create previous positive experiences or picture new events to prepare yourself mentally for performance (Weinberg & Gould, 2007). Research has shown that in comparison to no practice at all, imagery usually benefits performance (Durand, Hall, & Haslam, 1997). As a result, Hall (2001) has suggested that imagery can serve as an effective supplement to regular physical practice and as a substitute for some amounts of physical practice when athletes are unable to train (Cumming et al., 2004).

Even though research has been intensive in this field, limited research attention has been placed in exact imagery training programs specific for each sport. This study focuses on the use of imagery in judo athletes. Judo is a very demanding sport, both physically and mentally. Mental toughness is a very important determinant of success for the judo athletes. However, there is a lack of literature concerning judo and mental training. The interest for this topic arose from the author's personal experiences in the sport as a competitive athlete and from the acknowledgment that there is a need for knowledge regarding how to use PST effectively in judo. My intention is that this study will manage to provide some useful guidelines to coaches or sport psychology specialists that want to apply imagery training in judo.

Because imagery cannot be directly observed, the two skills most regularly examined are "imagery ability" and "imagery use" (Morris, Spittle & Watt, 2005). Both terms have been developed in relation to their measurement. Research and applied work on imagery training

indicates that imagery abilities can be improved (Morris et al., 2005). In addition, recent studies support the benefit of conducting interventions with youth sport athletes aimed at teaching them the importance and value of using imagery, and how they can effectively incorporate imagery into their regular training (Li-Wei, Qi-Wei, Orlick, & Zitzelsberger, 1992; Cumming & Hall, 2002a; Cumming et al., 2004).

Another key issue in the use of sport imagery for enhancing performance is that imagery is most effective, when it is used for a specific purpose rather than in a random or non-directed fashion (Simons, 2000; Vealey & Greenleaf 2001, as cited in Morris et al., 2005). In addition, imagery is most effective, when its use and the athlete's needs are matched (Martin, Moritz & Hall, 1999; Munroe, Hall, Simms & Weinberg, 1998 as cited in Morris et al., 2005).

In light of these findings, this study was designed to examine the influence of an imagery intervention on judo athletes' imagery ability and imagery use, as well as to describe and understand the learning process of the athletes. The imagery intervention was tailored to meet the individual needs of the athletes. It was hypothesized that the intervention would lead to an overall increase in imagery use, and more structured and regular imagery practice. In addition, it would lead to an overall enhancement of imagery ability.

2. IMAGERY

2.1 Definition

Defining mental imagery is a difficult task. Consequently, extensive debate about its characteristics and qualities continues both within and between the various fields of psychology (Morris et al., 2005). There exist various definitions of imagery in the literature. However, in relation to involvement in sport, the most widely used definition is the one provided by Morris et al. (2005).

> *Imagery, in the context of sport, may be considered as the creation or re-creation of an experience generated from memorial information, involving quasi-sensorial, quasi-perceptual, and quasi-affective characteristics, that is under the volitional control of the imager, and which may occur in the absence of the real stimulus antecedents normally associated with the actual experience.*

Morris et al. (2005) formulated this definition, by compiling specific elements of relevance from the definitions of Richardson (1969), Denis (1985) and Suinn (1993). The key elements of these definitions are presented in table 1.

Table 1

Key elements of the definitions of Richardson, Denis and Suinn

Author	Definition
Richardson (1969)	Imagery is described as a self-conscious awareness of quasi-sensory and quasi-perceptual experiences under conditions where the actual stimuli that produce the real sensorial and perceptual experiences are absent.
Denis (1985)	The dynamic and creative properties of images are highlighted. Imagery is defined as a psychological activity that evokes the physiological characteristics of an object, person, or place that is, either permanently or temporarily, absent from our perception.
Suinn (1993)	Imagery rehearsal is considered to be a covert activity whereby a person experiences the sensory motor sensations that reintegrate reality experiences, and includes neuromuscular physiological and emotional involvement.

2.2 Theories proposed to explain how imagery works

A number of theories have been proposed to explain how imagery works. These include the psychoneuromuscular theory (Jacobson 1931), the symbolic learning theory (Sackett 1934), Lang's (1977, 1979) bioinformational theory and the attention arousal set (Schmidt, 1982) (see Morris et al, 2005 for a review of all theories).

According to the psychoneuromuscular theory, imagery innervates the muscles as if one were actually practicing the movement. For example, when imagining the flexion of the knee, action potentials in the hamstring muscle occur. The slight neuromuscular impulses are identical to those produced when actually performing the movement, but they are reduced in magnitude (Hardy, Jones and Gould, 1997.)

Sacketts´ symbolic learning theory suggests that imagery may function as a coding system to help people understand and acquire movement patterns. One way individuals learn skills is by becoming familiar with what needs to be done to successfully perform them. When an individual creates a motor program in the central nervous system, a mental blue print is formed for successfully completing the movement (Weinberg & Gould, 2007). For example, a judo athlete can use imagery to rehearse a throwing technique. This will help the athlete to master the technique or correct mistakes and to perform it successfully in a competition fight, where there is not enough time for thinking.

Bio-informational theory is based on the assumption that an image is a functionally organised set of propositions stored by the brain. The model holds that a description of an image consists of two main types of statements: response propositions and stimulus propositions. Stimulus propositions are statements that describe specific stimulus features of the scenario to be imagined. Response propositions, on the other hand, are statements that describe the imager's response to the particular scenario, and they are designed to produce physiological activity (Weinberg & Gould, 2007). For example, a judo athlete before a major competition might imagine the crowd, the opponent and the people sitting or standing on the sidelines (stimulus proposition). The response to this scene would be

having the judo athlete to feel the excitement, arousal and all the emotions and bodily symptoms associated with the competition (response proposition).

Although, not full-blown theory, a psychological explanation that has been put forth to explain the effects of imagery is the notion of attention-arousal set theory. It argues that imagery functions as a preparatory set that assists in achieving an optimal arousal level. This optimal level of arousal allows the performer to focus on task-relevant cues and screen out task-irrelevant cues (Weinberg & Gould, 2007).

2.3 Measurement

Because imagery cannot be directly observed, assessing it presents a problem similar to those of many other mental processes in psychology (Perry & Morris, 1985; as cited in Morris et al., 2005). The two skills most regularly examined in the context of sport are imagery ability and imagery use (Morris et al., 2005). Both "imagery ability" and "imagery use" are terms that have been developed in relation to their measurement. Below follows a discussion of their definitions, conceptualizations developed in relation to sport, their measurement, as well as findings from previous research.

2.3.1 Imagery ability

"Imagery ability" refers to the self-reported assessment of the qualities of imagery. All people have the capacity to generate and use images but not in the same degree. Morris (1997) defined imagery ability as "an individual's capability of forming vivid, controllable images and retaining them for sufficient time to effect the desired imagery rehearsal". More recently, Watt, Spittle and Morris (2002) stated that "imagery ability represents the capacity of the individual to create images, and is typically evaluated in terms of generational, sensorial and emotional qualities".

Watt and Morris, based on their research using the Sport Imagery Ability Measure (SIAM), have formulated a model of imagery ability in relation to sport (Watt, Morris, and Andersen, 2004). The basic model constitutes a three-tier framework, with a general imagery-ability factor leading to image generation, feeling, and single-sense factors, and a

third stage that details individual dimensions, sense modality, and emotion characteristics. The third-stage characteristics include the image-generation components of vividness, control, duration, ease, and speed in combination with the visual sense modality. The preceding characteristics represent a latent factor formulated on the propositions that visual images may create the base from which to evaluate the dimensional qualities of sport imagery. Two more latent factors, the SIAM´s tactile, kinesthetic, and emotion subscale and auditory, olfactory and gustatory subscales, formed the rest of the model's basis. The second latent factor represents those images associated with diffuse body-feeling states. The third represents the nonvisual senses associated with somatic type sensory organs. This grouping of variables represents imagery characteristics that appeared to have the strongest conceptual clarity according to analyses of data from a wide age range, both genders, several cultural groups and a broad set of performance levels and sport activities.

Imagery literature uses many terms to describe the characteristics that measures of imagery ability assess. The terms "modalities" and "dimensions" are discussed in many studies and reviews. There exist several dimensions in the imagery literature that are relevant to an understanding of the nature of imagery ability in the context of the physical and sport domains. However, those that are relevant to the present study are the dimensions of vividness, controllability, duration, ease of generation, speed of formation and perspective.

The two dimensions of imagery ability that are most regularly discussed are those of vividness and controllability (Morris et al., 2005). As cited in Morris et al., (2005), Moran (1993) described vividness of an image, as "its clarity and sharpness or sensory richness". The term "controllability" describes the "ease of accuracy with which an image can be transformed or manipulated in one's mind" (Moran, 1993). Duration is represented by the amount of time an image is clearly maintained in the mind from its initial generation until it disappears (Denis, 1985). The dimension of ease of generation represents the level of ease or difficulty in evoking an image (Hall et al., 1985; Tower, 1981; as cited in Morris et al, 2005). The speed of formation of an image is a dimension that warrants investigation in determining the status of imagery skills. Currently, only limited research and analytic discussion of the imagery process proposes the assessment of this attribute (Watt et al,

2004). However, it is contend that speed of image generation represents a qualitative dimension that provides valuable evidence of imagery ability. Several researchers have reported that examining the imagery perspective is important in understanding imagery ability. Perspective can be external (third person), as if watching oneself in video, or internal (first person), which involves experiencing the image as if in one's own body (Mahoney and Avener, 1977).

Many authors have highlighted the need to involve all the senses (modalities) when using imagery rather than using only the visual modality. The assessment of imagery ability, should, therefore incorporate a range of sensory modalities, which may include visual, auditory, kinesthetic, olfactory, tactile and gustatory senses (Morris et al., 2005). According to Suinn (1993), another characteristic that could be included as a component of imagery ability is the experience of emotion. Vaeley and Greenleaf (1998) suggested that in re-creating outstanding performance "athletes should feel the emotions associated with those experiences". Based on the emphasis that several authors have placed on involving emotions in sport imagery, this characteristic is an appropriate variable to include in measuring imagery ability (Morris et al., 2005).

If imagery training is to be maximally effective, practitioners need to establish an understanding of the athlete´s ability to imagine. It seems that virtually everyone has the abilities to form and use images, but as with most skills, that ability varies between individuals (Hall, 1998). In the practical application of imagery, the assessment of an athlete´s imagery ability is a key component of developing and implementing an effective imagery rehearsal program (Janssen & Sheikh, 1994).

Interest in the area of imagery ability has prompted the development of a variety of assessment devices (see Morris et al., 2005 for a review of the existing measures). In this study, the Sport Imagery Ability Measure (SIAM) developed by Watt & Morris (1998a, b; as cited in Morris et al., 2005) was used to assess the imagery ability of the judo athletes (see "Measures" section). It was selected because based to previous research findings, it appears suitable for use in assessing sport imagery ability in both research and applied

settings (Moris et al., 2005). The SIAM has been adapted into the Finnish language (Elfving & Riches, 2002).

