

Psychological Preparation of Competitive Judokas – A Review

Gal Ziv and Ronnie Lidor ✉

The Zinman College of Physical Education and Sport Sciences, Wingate Institute, Israel

Abstract

The purpose of this article was to review a series of studies ($n = 18$) on psychological preparation of competitive judokas. These studies were grouped according to the type of study performed – observational, experimental, and case studies. In addition, five psychological categories were identified: (a) imagery, (b) motivation, (c) stress, anxiety, and mood states, (d) eating attitudes and weight control, and (e) coach/athlete interactions. The main findings of this review are that (a) there is a lack of data regarding the use of imagery to improve judo performance; (b) goal involvement states of competitive judokas fluctuate and undergo abrupt changes during actual combat, according to the ecological constraints of the situation; (c) cortisol levels and somatic and cognitive anxiety tend to increase prior to and during a judo combat; (d) weight reduction programs that judokas undergo prior to a judo combat can lead to unpleasant moods, and cultural differences can lead to conflicting results; (e) psychological preparation plans should be tailored to each individual judoka, as there can be significant individual differences among the judokas. Based on the findings of our review, a number of research limitations and methodological concerns are discussed.

Key words: Judo, competition, psychological preparation, imagery, anxiety, motivation, martial arts.

Introduction

Competition in elite combat sports such as boxing, fencing, judo, tae kwon do, and wrestling requires task-specific psychological readiness that will enable the performer to act in combat situations that may often change within extremely short periods of time (e.g., 100 to 200 msec) (Pedro and Durbin, 2001). Emotional and mental states are subject to extreme fluctuations during combat matches. It is a challenge for the competing combat athlete to simultaneously attack and defend while concealing his or her intentions from the opponent, and while in an state of extreme tension. It is difficult to make decisions under time pressure while facing aggressive opponents and to decide on alternative tactical movements (e.g., attentional flexibility), all while striving to achieve the designated goals.

In order for competitive combat athletes to meet the above-mentioned specific combat requirements, they should be involved in sport-specific training programs. A training program for competitive athletes is typically comprised of physical, technical, tactical, and psychological preparation (see Bompa, 1999; Zatsiorsky, 1995), which are uniquely linked with one another. The interaction between these preparations defines the quality of the

practice and its contribution to athletic goal attainment (Blumenstein et al., 2005).

In this article we focus on one type of preparation – the psychological preparation. Those professionals who regularly work with competitive combat athletes should obtain relevant information on psychological interventions that are evidence-based, in order to plan task-enhancement sport psychology programs aimed at preparing these athletes for practice sessions and combats. This evidence-based information can help the professionals who work with competitive judokas to effectively plan training programs that match the specific needs of the individual judoka. Among these professionals are sport psychology consultants (SPCs), coaches, and strength and conditioning coaches.

In this article, we focus on one combat sport – judo. Judo is a traditional martial art that was developed in Japan during the 1880s. It was first introduced as an Olympic sport for males in the 1964 Olympic Games in Tokyo. Four years later it was excluded from the Olympic Games in Mexico City, but returned in the Munich Games of 1972. In the 1992 Barcelona Games, female judo was included as an Olympic sport as well (Olympic.org, 2011). A judo combat for competitive females and males can typically last up to five minutes. However, a combat can last more than five minutes in cases where a tied score is reached between the two opponents and more time is allotted until one of the judokas is awarded additional points. During a combat, a split-second lack of concentration can lead to a quick defeat. On the other hand, a quiet mind, in conjunction with awareness of the opponent's energy and intentions, can lead to the execution of correct defensive or offensive techniques at the right moment, leading to victory.

The purpose of this article is twofold: (a) to review a series of studies ($N = 18$) examining the psychological aspects of judokas who compete at the intermediate level, national team level, and international level, and who hold international titles, and (b) to discuss a number of methodological concerns and research limitations that emerged from the reviewed studies. It is our assumption that not only those professionals who work with competitive judokas (e.g., SPCs, coaches, and strength and conditioning coaches) will benefit from the findings of the current review, but also those professionals who work with other competitive combat athletes, due to the similar characteristics that exist among the combat sports (e.g., the need to simultaneously attack and defend while deciding on alternative offensive and defensive maneuvers).

We decided to conduct a qualitative review and not

another type of review (e.g., a meta-analysis) for the following reasons: (a) The measured dependent variables in the reviewed studies were not the same in all of the studies; in a number of studies quantitative variables were collected and in other studies qualitative variables were obtained. In the current review, both quantitative and qualitative studies were included; (b) We wanted to explain why in some studies the psychological interventions did not lead to significant results, and we felt a narrative review may provide an opportunity to discuss possible reasons for the lack of improvements; and (c) In the current review we also wanted to emphasize a number of qualitative concepts associated with the use of psychological preparation in competitive judokas.