Research and applied work indicates that imagery abilities can be improved (Watt et al., 2002). Several studies examining the acquisition of motor skills have found that individuals with higher imagery ability are better able to learn, retain, and reacquire skills (Goss, Hall, Buckolz, & Fishbourne, 1986; see Hall, 1998; Murphy & Martin, 2002 for reviews). Moreover, imagery ability also seems to be related to other aspects of performance, such as state sport confidence (Mortiz, Hall, Martin, & Vadocz, 1996). Although research has not directly examined whether imagery ability is related to frequency of imagery use, Cumming and Ste-Marie (2001) found that figure skaters reported an increase in both imagery ability and imagery frequency following an intervention program suggesting that a relationship may exist between these two variables.

2.3.2 Imagery use

Regarding imagery use, as cited in Morris et al. (2005), Hall, Spittle and Morris (2002) proposed a simple definition: "Imagery use is the manner in which people image themselves in ways that can lead to learning and developing skills and can facilitate performance of those skills. It is normally assessed in terms of its cognitive and motivational attributes".

Various conceptualizations have been developed specifically in relation to sport imagery. A framework of greatest conceptual viability is Paivio´s (1985) Applied Model of Imagery Use in Sport (AMIUS). Paivio´s framework is essentially a 2 x 2 factor model, in which imagery plays a motivational role and a cognitive role at a general or specific level (Morris et al., 2005). From this model derived four categories of imagery: cognitive general (CG), cognitive specific (CG), motivational general (MG) and motivational specific (MS). Martin, Moritz & Hall (1999), summarized and extended the original four Paivio categories into:

a) Cognitive general (CG) - It involves images of strategy and game plans related

to a competitive event. Examples could include employing a serve-and-volley strategy in tennis or a quick-break play in basketball.

b) Cognitive specific (CS) - Imagery directed toward skill development or production. This involves seeing yourself perform specific skills, such as a tennis serve, golf putt or triple-toe-loop in figure skating. If learning and performance are the desired outcomes, evidence suggests that CS imagery will be the most effective choice

c) Motivational general arousal (MG-A) – Imagery related to arousal, relaxation, and competitive anxiety. There is good evidence to suggest that MG-A imagery can influence heart rate - one index of arousal - and can be employed as a 'psych-up' strategy.

d) Motivational general mastery (MG-M) – Imagery representative off effective coping and confidence in challenging situations. It is based on seeing yourself coping in difficult circumstances and mastering challenging situations. It might include maintaining a positive focus while behind, and then coming back to win. MG-M imagery appears to be important in developing expectations of success and self-confidence.

e) Motivational specific (MS) – Imagery that represents specific goals and goal-oriented behaviour. It involves seeing yourself winning an event, receiving a trophy or medal and being congratulated by other athletes. MS imagery may boost motivation and effort during training and facilitate goal-setting, but is unlikely on its own to lead directly to performance benefits.

More recently, Munroe, Giacobbi, Hall & Weinberg (2000) presented a simple framework that categorizes key athletes of how athletes incorporate imagery into their involvement in sport. They proposed that responding to the following four questions a broader

understanding of sport imagery might be acquired: Where is imagery used? When is imagery used? Why is imagery used? and What is being imaged? Hence, the "four Ws". Where relates to the context of imagery use within training and performance activities, with recent evidence indicating that athletes employ imagery in the competition environment more regularly than in the practice situation (Munroe et al. 2000). When refers to the timing of imagery use. This is determined in relation to scheduling factors, such as within or outside of physical practice or training time; before, during, or after competition; or as a component of rehabilitation. Why represents the functional aspects of imagery use. Munroe et al. (2000) have incorporated the Martin et al. (1999) cognitive and motivational structure of imagery use as a representation of the functional aspects relating to why athletes image. What athletes' image constitutes the most detailed element of the Munroe et al. model. They proposed that a content- and qualitative-based structure of sport imagery most appropriately represents the "what" of imagery use. The six key categories of content include sessions, effectiveness, nature of imagery, surroundings, type of imagery, and controllability. Subcategories relate more to specific qualitative and processing aspects of imagery, such as sensory involvement, image generation, image manipulation, emotional stage and perspective.

Questionnaires, interviews and anecdotal reports have been used for the examination of the use of imagery by athletes (see Morris et al, 2005 for a review of the existing measures). One test of imagery use, regularly used in research and applied areas is the Sport Imagery Questionnaire (SIQ). The SIQ was developed by Hall, Mack, Paivio, and Hausenblas (1998) as a general instrument to examine the cognitive and motivational functions of imagery (see "Measures" section). The SIQ was used in the present investigation to measure the judo athletes` imagery use.

Findings from several studies support the benefit of conducting interventions with athletes aimed at teaching them the importance and value of using imagery, and how they can effectively incorporate imagery into their regular training. In addition, previous studies, have shown increases in imagery use following intervention programs of lengths varying from 5 to 16 weeks (e.g., Cumming & Ste-Marie, 2001; Rodgers, et al., 1991), or even

interventions as short as a workshop (Cumming et al., 2004).

Cumming et al. (2004) examined the influence of a mental imagery workshop on female basketball players` subsequent use of imagery. The SIQ and an imagery diary were used as self-report measures to assess patterns of imagery use over a six-week period following the workshop. Results revealed that the basketball players significantly increased their imagery use for the 6-week period following the workshop, and that the basketball players believed the imagery training to be both valuable and effective.

In addition, a study retrospectively examining patterns of imagery use across athletes' careers showed that more elite athletes could be distinguished from their recreational counterparts by their amount of imagery practiced six years into their careers (Cumming & Hall, 2002a).

Another research with children aged 7 to 10 found improvements in the accuracy and technical quality of tennis table shots for those in a mental imagery training group as compared to those in a video observation group or a control group (Li-Wei, Qi-Wei, Orlick, & Zitzelsberger, 1992).

Limited research has examined why athletes are motivated to engage in imagery. Several recent studies, however, have adopted an achievement goal approach to study this issue and have found that differences in frequency of imagery use can be explained by understanding the athlete's profile of task and ego goal orientations (Cumming, Hall, Gammage, & Harwood, 2002; Harwood, Cumming, & Hall, 2003). These studies have found that athletes will be more likely to invest efforts in performing imagery when their motivational profile consists of moderate to high levels of task and ego orientation.

2.4 Applications of imagery

One of the most appealing aspects of imagery is that it is an extremely versatile technique that can be applied to a wide range of situations in sport and exercise. Its application is limited only by the imaginations of athletes, coaches, and sport psychologists. Perhaps this

is one of the reasons why imagery is reported to be one of the most commonly used psychological tools in sport and exercise (Morris et al., 2005). However, imagery is most effective, when it is used for a specific purpose rather than in a random or non-directed fashion (Simons, 2000; Vealey & Greenleaf 2001, as cited in Morris et al., 2005) and when its use and the athlete´s need are matched (Martin et al., 1999; Munroe et al., 1998 as cited in Morris et al., 2005). Systematic, well-structured, and specific imagery use is the most effective application of imagery in sport (Morris et al., 2005).

Numerous methods for application of imagery are presented in the literature. Research on imagery use in sport has suggested that athletes use imagery for cognitive and motivational functions (Hall, 2001 as cited in Morris et al., 2005). According to Morris et al. (2005), some of the potential uses of imagery in sport are categorized as:

a) Skill learning and practice – It is one of the most common uses of imagery. It includes skill learning or acquisition, skill practice, error detection and correction. Sometimes imagery used in this fashion is referred to as imagery rehearsal or cognitive specific imagery. Using imagery in this way allows athletes to learn and maintain technical skills for their sport.

b) Tactical and game skills – It includes strategy development, strategy learning, strategy practice and problem solving. Using imagery in this way allows athletes to develop or create new strategies, or to develop game plans to combat specific opponents before getting to the competition. Once new strategies have been created, athletes can use imagery to rehearse them in attempt to learn them before competition. In addition, this form of imagery can be used to review performance or detect and correct errors. For example, players who have problems with technique, strategy or psychological skills might use imagery to imagine when they were performing at their best and compare this to their current performance to find the factors causing the slump.

c) Competition and performance – Athletes can also use imagery to get themselves

ready for a particular competition or to reflect on a competition when it is over. This form of imagery includes familiarization of competition sites, mental warm-up, pre-performance routine, preview and review.

d) Psychological skills – Imagery can also influence an athlete's psychological state. It can enhance psychological skills such as concentration, confidence, motivation and anxiety control. Specifically, this form of imagery includes managing arousal/anxiety and stress control, improving concentration and attention, increasing self-awareness, building confidence and self-efficacy, increasing motivation, controlling psychophysiological response, developing interpersonal skills.

e) Recovery from injury or heavy training – Because imagery is a mental activity and is not associated with physical movement, it has uses associated with injury and heavy training. This form of imagery includes coping with pain and injury, dealing with long-term injury, recovering from injury or heavy training. Aside from allowing athletes to work on technical, tactical, and psychological skills when they can't or shouldn't physically practice, it may also help them cope with and recover from injury.

3. EMOTIONAL PROFILING

Emotions are an essential part of sporting activity. To perform well, the athlete needs specific emotions with specific intensities. According to Syrjä (2000), the roots of the emotion research connected to highly demanding human performance can be tracked back to period of World War II and several theoretical orientations have been introduced to describe the relationship between emotions and athletic performance. Perhaps one of the most widely used frameworks during the recent years, has been the Individual Zones of Optimal Functioning (IZOF) model (Hanin, 2000, 2003). The IZOF is a multidimensional model. It includes five basic dimensions as a foundation for the systems description of performance psychobiosocial states and emotion-performance relationships: form, content, intensity, time and context.

The form dimension includes seven basic components of total human functioning that provide a relatively complete description of performance state: *cognitive*, *affective*, and *motivational* components represent psychological aspects of a state; *bodily-somatic* and *motor behavioral* components represent biological or psychophysiological aspects; and performance and communicative components reflect a person´s observable social interactions with the environment. The seven components constitute the person´s psychobiosocial performance-related state, providing a framework for describing the factors affecting individual performance.

The content dimension is a qualitative characteristic of the performance state. It is conceptualised within the framework of two closely related but independent factors. The first factor concerns the distinction between positive, pleasant and negative unpleasant emotions. The second regards the harmful effect of emotions upon human behaviour, which are conceptualised to be either optimal or dysfunctional. Using these independent factors (positive-negative and optimal-dysfunctional), four emotion categories have been proposed for the systematic analysis of individually relevant emotional experiences related to successful and unsuccessful performance. The four emotion categories are:
    a) positive, pleasant, and helpful, optimal emotions (P+);

b) negative, unpleasant, and helpful, optimal emotions (N+);

c) positive, pleasant, and harmful, dysfunctional, emotions (P-);

d) negative, unpleasant, and harmful, dysfunctional, emotions (N-).

The intensity dimension is a quantitative characteristic of affect or any other modality of psychobiosocial state. The IZOF model conceptualizes the intensity dimension at the individual level using the in-out of the zone notion. The concept of in-out of the zone has been proposed as an individual criterion for describing and predicting the emotion-performance relationship. The principle assumes that the current emotion intensity is not so critical for performance as the distance between the current intensity and individually optimal or dysfunctional zones. The in-out of the zone principle was proposed to describe separate or joint effects of both positive and negative emotions consisting of the four emotion categories (see above). The effect of emotion in performance is described by identifying for each athlete his/her individually relevant helpful emotions (P+ and N+) and their optimal zones related to successful performance and his/her individually relevant harmful emotions (P- and N-) and their dysfunctional zones related to unsuccessful performance. The P+ and N+ emotions and their optimal zones are assumed to indicate the highest probability of successful performance, whereas the P- and N- emotions and their dysfunctional zones are predicted to indicate the highest probability of poor performance.

The time dimension reflects the dynamics of emotional experiences before, during, and after performance of a single or repeated short- or long-duration task. Finally, the context dimension is an environmental characteristic including situational (practices vs. competitions), interpersonal, and intragroup antecedents or consequences that determine emotion intensity and content.

In the present study, emotional profiling was combined with imagery training. Emotional profiles are widely used in research and applied work to control emotions and increase self-awareness. As described above, imagery can also be used for managing arousal, controlling emotions and increasing self-awareness (see "Applications of imagery" section). However, to date there exist no previous studies that combined emotional profiling and imagery. In

this investigation, emotional profiles were drawn for all the participants following the method suggested within the IZOF model. The emotional profiles were used to create imagery scripts for emotion control (see "Individual imagery training programs" in "Results" section).

4. PSYCHOLOGICAL ANALYSIS OF JUDO

4.1 Judo as a sport

Judo has its roots to the fighting system of feudal Japan, when the ruling class consisted of samurai and shoguns. Founded in 1882 by Dr. Jigoro Kano, it is a refinement of the ancient martial art of jiu jitsu. During the Meiji era (1868-1912), judo became the first Japanese sport introduced in physical education in schools. It´s foundation and philosophy retained the original martial art methods of training to develop martial skills and character. It also maintained the ethical codes instilled in the samurai warriors of the past.

Within the samurai´s training system, one mistake could lead to death. Same spirit was attempted to be preserved in modern judo. Small lose of concentration, small carelessness or wrong attitude can mean a defeat and wasting of hard work. Judoka means to tolerate failures and being able to start after this. One of the basic demands of judo is that you have to cope with the unpleasant feeling that things are not going good. In addition, you need to be able to remain focused under lot of pressure and tiredness (Fagerlund, 1983.)

4.2 Judo training

According to Kano (1986), there are two primary methods of judo training: "kata" and "rantori". *Kata, which means "form",* is a system of prearranged movements that teach the fundamentals of attack and defence. *Rantori* means "free practice". Partners pair off and fight with each other as they would in an actual match. The objective of this systematic physical training is to perfect control over mind and body and to prepare a person to meet any emergency or attack (Kano, 1986). According to Kano (1986), both kata and rantori are forms of mental training. Especially in rantori, one must search out the opponent´s weaknesses and be ready to attack with all the resources at his disposal the moment the opportunity presents itself, without violating the rules of judo.

> *"Practicing randori tends to make the athlete earnest, sincere, thoughtful, cautious and deliberate in action. At the same time, the athlete learns to value and make quick decisions and to act promptly, for, whether attacking or defending, there is no place in randori for indecisiveness". (Kano, 1986)*

In addition, judo is a technical and tactical sport. Judo training needs patience and commitment. The technical skills develop slowly and progress is difficult to measure. Almost without exceptions, even the most skilful person needs ten years to accomplish international success. Peak age for the competitive judokas is 25-30 years old (Fagerlund, 1983). Judo needs dedication and hard work. For many athletes it becomes a lifestyle and it is believed that if you cannot give to judo this position in your life you need to forget being a champion (Fagerlund, 1983).

"Judo is more than an art of attack and defence. It is a way of life" (Kano, 1986)

4.3 Philosophy of judo

Rules and regulations come from the Japanese culture. Jigoro Kano, the founder of Judo, was a pedagogist and his philosophy is still being preserved in judo. The most important aspects of his philosophy were the principles of "maximum efficiency" and "mutual prosperity". These principles should be followed from the judo athletes, not only in their sport but also in their lives. According to the principle of "maximum efficiency":

"one´s mental and physical energy must be used most effectively in order to achieve a certain goal... One must apply the most effective method or technique for using the mind and body.... You must put your mental and physical energy to work in the most effective manner" (Kano, 2005)

The principle of "mutual prosperity" expresses the collectivistic nature of the Japanese culture. Even if judo is individual sport, athletes work together to develop each other. In contrast with other individual sports, in judo you cannot train alone.

4.4 The nature of competition

A necessity for the development of specific mental skills rises from the nature of the sport and the nature of the competition. On the competition day, the athletes need to wait for several hours until their turn to compete comes. During these hours, they are just watching the athletes from the other weight categories competing and they have to find a way to cope with their stress. When the time comes for their weight category, they need to fight not once, but several times, depending on the number of the athletes in the category. Each fight

will last from some seconds to a maximum of five minutes and then they need to wait again until the next fight. During this time, their psychology is usually affected by the results of their previous performance. Their emotional state will change many times during the day. Jigoro Kano, in his writings, had many times referred to the importance of control of emotions in judo.

> *"Judo teaches us to look for the best possible course of action, whatever the individual circumstances, and help us to understand that worry is a waste of energy. Paradoxically, the man who has failed and one who is at peak of success are in exactly the same position. Each must decide what he will do next, choose the course that will lead him to the future. The teachings of judo give each the same potential for success, in the former instance guiding a man out of lethargy and disappointment to a state of vigorous activity.....If we let ourselves be carried away by success, defeat will inevitably follow victory. One should always be prepared for a contest, even the moment after scoring a victory." (Kano, 1986)*

In addition, judo athletes before competition have to cope with the stress of reducing or controlling weight. The level of this stress sometimes is even higher than the stress of the actual performance. From the above characteristics of the sport and its competitive nature, arise the necessity of the development of PST programs that will help the competitors to prepare mentally for performance and control their pre-competition anxiety.

Even though there is not much knowledge of mental training skills programs specific for this sport, the importance of the psychological preparation is widely accepted by all judo athletes and coaches. As previously stated, this paper aims to provide some useful information to coaches and sport psychology specialist that want to apply PST in judo.

Only few published studies that include imagery interventions for martial art athletes, exist in the literature. Weinberg, Seaboume, and Jackson (1981), investigated whether imagery combined with relaxation (VMBR) is more effective in facilitating karate performance than either imagery or relaxation alone. In addition to the research studies, some papers exist in

the literature that discuss the application of imagery in martial arts. The use of imagery and other psychological training techniques is reported in Karate. Galloway (2006), applied traditional sport psychology techniques in sport Karate, which included: goal setting, self-talk, imagery, arousal control and how to relate these skills to IZOF. In addition, some publications report the use of imagery in Mixed Martial Arts (Lajcik, 2008). Kozuma (2009) worked for several years as a sport psychologist for the Japanese judo national team and he implemented various interventions that included basic psychological skills, such as goal setting, relaxation, psyching up, imagery, concentration, positive thinking, self-talk and mental preparation for competition. However, there are no research studies published that include imagery interventions for judo athletes.

5. PURPOSE OF THE STUDY

5.1 Aims of the present study

The aim of the present investigation was to examine the effects of an imagery intervention on the imagery ability and subsequent use of imagery of skilled judo athletes. In addition, there are very few studies on imagery that discuss in depth the learning process of the athletes. Thus, this study aimed at describing the learning process of the judo athletes during the intervention.

5.2 Aims of the intervention

Following the aims of the study, we set the goals of the imagery intervention. The first goal was to increase each athlete's subsequent use of imagery. The second goal was to enhance their imagery ability. The third goal of the intervention was to affect the athletes' attitudes towards imagery training.

It was hypothesized that the intervention would lead to an overall increase in imagery use, and more structured and regular imagery practice. In addition, it would lead to an overall enhancement of imagery ability.

5.3 Research questions

Following the above mentioned aims, the study examined four key problems: a) learning process and adherence to the intervention, b) imagery ability, c) imagery use, and d) attitudes towards imagery training. The following specific research questions were formulated.

    a. Learning process and adherence to the intervention
        i. Does the adherence of the athletes improve when imagery training is structured and individualized compared to when imagery training is non-directed and unstructured?
    b. Imagery ability
        i. Does imagery ability improve after an 8-week imagery intervention?

      ii. What are the changes in the athletes´ components of imagery ability after an 8-week imagery intervention?

c. Imagery use

      i. Is an 8-week imagery intervention effective in increasing the athletes´ subsequent use of imagery?

      ii. What type of imagery highly skilled judo athletes use most frequently?

      iii. Which are the changes in the patterns of imagery use after an 8-week imagery intervention?

d. Attitudes towards imagery training

      i. What is the effect of the intervention on the athletes' perceptions of the values of imagery training?

6. METHODS

This study followed the action-oriented research model. According to Patton (2002), action research aims at solving specific problems within a program, organization, or community. The research methods tend to be less systematic, more informal, and quite specific to the problem, people, and organization for which the research is undertaken. It focuses on specific programs at specific points in time. There is no intention, typically, to generalize beyond those specific settings. In action research, design and data collection tend to be more informal, the people in the situation are often directly involved in gathering the information and then studying themselves, and the results are used internally to attack specific problems within a program, organisation, or community. The present investigation used both quantitative and qualitative methods. This strategy is called triangulation. *Triangulation* strengthens a study by combining methods (Patton, 2002).

6.1 Participants

Participants were 5 judo athletes (4 males, 1 female), recruited from a Sport Institute located in Pajulahti, Finland. These athletes had a mean of age of 21 ±1, 58 years and an average of 11 ±1, 74 years of experience. Pajulahti Sport Institute was chosen because it is a high performance center and top-level athletes are training there. We can state that the sampling method was *critical case sampling* because the athletes that participated in the study were elite and they had achieved good results both nationally and internationally. They had been selected to study in the Pajulahti Training Institute because they were among the most promising young Finnish judo athletes. In addition, the fact that the athletes were living, studying and training in the Sport Institute, made scheduling of the intervention easier. It needs to be noted that in the beginning of the study, all judo athletes that were studying in the Sport Institute (n=7), volunteered to participate. However, two of them did not complete the intervention project due to problems in their schedule. These two athletes were still high school students (in contrast with the rest of the athletes that had finished the high school) and their courses were many times overlapping with the schedule of the intervention project. Thus, only 5 athletes were studied.

6.2 Measures

As stated above, this study used both quantitative and qualitative methods. Below follows a description of all the measures used.

Observational data. The aim of the observations in the specific study was to get familiar with the training environment, the training routines of the athletes, the coaching style, the athletes and their performance level. All this information was useful in order to build the trust with the team and to plan suitable imagery training sessions, in a way that they would fit to their training program and routines. The observations took place during their morning trainings (the athletes where training twice per day). One to two training sessions were observed every week in both, the pre-intervention and intervention phase. The role of the observer was onlooker/ spectator (not participant), thus the outsider (etic) perspective was used. The athletes were aware that they were observed (disclosure of the observer's role to others), however they were not informed of the exact focus of the observation.

Researcher´s logbook. Handwritten notes were kept from the researcher in a logbook (32 pages). These notes included information from the observations and the guided imagery sessions, as well as from unofficial conversations with the athletes and the coach. The events were organized on a time line and presented in the form of narrative to describe the process of imagery intervention.

Individual interviews. The general interview guide approach (or semi-structured interviewing) was used in the pre-intervention phase. The interviews took place in a classroom at the Pajulahti Training Institute, lasting 45 minutes approximately. The interviewer was alone with the interviewee, except of one case that the athlete was not comfortable with the English language and he asked his coach to serve as interpreter. The topics included in the interview guide were:

> 1) Demographic data – name, age, training age, competitive level
>
> 2) Mental skills training background - athlete's knowledge on mental training, previous experiences on mental training, expectations from this intervention, perceived mental strengths and weaknesses

3) Stambulova´s (2007) 5-step strategy:

Step 1: Make a framework

- Draw a life/time line and mark your birth (e.g., the year) as an initial point in the left
- Mark your current age (or year) as the second point on the line.
- Now you have a framework: the past, the present and the future.

Step 2: Structure the past

- Describe the most important events in sport career and mark them on the lifeline.

Step 3: Structure the present

- What are the most important parts of your life right now?
- Rank these parts of life in regard of: (a) their importance for you, (b) time spend, (c) stress level.

Step 4: Structure the future

- What are the most important events you can/wish to expect in the future (during the whole life, during the next 10 years, during the next year etc.)?

Step 5: Bridge your past, present and future

- What were the most important sport events in your career and how did you cope in them?
- What do you need to do today to reach your future goals? Can you do anything to develop readiness to the coming events/demands/ challenges?

Imagery diary. A diary was used as a self-report measure of imagery use over the intervention period (appendix 1). In this diary, the athletes were asked to report information pertaining to the date, time, location and duration of their imagery sessions. They were also asked to rate from 1 to 4, how vivid and controllable were their images. In addition, they were asked to report which perspective they were using during each imagery session.

Post-intervention questionnaire. At the conclusion of the study, the athletes were asked to respond some questions pertaining the mental imagery. In the first section of the

questionnaire (appendix 2), the athletes were asked if the imagery training was beneficial for their judo performance, and in what way. In the second part of the questionnaire, the athletes were asked to describe any difficulties that the may had encountered when they were performing mental imagery. In the third and final part of the questionnaire, the athletes were asked if they were planning on using mental imagery in the future. If they responded by saying yes, the athletes were asked to describe how they plan to use imagery in the future, and if they responded by saying no, they were asked to comment on why they would not.

The *Sport Imagery Questionnaire* (Hall et al., 1998) is a 30-item self-report questionnaire that evaluates the cognitive and motivational functions of imagery (table 2). It is an instrument with five subscales: cognitive general imagery (CG), cognitive specific imagery (CS), motivation general-mastery imagery (MG-M), motivation general-arousal imagery (MG-A), and motivation specific imagery (MS). The athletes are asked to rate the items on a response scale, ranging from 1 (rarely) to 7 (often).

Table 2

Sample of items from the SIQ

Example of item	Function of imagery
I make new strategies in my head	CG
I can consistently control the image of physical skill	CS
I image other athletes congratulating me on a good performance	MS
I image giving 100% during an event or game	MG-M
can re-create in my head the emotions I feel before I compete	MG-A

Hall et al. (1998) reported that internal consistencies for each subscale were acceptable, with alpha coefficients greater than .7 for all subscales and all items loaded on their appropriate factor (criterion level > .40). In the present investigation, the Finnish version of the SIQ (Watt, Jakkola and Morris, 2006) was used to assess the athletes' patterns of imagery use, before and after the intervention. Watt et al. (2006) have reported satisfactory

psychometric properties for the SIQ. Subscales demonstrate an acceptable internal consistency with moderate to very good coefficients, ranging from .64 to .83.

Sport Imagery Ability Measure. The SIAM was developed by Watt & Morris (1999; as cited in Moris et al., 2005) and it is a task-oriented, multi-modal, multi-dimensional test designed to assess self-reported imagery ability related to sport. It uses four sport related scenes to measure five dimensions of imagery: vividness, controllability, ease of generation, speed of generation, and length of time the image is held (duration). It is also designed to measure six sense modalities: visual, auditory, kinesthetic, olfactory, gustatory, and tactile. In addition, the SIAM includes a measure of emotion. Participants imagine each scene for 60 seconds. After imagining each scene, participants are instructed to make their responses on 10 cm visual analogue scales. Each 10 cm line separates two opposing anchor statements (for example, "no feeling" and "very clear feeling" for the tactile modality). The test comprises 48 items. Twelve subscale scores are calculated by adding together the relevant dimensions or sensory-item scores for the four scenes. As cited in Moris et al. (2005), the Gronbach´s alpha values for the SIAM indicated good to very good internal consistency with coefficients ranging from .66 (speed subscale) to .87 (gustatory subscale). The Finnish version of the SIAM (Elfving & Riches, 2002) was used in the present investigation, in order to measure the athletes´ imagery ability, before and after the intervention. For the purposes of this study, the sport related scenes were adapted to the context of judo (see appendix 3).

Individualized emotion profiling procedure. Performance related emotional experiences were measured using the individualized emotion profiling procedure. The procedure, introduced within the framework of the IZOF model (Hanin, 2000, 2003, 2007), is an individual-orientated and task-specific measure that identifies: (a) individually relevant emotion content, (b) individually optimal and dysfunctional emotion intensity, (c) individually relevant context and (d) the interaction effects of optimal and dysfunctional emotions. A stimulus list of emotion descriptions is provided to help athletes in generating emotion descriptors. The intensity of each athlete-generated emotion descriptor is then measured on a modified version of the Borg´s Category Ratio (CR-10) scale. Reliability

scores for idiosyncratic emotion scales ranging from .54 to .90 have been reported in soccer players (Hanin & Syrjä, 1996). In the present study, the Finnish version of the list of emotion descriptions was used (Syrjä, 2000). The Finnish version of the list is dichotomized into positive and negative adjectives. The list of positive adjectives is consisted from 15 groups of words (in total 41 words) and the list of negative adjectives is consisted from 14 groups of words (in total 37 words). The stimulus list of emotion descriptions was utilized in the identification of the performance-related emotion content. This was done by asking the athlete to recall his past experience of judo competition (best and worst competition fights) and to select from the stimulus list (or add his own words) four to five:

a) positive adjectives which best describe his emotions either prior to or during (or both) a typical successful performance (P+)

b) negative adjectives which best describe his emotions either prior to or during (or both) a typical successful performance (N+)

c) positive adjectives which best describe his emotions either prior to or during (or both) a typical unsuccessful performance (P-)

d) negative adjectives which best describe his emotions either prior to or during (or both) a typical unsuccessful performance (N-)

After the individually relevant emotion descriptions were selected, the athletes were requested to identify a typical level of intensity in successful and unsuccessful performance. Using the Borg´s scale, the athletes were asked to identify:

a) for each helpful positive and negative emotion, the optimal zone indicating the level of intensity in a typical successful performance; and

b) for each harmful positive and negative emotion, the dysfunctional zone indicating the level of intensity in a typical unsuccessful performance.

This procedure has been succesfully used to examine performance related states in skilled Karate athletes (Ruiz & Hanin, 2004a, 2004b). As an example, one athlete´s emotion profile is presented in Table 3 and Figure 2 ("Results" section). In the present study, the emotion profiles were used for the development of imagery scripts aiming at enhancing self-awareness and control of emotions (see "Results" section).

6.3 Research Design and Procedure

As previously stated, the present investigation combines quantitative and qualitative methods (triangulation). The form mixed was: naturalistic inquiry (qualitative design), qualitative and quantitative data, statistical and content analysis. The study was separated in three distinct phases (pre-intervention, intervention and post-intervention phase). Below follows a figure of the design as well as a description of each step taken.

1. Pre-intervention Phase (weeks 1-4)	1.1 Observation of trainings
	1.2 Lecture 1
	1.3 Interviews
	1.4 Emotional profiling
	1.5 SIAM
	1.6 SIQ
2. Intervention Phase (weeks 5-12)	2.1 Lecture 2
	2.1 Guided imagery training
	2.2 Unsupervised imagery
	2.3 Imagery diary
	2.4 Individual imagery training program
3. Post-intervention Phase (week 13)	3.1 SIAM
	3.2 SIQ
	3.3 Post-intervention questionnaire

Figure 1. Design of the study

 6.3.1 Pre-intervention phase

Prior to the start of the research study, a meeting was set with the coach of the judo athletes. The aims of the study and the aims of the intervention were discussed and permission was taken. It needs to be noted that the coach had an active participation in planning the intervention project in order to be suitable for the needs and the schedule of the athletes. In another meeting that had the form of a lecture, the importance of Psychological Skills Training (PST) for sport performance was presented to the athletes. In addition, the nature of the study was described and the extent to which their participation was requested. Informed consent was also obtained at this time.

Week 1, 2: All athletes were interviewed using the general interview guide. In addition, the observations of trainings started (see "Measures" section) and they continued until the end of the intervention phase.

Week 3: Performance-related emotion experience was measured, following the framework of Hanin´s IZOF model. The purpose was to create imagery scripts that train the athletes to achieve their individual zones of optimal functioning. The IZOF worksheets in Finnish language were given to the athletes after a training session, together with verbal and written instructions. In addition, a short introduction to the IZOF model and the way that it is going be used in this study was provided to them. The athletes filled the forms in their personal time and they returned them when they had them ready. The athletes were free to add emotion descriptions at their own. In addition, a form with open-ended questions was used for a better understanding of the personal meaning of the emotions.

Week 4: The Finnish versions of the SIAM and the SIQ (see "Measures" section) were used in order to measure the participants` imagery ability. The measurement took place in a classroom during morning hours. The researcher explained and supervised the procedures.

At the end of the pre-intervention phase, the baseline data were analyzed. Individual emotional profiles were drawn and some feedback was given to the athletes according to their scores in the measurements.

6.3.2 Intervention phase

Week 5-8: A power-point presentation with the topic "sport imagery" was presented to the athletes. The main purpose of this presentation was to explain to the athletes what sport imagery is and how it works. In addition, to inform them on the different uses of imagery, as well as the imagery dimensions and the imagery modalities. The presentation took place in one of the classrooms of the training institute and lasted 45 minutes. After the theoretical part, some very simple imagery exercises were introduced. For example, "imagine a sunset"; "imagine your training place" etc. After the lecture on imagery, the *guided imagery training phase* started (see "Guided imagery training" in "Results" section) as well as the *unsupervised imagery training* (see Unsupervised imagery training" in "Results" section). An imagery diary was used as a self-report measure of imagery use. In this diary, the judo athletes were asked to record information pertaining to the date, time, location, and duration of their imagery sessions (guided and unsupervised).

Week 9-12: At the ninth week, each athlete had an individual meeting with the researcher in order to discuss his/her progress and to set his/her personal goals for the individual imagery training program. Each athlete was setting own goals regarding the amount and duration of imagery training, the timetable (for example every day before going to sleep), the content of the scripts and the use of means (audio scripts, paper scripts, video etc.). After the individual meetings with the athletes, a meeting was set with the coach where he was informed about each athlete's individual imagery training program and he gave his permission. New imagery scripts were provided to the athletes in paper and audio form, according to their personal goals and needs. The individual imagery training phase lasted 4 weeks and the athletes recorded their progress in the imagery diaries that were described above.

6.3.3 Post-intervention phase

Week 13: During this phase, the post-intervention measurements took place. All data were collected during the same day. The measurements took place in a classroom during morning hours, following exactly the same procedure like the pre-intervention phase. The SIAM and SIQ were used again to assess athletes' progress in imagery use and ability. In

addition, a post-intervention questionnaire (see "Measures" section) was used to assess athletes' attitudes towards the intervention.

7. RESULTS

This study aimed to describe and understand four key issues: a) learning process, and adherence to the intervention b) imagery ability c) imagery use and d) attitudes towards imagery training. All issues will be examined separately and followed by a brief summary and interpretation of the findings. To assure the confidentiality, the data are presented in this paper by using code names.

7.1 Learning process and adherence to the intervention

To understand the learning process and the adherence of the athletes, a description of the intervention process is necessary. In the following paragraphs, each component of the intervention will be described separately.

7.1.1   Guided imagery training

The imagery training started with short and simple exercises, to progress later with longer and more complex ones. In total, seven sessions of guided imagery training were conducted (table 3). These sessions took place once or twice per week. The imagery scripts were adapted to the judo context. The purpose of these imagery exercises was to improve each athlete's controllability and vividness of imagery, as well as to introduce them to the various uses of imagery. Results of the analysis of the post-intervention questionnaire, as well as observational data, indicated that the experiences of the guided imagery training phase, helped the athletes, the coach and the sport psychology specialist, to understand how they can integrate imagery exercises into the daily training routine of judo.

Table 3

Schedule of Guided imagery training

Session	Date	When	What	Relaxation Method
1	19.03.08	After	Practice techniques	Progressive
2	01.04.08	After	Recall best competition fight	Tense-relax
3	02.04.08	After	Controlling performance against a tough opponent	Breathing
4	08.04.08	After	1) Practice techniques 2) Imagine a positive performance	Free
5	09.04.08	During	Preperformance imagery	---
6	15.04.08	After	Prepare for competition Control emotions	Imagery
7	30.04.08	Before	Practice techniques (use of videos)	---

Note: After= after training, During= during training, Before= before training

Five of these sessions (sessions 1,2,3,4 and 6) took place exactly after the morning trainings and lasted 15 minutes each. The athletes were asked to lie down or sit comfortably on the training mats and if they want to close their eyes. After relaxation (see "Relaxation" section below) followed a 5-10 minutes imagery exercise (each time different). However, many times the athletes reported that it was difficult to relax and concentrate on imagery, while they were still very tired from the physical training.

One session (session 5) was integrated in the physical training program. In this session, the athletes were in pairs and they were asked to visualize each judo technique for some seconds before the actual execution. The athletes gave very positive feedback for this

exercise and they stated that they were able to execute better throws after imagery than without imagery.

Finally, the last session (session 7) took place in one of the classrooms of the sport institute, one hour before the morning training. The duration of this session was 45 minutes. Some videos of successful throws, executed from world famous judo athletes in competitions, were presented using a power point. The athletes were asked to relax on their seats. After watching each video for three or four times, they were asked to visualize themselves executing this throw in competition. After visualization, the coach was commenting on the technical and strategic aspects of each video. The idea of this presentation arose when one of the athletes (Aino) reported that she has problems to create clear pictures during imagery. Specifically, she said *"I can hear, I can feel, but I cannot see"*. Thus, this presentation aimed to improve the visual modality of the athletes` imagery ability, as well as to introduce the use of videos in imagery training. The athletes and the coach gave very positive feedback for this session. Some of the athletes later reported that they continued using videos before imagery during their personal time.

7.1.2 Relaxation

Since imagery is more effective when participants are in a relaxed state, different relaxation strategies were introduced during the guided imagery sessions (table 3). These included progressive relaxation, tense-relax method, breathing relaxation and imagery relaxation and lasted for 5-10 minutes.

During the sessions 1, 3 and 6, the researcher was reading the relaxation scripts. However, during session 2, an audio script was used for relaxation, but the athletes complained that the voice sounded too soft and unnatural. They stated that they prefer the voice of the researcher, even though the audio scripts were in Finnish (their mother tongue) and the researcher was reading in English. Thus, audio scripts were not used again during the guided imagery phase. When audio scripts were needed for the individual imagery training programs, these were recorded with the voice of the researcher.

The ability to relax differs from individual to individual and different relaxation methods are suitable for each person. Thus, during session 4, the participants were asked to choose by themselves the method that they like more and try to relax individually. Most of the athletes used the progressive relaxation method. During sessions 5 and 7, no relaxation method was used. Due to the content of these sessions, it was judged that a relaxation method is not necessary.

7.1.3   Unsupervised imagery training

In addition to the guided imagery sessions, five imagery scripts were provided to the athletes (appendix 4), in order to help them to start practicing in their personal time. However, the athletes were free to create and use their own imagery scripts if they wanted. In addition, some guidelines were given to them in order to use imagery effectively. This phase lasted from March 20 to April 14 (almost four weeks) and it was very unstructured. The purpose was to let the athletes discover by themselves how they can use imagery in their personal time and what their individual needs are. Their experiences from this phase helped them and the researcher in the development of the individual imagery training programs.

7.1.4   Individual imagery training programs

After four weeks of guided imagery sessions and unsupervised imagery training, an individual imagery training program was made for each athlete. The programs were made after discussion with the athletes in individual meetings, and discussion with the coach. The athletes set their personal goals for their individual imagery training programs, regarding the context and the quantity. Suitable imagery scripts were developed by the researcher and were given to the athletes in paper and audio form. This phase lasted 4 weeks (from April 14 to May 13).

Two of the athletes (Antti and Olli), chose as a goal for their individual training program to improve techniques. Specifically, each one of them chose two throwing techniques that they would like to practice by using imagery training. Both athletes, committed that they would use imagery every night, before they go to sleep, for 10 minutes. Suitable imagery

scripts, for skill learning and practice, were developed by the researcher. The scripts were recorded in audio with the researcher´s voice and they were provided to them in MP3 audio format. Following the audio scripts, the athletes were visualizing for two weeks the selected throwing techniques repeatedly, in different speeds (slow motion and real time) and from different perspectives (internal and external). After two weeks, new scripts were developed. Following, the new scripts, the athletes were visualizing performing these techniques in competition under different situations. It needs to be noted that the coach had an active and very enthusiastic participation in this phase. He helped the athletes to choose which techniques they should practice. In addition, in order to see the actual effects of the imagery training in their performance, he recorded videos of Antti and Olli, executing the selected throws in the training, before and after the individual imagery training phase. The results of the analysis of these videos were not shared with the researcher, thus they are not discussed in this study. However, the athletes reported that the imagery training had positive effects to their performance.

Two of the athletes (Jarmo and Juuso), chose to control emotions as a goal for their individual imagery training programs. For these athletes suitable imagery scripts were developed by using information from their emotional profiles. Both of them committed that they would use imagery every night, before going to sleep, for 10 minutes. In order to demonstrate, how the scripts were developed using the emotional profiles, below follows Jarmo´s emotional profile (table 4) as well as the imagery script that was developed for him.

Table 4

Jarmo´s optimal and dysfunctional emotions and intensities

Successful performance		Unsuccessful performance	

Emotion category
  Emotion description
	Optimal
	zone
		Emotion category
		  Emotion description
			Dysfunctional
			zone

Positive (P+)		Positive (P-)	
eager (innokas)	7	alert (pirteä)	4
cheerful (hyväntuulinen)	9	enthousiastic (innostunut)	0,5
peaceful (rauhallinen)	7	tense (jännittynyt)	8
certain (varma)	6	reactive (sähäkä)	6
reactive (sähäkä)	10		
Negative (N+)		Negative (N-)	
concerned (huolestunut)	1	depressed (masentunut)	7
aggressive (hyökkäävä)	3	unwilling (haluton)	8
tense (jännittynyt)	2	tense (jännitynyt)	6
tired (väsynyt)	0,5	provoked (ärsyyntynyt)	8

Jarmo´s imagery script of his individual imagery training program:

"Imagine your best earlier performance. Your best fight in competitions. Take some time to recall everything. Imagine your opponent and all the surroundings. Use all your senses. Concentrate on the emotions that you had exactly before the fight. Remember how eager, reactive and sure you were. How cheerful and peaceful. You were also a bit tensed, aggressive and concerned but you knew that it was just this small anxiety that helps you to fight better. Recall these emotions as vividly as possible.
When you have the emotions strongest, anchor (connect) them to something. It can be a deep inhale, a repetition of a key word, a visual image or something else meaningful to you. Enjoy the good performance and let body and mind recover by relaxing for a moment.
Now, imagine yourself in a situation in which you usually tense up, lose concentration, or lose confidence. Take some time to imagine the situation as vivid as possible. Concentrate on the emotions that you feel. Then use the anchor to recall your optimal emotions (these that you had before your best fight) and feel the tension leaving from your body. See yourself having control of the situation again and doing a good performance. Hear the sounds. Feel how your body feels and the activity in your muscles. Enjoy good performance by using all senses".

After one month of imagery training following the above script, Jarmo reported that he was able to recall his optimal emotions and "enter the zone" in almost any situation in training or competition, by using the anchor. It needs to be noted that two weeks after the end of the intervention, Jarmo won first place in his category in a World Cup.

Finally, Aino chose as a goal, to enhance her motivation and prepare for competition. She said that she would use imagery every night, before she goes to sleep, for five to ten minutes. Aino had just changed from the youngs' division to the womens`devision. When she was in the youngs' division she was always first in her weight category. However, her first competitions in the women's division were not so successful. This made Aino to lose her motivation and to start thinking about quitting her career as a competitive athlete. An imagery script for motivation and preparation for competition was developed from the researcher and provided to her in audio and script form. Following this script, Aino was visualizing herself in competition situations, winning her matches and being congratulated from her coach and teammates. Aino had reported that she often had problems to create vivid images and that relaxation exercises were very helpful to her. She said that especially progressive relaxation helped her to achieve a more relaxed state and better visualization. Thus, a progressive relaxation script in audio form was also provided to her.

7.1.5 Imagery diary

An imagery diary (see "Measures" section & appendix 1) was used as a self-report measure of imagery use, during the whole intervention period. In this diary, the athletes were asked to record information pertaining to the date, time, location, and duration of their imagery sessions. They were also asked to rate the controllability and vividness. At the end of each week, the athletes were returning the diaries to the researcher and they were getting new ones.

The number of imagery sessions that the judo athletes reported that they engaged in over the four-week period of the individualized imagery training phase was added together to arrive at a frequency score. This finding indicated that athletes engaged in 6 to 16 imagery sessions throughout the four-week period, with an average of 9 sessions (SD=4). Each

session ranged in duration from 2 to 30 minutes, with the average length of an imagery session being 10 minutes ($SD = 6$). In addition, the athletes were rating the vividness of their imagery sessions (not vivid at all, little vivid, quite vivid, very vivid), the controllability (very difficult, quite difficult, very easy, quite easy), as well as the perspective that they were using (only internal, only external, internal and external equally the same, mostly internal, mostly external). Medians of their ratings were calculated. All the athletes had quit vivid images, except of Olli that had very vivid images and all of them reported that it was quite easy to control their images. In addition, athletes reported that they were using mostly internal perspective, except of Antti that was using mostly external. The frequency and duration of their imagery sessions are presented in table 5.

Table 5

Frequency and duration of the imagery sessions during the individual training program phase

ID	Frequency	Duration	
		Mean	SD
Antti	9	10	0
Jarmo	16	7	3
Olli	6	20	11
Aino	8	9	5
Juuso	7	7	2

The frequency scores do not fit with their commitment to practice imagery every single night. However, it is not clear if the frequency score recorded to the diaries was the actual amount of their imagery sessions. It could be that they were practicing less than they promised, or that they were not recording all the imagery sessions in the diaries.

7.2 Imagery Ability

The SIAM was used to assess the imagery ability of the athletes, before and after the intervention. Athletes were asked to visualize four different situations (home arena, successful competition performance, practice situation, slow start). After each situation, they were asked to rate from 0 to 100, the imagery modalities (visual, auditory, olfactory, gustatory, tactile, kinesthetic), the imagery dimensions (vividness, control, duration, ease, and speed of generation) and the sensation of emotion. Means and standard deviations were calculated for pre and post intervention values (tables 6 & 7).

Table 6

Means and standard deviations for the pre- and post-intervention values of the imagery modalities

ID		Tactile		Gustatory		Auditory		Visual		Kinesthetic		Olfactory	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Antti	Mean	74	85	39,5	69,8	82	83	86	88,3	78,5	86,5	40,5	72,5
	SD	8,9	3,7	7,3	8,3	12,9	2,9	3,6	6,3	3,3	8,4	5	2,9
Jarmo	Mean	65	81,3	5,5	4,5	75,5	85,3	82	93,3	73,3	86,5	3,3	8
	SD	7,1	6,2	3,8	3,1	18,1	17,1	11,5	4,1	11,8	5,3	1	4,1
Olli	Mean	58,8	57,5	4,5	11,3	71,3	50	76,8	88,8	67,5	79	4,5	4,5
	SD	36,1	15,4	1,7	13,9	2,4	20,5	20,6	7,1	18,8	13	0,6	0,6
Aino	Mean	23,8	28,5	3,8	3,3	37	15	49,3	70	82,3	62,8	4,3	3
	SD	14,9	27,8	0,5	0,5	21,3	10,6	18,1	9,8	10	21,9	1	0
Juuso	Mean	49	34	43,3	20,8	53,5	29,5	78,3	71,5	80,8	84,8	45,3	31
	SD	14,6	26,9	19,4	18	20,9	18,7	3,8	25,3	5,4	13,6	12,3	13,1
Total	Mean	54,1	57,3	19,3	21,9	63,9	52,6	74,5	82,4	76,5	79,9	19,6	23,8
	SD	24,7	29,2	20,4	27,2	22,4	31,9	17,9	15,2	11,4	15,3	20,3	27,6

Table 7

Means and standard deviations for the pre- and post-intervention values of the imagery dimensions

ID		Vividness		Length		Ease		Control		Speed		Emotions	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Antti	Mean	80,3	82,3	78,8	99,8	75,8	84	94	88,8	89	99,3	59	79
	SD	17	5,1	9,7	0,5	12,6	23,5	5,2	12,1	13,1	0,5	16,4	6,2
Jarmo	Mean	78,5	93	92,5	96,5	76,8	94	79,8	94,5	80,8	96	66,5	86,5
	SD	3,8	4,5	11,1	4,4	11	4,1	9,4	7	6	4,8	22,4	8,2
Olli	Mean	66,8	84,8	74,3	95	66,8	92,3	74,3	84,3	69,8	94	44,8	52
	SD	20,4	3,3	17,8	3,4	23,5	3,5	7,3	9,7	16,9	4,8	30,7	22,2
Aino	Mean	50,3	71,8	67,3	99	34,5	72	64,8	95,8	32	68	32	24
	SD	18	13,4	30,3	0	28,3	19,3	21,7	5,2	25,3	23,9	7,3	23,7
Juuso	Mean	70,8	69,5	100	92,3	83	70	63,5	77,8	87,5	81,5	83,3	69,5
	SD	12,7	10,5	0	11,3	2,6	15,9	16,4	7,2	10,1	10,5	23,1	10,3
Total	Mean	69,3	80,3	82,6	96,5	67,4	82,5	75,3	88,2	71,8	87,8	57,1	62,2
	SD	17,6	11,6	19,5	5,7	23,9	17,2	16,6	10,2	25,7	16	26,3	26,9

As it can be seen in table 6, before the intervention the modality that was most used by the judo athletes was the kinesthetic, followed by the visual, the tactile, the auditory, the olfactory and the gustatory. After the intervention most used was the visual modality, followed by the kinesthetic, the tactile, the auditory, the gustatory and the olfactory.

The number of the participants is very small for a statistical analysis. Thus, the pre and post values will be depicted in graphical form (figure 2).

Figure 2. Overall imagery ability, before and after the intervention.

In general, the overall imagery ability of all the athletes was higher after the intervention, than before the intervention (see figure 2). Only exception was Juuso. This athlete, in the meeting for the planning of his individual imagery training program that took place during the 4th week of the intervention, confessed that he overestimated himself during the pre-measurements of the imagery ability. Thus, the decrease in his values could be explained by a change in the way that he was answering the SIAM during the post-measurements. It shouldn´t be interpreted as an actual decrease in his imagery ability.

7.3 Imagery use

The SIQ was used to assess the imagery use of the athletes before and after the intervention. Means and standard deviations were calculated for each subscale of imagery (table 8).

Table 8

Means and standard deviations of Sport Imagery Questionnaire (SIQ) pre- and post-intervention

ID		CG		MGM		MS		MGA		CS		All	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Antti	Mean	4,0	4,7	5,3	5,7	3,2	3,3	2,2	2,7	5,3	6,2	4,0	4,5
	SD	1,3	2,3	0,8	0,8	2,1	1,5	0,4	0,8	0,8	0,8	1,7	1,9
Jarmo	Mean	4,0	4,7	4,8	6,0	4,2	3,8	3,7	5,3	4,0	5,7	4,1	5,1
	SD	1,3	1,5	1,3	0,6	1,8	1,5	1,2	1,8	0,6	0,8	1,3	1,4
Olli	Mean	3,2	5,2	4,3	6,0	3,7	5,2	2,5	4,0	2,2	5,8	3,2	5,2
	SD	1,2	0,8	1,4	0,9	1,8	1,7	1,0	1,7	1,2	1,5	1,5	1,5
Aino	Mean	3,5	2,3	2,7	3,8	2,2	1,7	2,0	3,0	3,2	5,3	2,7	3,2
	SD	0,8	1,0	1,6	1,0	1,9	1,2	1,7	2,0	1,6	0,8	1,6	1,8
Juuso	Mean	3,3	3,3	4,8	4,8	3,5	4,2	5,3	5,2	3,5	4,0	4,1	4,3
	SD	0,5	1,6	1,2	1,6	2,3	2,3	1,4	1,9	1,5	2,5	1,6	2,0
Total	Mean	3,6	4,0	4,4	5,3	3,3	3,6	3,1	4,0	3,6	5,4	3,6	4,5
	SD	1,3	2,3	0,8	0,8	2,1	1,5	0,4	0,8	0,8	0,8	1,6	1,8

Note: CG = Cognitive general, MGM = Motivational general –mastery, MS = Motivational specific, MGA = Motivational general- arousal, CS = Cognitive specific.

As it can be seen in table 8, before the intervention the athletes were using most frequently motivational general-mastery imagery, while after the intervention they were using most frequently cognitive specific imagery. All of the athletes reported increases in their use of cognitive specific imagery from the pre-intervention to the post-intervention measurements. As stated before, the number of the participants is too small for a statistical analysis, thus the pre and post values will be depicted in graphical form (figure 3).
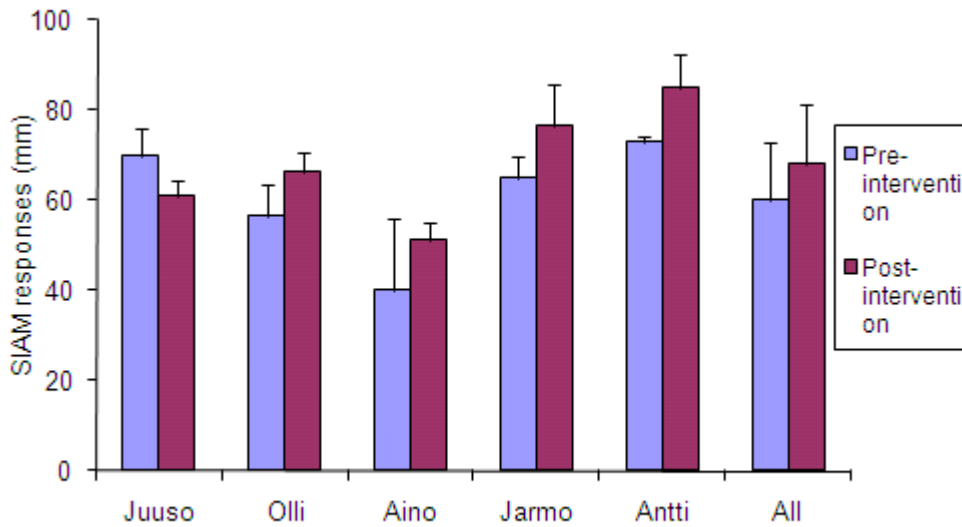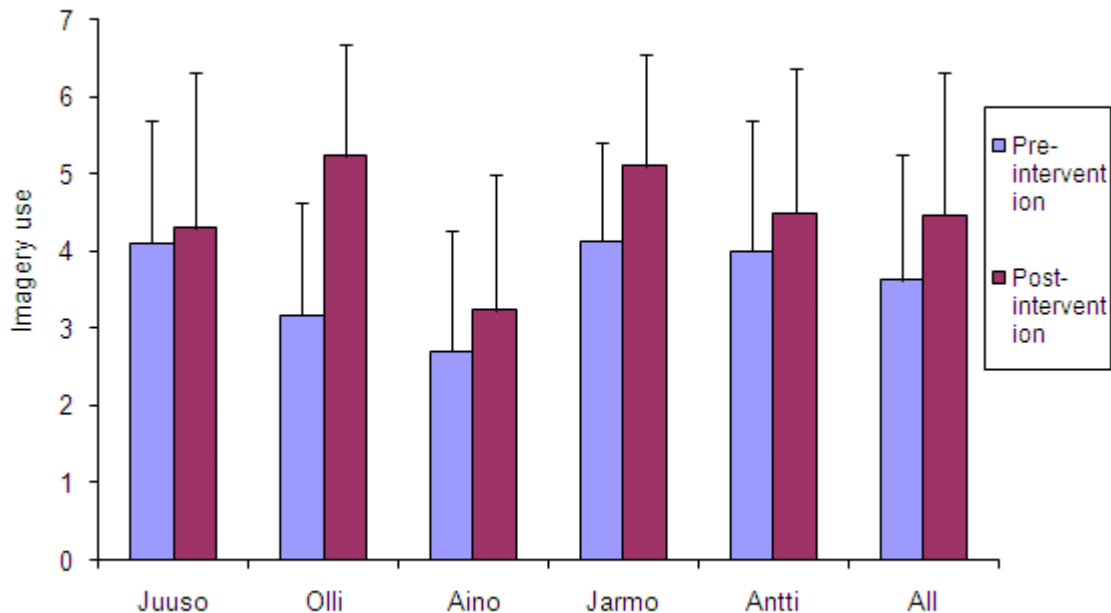
Figure 3. Overall imagery use, before and after the intervention.

As it can be seen in figure 3, all athletes increased the overall use of imagery after the intervention.

7.4 Attitudes towards imagery training

During the interviews that took place in the pre-intervention phase, only one of the athletes said that she had follow an imagery training session during a training camp of the Finnish national team. After the intervention, a post-intervention questionnaire (appendix 2) was used to assess the attitudes of the athletes towards imagery training and towards the intervention. In the question *"In your opinion, was this imagery intervention beneficial for you and your judo performance?"* all five athletes answered *"Yes"*. In the question *"If yes, in what way was it beneficial?"* the athletes referred to the improvement of their techniques, to the better control of emotions, the enhancement of the vividness of their images, as well as to the various uses and applications of imagery. Specifically, the following answers were given:

"I learned to control my emotions better and to get the fight spirit easier"

"When I imagine the techniques before performing them, my throws are more successful"

"I got more ideas for imagery training"

"Usually I was just watching videos without thinking and those got forgotten. Now when I watch a video, I visualize myself in this situation and then I try to perform it in the training"

"I was able to create more vivid images from difficult situations"

In the question, *"What kind of difficulties did you meet during imagery training?"* the athletes referred to concentration problems, controllability problems, as well as difficulties with the gustatory and olfactory modalities. Specifically, the following answers were given:

"At times thoughts were escaping elsewhere and I couldn´t concentrate"

"It was very hard to taste, smell and hear during imagery"

"My images were not like videos but they were cut in scenes"

"In the evenings I couldn´t concentrate enough because I was too tired. Also controlling the images was sometimes difficult"

"I don´t feel very well the smell and taste sensations".

In the question *"Are you planning to continue imagery training?",* all five athletes replied *"Yes"*. In the question *"If yes, then how?"* the athletes referred to the time and the context of their future imagery practices. Specifically, the following answers were given:

"It would be nice to continue practicing regularly"

"When preparing to competitions and to learn new techniques"

"I will be watching judo videos and then visualizing and also I will be visualizing my techniques before going to sleep"

"I will be visualizing techniques and match situations"

"When I am travelling I will be using the time for imagery".

Finally, in the section *"Other comments"* the athletes commented the following: *"Imagery audios were good and easily available. With these, it was easier to do the practice. In some parts of the audio scripts the empty (thinking time) was a bit too short"*

"When I was doing imagery in my personal time it was a bit challenging. However, I believe that imagery training was and will be beneficial for my sport performance"

"Tactile sense improved a bit, but smell and taste sensations remain the same. Relaxation exercises were good"

"I believe that imagery is beneficial to my own performance, but I should do it regularly for longer time to make the benefits appear"

"This intervention made me understand the importance of imagery training".

8. DISCUSION

The purpose of this study was to investigate the effects of an imagery intervention on imagery ability and imagery use, as well as to describe and understand the learning process of the judo athletes. To this end, four key issues were examined: a) learning process, and adherence to the intervention b) imagery ability c) imagery use and d) attitudes towards imagery training.

8.1 Learning process and adherence to the intervention

To date, limited research has examined the learning process of the athletes during imagery interventions and only few studies have discussed ways to integrate imagery exercises into the daily training routine. Following the experiences of the present intervention, one issue that needs to be discussed is the correct timing for effective imagery training. During the guided imagery training phase, the athletes found it difficult to relax and concentrate in imagery exactly after the physical training session, because they were very tired. In addition, during the individualized imagery training phase, many athletes wrote in their diaries that sometimes they were falling asleep during visualization, when they were using imagery exactly before they go to sleep. Very positive comments were given from the athletes after a session of imagery that took place exactly before the morning training. Specifically, the athletes stated that their energy levels were higher than usually when they started training because they were "psyched up" from imagery. In addition, positive comments were given from the athletes after a session that was integrated in the physical training. They stated that they were able to execute better throws after imagery, than without imagery.

According to the *Four Ws,* the framework of imagery use developed by Munroe et al. (2000), one of the four Ws refers to *When* the athletes imagine (the timing of imagery use). This is determined in relation to scheduling factors, such as within or outside of physical practice or training time; before, during or after competition; or as a component of rehabilitation (Morris et al., 2005). However, to date, there are no studies examining what is the most effective timing for imagery use. Following the findings of the present

investigation, it could be stated that imagery use is more effective when the athlete is not tired. Recommended timing could include the morning hours and before the training. After the training, or after the competition, imagery could be used for review or recovery but not for skill and strategy learning.

Another issue that needs to be discussed is the individualization of the imagery training. Findings revealed that during the unsupervised imagery training phase the adherence of the athletes to the intervention was low. None of them returned the imagery diary during this phase. In contrast, during the individual imagery training phase, the adherence of the athletes increased. All athletes started using imagery more often. They were filling their dairies and returning them to the researcher. In addition, they were asking questions and initiating conversations regarding their imagery training. Thus, imagery is most effective when it is used for a specific purpose, rather than in a random or nondirected fashion (Simons 2000; Vealey and Greenleaf 2001) and when its use and the athlete´s need are matched (Martin et al., 1999; Munroe et al., 1998).

8.2 Imagery ability

The results of the present investigation revealed an increase in both imagery ability and imagery use following the intervention. An examination of the changes in imagery ability in the group level revealed that the overall imagery ability of all the athletes was higher after the intervention. The only exception was Juuso. As stated in the "Results" part, this athlete, in the meeting for the planning of his individual imagery training program that took place during the 4th week of the intervention, reported that he overestimated himself during the pre-measurements of the imagery ability. Thus, the decrease in his scores could be explained by a change in the way that he was answering the SIAM during the post-measurements. It should not be interpreted as an actual decrease in his imagery ability.

Before the intervention the modality that was most used by the judo athletes was the kinesthetic, followed by the visual, the tactile, the auditory, the olfactory and the gustatory. After the intervention, the most used was the visual modality, followed by the kinesthetic, the tactile, the auditory, the gustatory and the olfactory. An explanation for this increase in

the use of visual sense could be the use of videos during the intervention. As stated in the "Results" section, the idea of introducing the use of videos in imagery training arose when Aino reported that she had problems using the visual sense during imagery.

8.3 Imagery use

The results of the present investigation support the findings of previous studies, that have shown increases in imagery use following intervention programs of lengths varying from 5 to 16 weeks (e.g., Cumming & Ste-Marie, 2001; Rodgers, et al., 1991), or even interventions as short as a workshop (Cumming et al., 2004). All judo athletes increased their overall imagery use after the 8-week imagery intervention.

Some changes were indicated, regarding the patterns of imagery use. In the group level, before the intervention the athletes were using most frequently motivational general-mastery imagery, while after the intervention they were using most frequently cognitive specific imagery. All of the athletes reported increases in their use of cognitive specific imagery from the pre-intervention to the post-intervention measurements. Following that cognitive specific imagery refers to imagery directed toward skill development or production, these results can be explained by the contents of the specific imagery intervention. Three out of seven guided imagery sessions aimed to skill practice and development and two out of five athletes chose skill development as their goal for their individual imagery training programs.

A second explanation can be provided, following previous research indications that imagery use may be dependent on the importance of a particular function to the player (Callow & Hardy, 2001). For judo athletes, who practice a sport that requires a heavy emphasis on skills and techniques, it is not surprising that they increased their use of cognitive specific imagery. In addition, the use of motivational general-mastery imagery (that was the most frequently used before the intervention and the second most used after the intervention) would be important to all judo athletes because it allows them to practice mastering challenging situations.

Other changes in imagery use patterns appeared to be specific to the individual. A number of different factors may explain these individual differences, including variations in the athletes' motivation to perform imagery, differences in the athletes' ability to effectively create and control their images, as well as competitive level in the sport of judo. According to Cumming et al. (2004), limited research has examined why athletes are motivated to engage in imagery. Several recent studies, however, have adopted an achievement goal approach to study this issue and have found that differences in frequency of imagery use can be explained by understanding the athlete's profile of task and ego goal orientations (Cumming et al., 2002; Harwood et al., 2003). These studies have found that athletes will be more likely to invest efforts in performing imagery when their motivational profile consists of moderate to high levels of task and ego orientation. It is possible that reported differences in frequency of imagery use found in the present study may also be explained by variations in the athletes' dispositional goal orientations.

8.4 Attitudes towards imagery training

Results revealed that after the intervention, the judo athletes believed the imagery training to be both valuable and effective. In addition, all athletes reported that they were planning to continue using imagery after the intervention. Similar results have been found in previous studies (Cumming et al. 2004). These findings support the benefit of conducting interventions with athletes aimed at teaching them the importance and value of using imagery.

8.5 Methodological considerations

A combination of methods (triangulation) was used in the present study, which included both quantitative and qualitative measures. All instruments have been used in previous studies and have shown good reliability and validity ratings. However, several methodological issues should be examined with caution:

The Imagery Diary. A self-report measure in the form of a diary was used in the present study to examine the structure and regularity of imagery practice. Imagery diaries have been one of the most frequently used qualitative assessment in imagery research. As cited

in Morris et al. (2005), Sheehan et al. (1983) have suggested that measures of this type, which tap people's real experiences, "may be more valid for measuring those aspects of cognition that characterize current everyday thinking". Several advantages of these procedures have been outlined, the first being that these methods are sensitive in how they address the idiosyncratic aspects of participants experiences and involve them in the measurement process. Second, the methodology attempts to examine recent memories, which have more value than questionnaire measures"where items are relevant to memory of events that rarely have taken place in the immediate past". However, many studies that used imagery diaries have reported various difficulties. For example, in a study investigating the influence of an imagery workshop on athletes` use of imagery (Cumming et al., 2004), the athletes reported difficulties completing the diary because they found it to be time-consuming and/or annoying. In the present study, similar problems were met. In the unsupervised imagery training phase, the athletes did not report their imagery sessions and they did not return the diaries. When asked by the researcher, the athletes said that it was too time consuming and they also reported that they did not have a specific time of the day that they were doing their imagery training. They were visualizing in different places and different times of the day. Thus, many times they did not have the diary with them and when they were returning home they were forgetting to record the information. However, during the individual imagery training phase and after the guided imagery sessions, the athletes were using and returning the diaries. In the guided imagery sessions phase, the researcher was bringing copies of the diaries, as well as pencils and pens. At the end of each session, the athletes were asked to record in the diaries all information regarding the effectiveness of their imagery. Writing and collecting the diaries did not take much time. With the researcher, the coach and their teammates present, the athletes never denied to write their diaries during this phase. However, it is possible that the information in the diary does not accurately reflect the judo athletes' imagery use, but instead reflects their lack of adherence to completing the diary. Nevertheless, the diaries provided some valuable information concerning the athletes' imagery training.

The Post-intervention Questionnaire. At the conclusion of the study, the athletes were asked to respond some questions pertaining the mental imagery. The responses to the post-

intervention questionnaire provided some valuable information concerning the athletes' imagery training. Specifically, this instrument provided information about whether the intervention was successful in educating the athletes on the value and benefit of imagery training, and effective in getting athletes to integrate imagery into their regular training program. However, a limitation is that the questionnaire was not anonymous. Thus, this might have affected the way that the athletes were answering the questions.

8.6 Limitations

Findings from the present study demonstrate that an 8-week intervention can impact on an athletes' imagery ability and imagery use. It is important to note, however, that these findings would be strengthened by having a follow up measurement to assess if imagery ability and imagery use remain high, some weeks or months following the intervention. In addition, findings would be strengthened by having comparison group who received the intervention in different amounts (e.g., shorter intervention) or not at all (e.g., control group).

It needs to be noted that the present investigation is limited to the small amount of the participants, as well as to the culture of the participants. As cited in Schinke & Hanrahan (2009), researchers in cultural psychology suggest that findings once thought to be universal are culturally bound (Hofstede, 1980), and although some theories may be universal, cultural background shapes the expression of the theory (Chang, Arkin, Leong, Chan & Leung ,2004; Cheung & Leung, 1998). Thus, researchers and practitioners should resist generalizing findings from one cultural background to another (Peters & Williams, 2006).

8.7 Ethical considerations

The participants of this research were recruited from the Pajulahti sport institute and their coach gave permission for their participation to this study. The athletes were notified of the study's goals and procedures, as well as the extent that their participation was needed. It was stressed that the athletes could decide not to participate in the study, or to withdraw with no resulting consequences. If they agreed, athletes were asked to sign an informed

consent form acknowledging their agreement to participate in the study. It needs to be noted that the coach was very enthusiastic and supportive to the intervention project. Thus, his presence and authority, and possibly the fact that all their peers were taking part in the study, could have created some pressure for compliance.

To assure the confidentiality, the data were presented in this paper by using code names. Individual results and their significance were shared with the athletes only in a face to face individual meeting. During the individual meetings, the athletes were informed on the extend that the confidentiality would be kept. For example, athletes were informed that all results from the imagery ability and imagery use measurements will be discussed with the coach, but that all the data from the personal interviews would be treated as confident.

8.8 Future directions and practical implications

This study aimed to provide information to coaches, and sport psychology specialists that want to apply imagery training in judo. Findings from this study suggest that it is important for practitioners to consider how the psychological skill training program will be delivered to the athletes. Future research should investigate the optimal length of an imagery intervention for developing and maintaining regular imagery use and identify effective adherence-related strategies. In addition, more research should be conducted in how and when imagery is most effective. Other directions for future research could be the investigation of the relationship between imagery ability and imagery use, as well as, how to incorporate emotional profiling with imagery training for control of emotions. Could imagery training help athletes achieve an optimal emotional state ("get in the zone") before competition? Furthermore, future research should investigate cultural differences in the application of imagery in sport. Finally, as stated from Weinberg (2008), we should try to learn more about how imagery can help people in a variety of ways and settings.

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APPENDIX 1

The imagery diary

VIIKKOPÄIVÄKIRJA MIELIKUVAHARJOITELULLE

Nimi:
_____

Täytä yksi rivi jokaista mielikuvaharjoituskertaa kohti. Ensimmäisellä rivillä on annettu esimerkki. Numerokoodit näet taulukon alapuolelta.

Päiväys	Aika	Duration (minutes)	Eläväisyys				Kontrolloitavuus				Perspektiivi					Comments
21.4.08	*22:00*	*7 min.*	1	2	(3)	4	1	2	3	(4)	(1)	2	3	4	5	*This is an example.*
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	
			1	2	3	4	1	2	3	4	1	2	3	4	5	

Numerokoodit:

Eläväisyys: Kuinka eläväisiä mielikuvasi olivat?
- 1 = ei eläväisiä ollenkaan
- 2 = vähän eläväisiä
- 3 = melko eläväisiä
- 4 = erittäin eläväisiä

Kontolloitavuus: Kuinka vaikeaa mielikuvien kontrollointi oli?
- 1 = hyvin vaikeaa
- 2 = hieman vaikeaa
- 3 = melko helppoa
- 4 = hyvin helppoa

Perspektiivi Mielikuvaharjoittelussa käytit sisäistä vai ulkoista näkökantaa?
(sisäinen = näen kuin silmieni kautta, ulkoinen = näen itseni kuten elokuvassa)
- 1 = vain sisäisesti
- 2 = vain ulkoisesti
- 3 = sisäisesti ja ulkoisesti yhtä paljon
- 4 = enimmäkseen sisäisesti
- 5 = enimmäkseen ulkoisesti

APPENDIX 2
Post-intervention questionnaire

Projektin loppukysely

Nimi:_____   **Päiväys:**_____

---

1) Oliko tämä mielikuvaharjoittelu-projekti mielestäsi hyödyllinen sinulle ja sinun suorituskyvyllesi judossa?

        Kyllä ☐   **Ei** ☐

- **Jos kyllä, niin millä tavalla?**

_____
_____

- **Jos ei, niin miksi ei?**

_____
_____

---

2) Millaisia vaikeuksia sinulla oli mielikuvaharjoittelua tehdessäsi?

_____
_____

---

3) Suunnitteletko käyttäväsi mielikuvaharjoittelua tulevaisuudessa?

        Kyllä ☐   **En** ☐

- **Jos kyllä, niin miten?**

_____
_____

- **Jos et, niin miksi et?**

_____
_____

---

4) Muita kommentteja?

_____
_____
_____

APPENDIX 3

The judo related scenes that were used in SIAM.

Home arena
Kuvittele, että sinulla on kilpailut paikassa, joka on tuttu sinulle, koska olet kilpaillut siellä usein. On viimeiset hetket ennen kuin kilpailu alkaa. Sinulla on päälläsi judoki ja olet tekemässä venytyksiä tatamilla. Pyrit rentoutumaan ja katselet tuttua ympäristöä. Huomioi mitä näet ympärilläsi, mitä ääniä kuulet, ja mitkä lihaksesi työskentelevät. Pystytkö aistimaan mitään hajuja tai makuja? Voitko tuntea välineitä tai pintoja, joilla työskentelet? Liittykö harjoitukseen emotionaalisia tunteita? Nyt sinulla on 60 sekuntia aikaa muodosta ja kokea mielikuvaa. Kun 60 sekuntia on kulunut, täytä kaikki 12 vastauslomakkeen kohtaa. Älä mieti liian kauan yhtä kohtaa, vaan sijoita rasti viivalle ensituntuman mukaan. Muista sijoittaa rastin keskikohta viivalle.

Successful competition performance
Kuvittele itsesi kilpailemassa SM-kisoissa ja ottelemassa finaalissa. Olet otellut kovaa 4,5 minuuttia, mutta olet häviämässä kokalla. Sinulla on 30 sekuntia aikaa. Keräät kaiken energiasi viimeiseen hyökkäykseen voittaaksesi ottelun. Huomioi mitä näet ympärilläsi, mitä ääniä kuulet, ja mitkä lihaksesi työskentelevät. Pystytkö aistimaan mitään hajuja tai makuja? Voitko tuntea välineitä tai pintoja, joilla työskentelet? Liittykö harjoitukseen emotionaalisia tunteita? Nyt sinulla on 60 sekuntia aikaa muodosta ja kokea mielikuvaa. Kun 60 sekuntia on kulunut, täytä kaikki 12 vastauslomakkeen kohtaa. Älä mieti liian kauan yhtä kohtaa, vaan sijoita rasti viivalle ensituntuman mukaan. Muista sijoittaa rastin keskikohta viivalle.

Practice situation
Kuvittele itsesi harjoituksiin ja tekemään erittäin vaativaa harjoitetta, joka on erittäin raskas sinulle. Kun saat kuvan itsestäsi suorittamassa harjoitetta, yritä muodostaa koko harjoite vaihe vaiheelta. Huomioi mitä näet ympärilläsi, mitä ääniä kuulet, ja mitkä lihaksesi työskentelevät. Pystytkö aistimaan mitään hajuja tai makuja? Voitko tuntea välineitä tai pintoja, joilla työskentelet? Liittykö harjoitukseen emotionaalisia tunteita? Nyt sinulla on 60 sekuntia aikaa muodosta ja kokea mielikuvaa. Kun 60 sekuntia on kulunut, täytä kaikki 12 vastauslomakkeen kohtaa. Älä mieti liian kauan yhtä kohtaa, vaan sijoita rasti viivalle ensituntuman mukaan. Muista sijoittaa rastin keskikohta viivalle.

Slow start
Kuvittele itsesi ottelemassa kilpailussa. Olet otellut kovaa joitakin minuutteja, mutta olet tehnyt muutamia virheitä ja olet häviämässä yukolla. Sinun on vaikea keskittyä. Haluat saada kiinni hyvästä suorituksesta ennen kuin on liian myöhäistä. Tuomari on pysäyttänyt ottelun, jotta saat korjattua vyötäsi. Hengität syvään pari kertaa ja todella keskityt seuraavaan pisteeseen. Palaat otteluun paljon virkeämpänä ja keskittyneempänä. Huomioi mitä näet ympärilläsi, mitä ääniä kuulet, ja mitkä lihaksesi työskentelevät. Pystytkö aistimaan mitään hajuja tai makuja? Voitko tuntea välineitä tai pintoja, joilla työskentelet? Liittyykö harjoitukseen emotionaalisia tunteita? Nyt sinulla on 60 sekuntia aikaa muodosta ja kokea mielikuvaa. Kun 60 sekuntia on kulunut, täytä kaikki 12 vastauslomakkeen kohtaa. Älä mieti liian kauan yhtä kohtaa, vaan sijoita rasti viivalle ensituntuman mukaan. Muista sijoittaa rastin keskikohta viivalle.

APPENDIX 4
Imagery scripts that were used during the unsupervised imagery training phase.

Vividness exercise 1: *Imagine your training place (easy).*
Imagine that you are in your training place. Look around you and pay attention to all the details. What do you see? What sounds do you here? What is the temperature like? What do you smell? Use all your senses.

Vividness exercise 2: *Imagine a positive performance of a skill.*
Select a particular technique and visualize yourself performing it perfectly. Perform the technique over and over in your mind and imagine every feeling and movement in your muscles. You can start by seeing yourself in the ready position, looking at your training partner. Then take your grip. Use all your senses in your imagery. See and feel how you start the movement. Feel the weight of your partner and the activity in your muscles. Do the technique until the end and then repeat again and again. Try to do it in a real time.

Vividness exercise 2: *Imagine a positive performance.*
Recall as vividly as possible a time when you performed very well. If you can recall your best fight use that.
First, visually recall how you looked when you were performing well. Notice that you look different when you are fighting well compared with when you are fighting poorly. Try to get as clear picture as possible of what you look like when you are fighting well.
Now reproduce in your mind the sounds that you here when you are fighting well, particularly the internal dialogue you have with yourself. What is your internal dialogue like? Recreate all the sounds vividly as you can.
Finally, recreate in your mind how your muscles feel when you are fighting well. How do your feet and hands feel? Do you have a feeling of quickness, speed, or intensity? Do your muscles feel tight or relaxed? Stay focused on the sensations associated with fighting well.

Controllability exercise 1: *Controlling performance*
Imagine working on a specific technique that has given you trouble in the past. Take careful notice of what you were doing wrong. Now imagine yourself performing that technique perfectly while seeing and feeling your movements. Now think about a competitive situation in which you have had trouble in the past. Imagine yourself remaining calm and having control of the situation. Even though you have done some mistakes, you don't loose your concentration. You find the opportunity and you perform the specific technique perfectly.

Controllability exercise 2: *Controlling performance against a tough opponent*
Picture yourself fighting with a tough opponent who has given you trouble in the past. Try to execute a planned strategy against this person just as you would for a competition. Imagine situations in which your opponent is attacking you with his best techniques. You have total control of the situation and you defend his techniques successfully. Make sure you control all aspects of your movements as well as the decisions you make.