Psychological interventions and preparation in judo

A literature search was conducted using major computerized databases (e.g., SPORTDiscus, Google Scholar) and library holdings for peer-reviewed articles in the English language. Combinations of the search terms *judo*, *psycholog**, *imagery*, *anxiety*, and *food restriction* were used. A manual search of the reference lists in the relevant studies found in the computerized search was also performed. The search yielded 18 studies, and these are included in our review. Both quantitative and qualitative studies were included. The studies were divided into three research categories, according to the classification of the study: observational studies ($n = 13$), experimental studies ($n = 3$), and case studies ($n = 2$). While reviewing the studies, five psychological categories were identified: (a) imagery, (b) motivation, (c) stress, anxiety, and mood states, (d) eating attitudes and weight control, and (e) coach/athlete interactions. The current review is structured according to the three classifications of the studies, and within each classification according to the identified psychological category.

Observational studies

In observational studies, researchers observe patterns of behavior of an individual (e.g., a judoka) or individuals (Thomas et al., 2011). Based on these observations, the researcher can accurately describe unique phenomena that occur during an observed event. In judo, for example, researchers typically describe psychological attributes and characteristics of competitive judokas. The main tools for data collection used in the descriptive studies reviewed in this article were interviews and questionnaires. These studies focused on the following psychological aspects of the competitive judoka: imagery; motivation; stress, anxiety, and mood states; eating attitudes and weight control; and coach/athlete interactions.

Imagery: Two studies that examined the relationship between imagery and judo performance were found. In one study (Campos et al., 2001), questionnaires regarding mental imagery, movement imagery, and body consciousness were administered to 48 college students at the intermediate judo level (i.e., judokas who hold a green belt). The judokas' competence in performing a number of

skills in judo (e.g., destabilizing the opponent, maintaining an appropriate spatial position, overall coordination) was assessed independently by two expert judges. No relationships were found between the responses to the imagery questionnaires and the assessed skills. However, responses to the body competence scale correlated moderately with the judo skills ($r = .28 - .4$). It was unclear from this cross-sectional study what type of imagery was used by the judokas, or when the imagery sessions took place. If the judokas imagined sparring against an opponent, the benefits should be examined during a combat and not merely when performing judo skills. The fact that the performance of judo skills under sterile conditions did not correlate with the scores of the imagery questionnaire does not necessarily lead to the conclusion that the imagery practices were not useful.

In contrast to the previous study, a qualitative study of 36 elite Korean judokas found that the ability to visualize judo performances or the competition site differed between medalists and non-medalists (Han, 1996). However, 83% of the medalists reported that in their least successful combats they were unable to visualize their mental preparation routine. The author of this study suggested that individualized psychological preparation plans should be developed for judokas, and that additional studies on imagery and its relationship to judo performance are needed.

Motivation: An attempt was made to examine motivational aspects that differentiated between judokas who persisted in their elite training and those who dropped out (Le Bars et al., 2009). Participants were 52 judokas (30 males, 22 females) who persisted in their training during the first two years, and 52 judokas (34 males, 18 females) who dropped out during the first two years of their program. In Phase 1 of the study, the judokas completed five questionnaires regarding goal orientation, success, self-perception, perceived competence, and intentions of giving up judo. The results showed that dropouts, compared with judokas who persisted, perceived the motivational climate as more ego-involving and less task-involving. In addition, the best predictor for persistence was a peer-induced task-involving climate. While dropouts were less task-oriented, persistent judokas were more ego-oriented. Phase 1 was a cross-sectional study and Phase 2 was a longitudinal study; both examined the changes in judokas' perceptions of motivational factors over two years. Out of the original sample, 45 males and 37 females completed the questionnaires six times over two years. The perception of the coaches' ego-involving role increased over two years. However, there was no concurrent increase in the judokas' ego-orientation. As the authors suggested, these findings may reflect relative independence between the coach-induced and the athlete-induced motivational climates. Parents' task-involving role decreased over the two years, while no changes in the judokas' task-orientation was recorded. Interestingly, the intention to drop out increased over the two years. In general, this study suggests that the main distinction between persistent judokas and dropouts is that dropouts perceived the roles of coaches, parents, and peers as less task-oriented. Coaches should be aware of the fact that creating a task-oriented

climate can be beneficial for their judokas.

A second study on motivational aspects in judokas involved 32 females and 69 males who participated in a French national tournament, and examined whether coaches' support for judokas' autonomy increased the judokas' motivation (Gillet et al., 2010). Three questionnaires – contextual motivation for judo, situational motivation for the specific judo tournament, and the perceived autonomy support – were administered two hours prior to the beginning of a combat. Results showed that coaches' support for judokas' autonomy was associated with contextual (i.e., general) self-determined motivation towards judo. This, in turn, was associated with situational self-determined motivation prior to the specific judo tournament. These results support a hierarchical or top-down model that begins with coaches' autonomy support, continues with contextual and situational self-determined motivation, and ends with objective performance. However, these results should be interpreted with caution, as no causation can be inferred from the design of this study. In addition, while the judokas were assessed as one group, their age range was 14–43 years, and differences across age groups are intuitively plausible. Future work should use carefully planned experimental designs in order to examine the validity of their results.

Changes in motivational factors of judokas from the Polish National team before (1989/1990, 25 females and 25 males) and after (2002, 11 females and 9 males) Poland joined the European Union (EU) were described using a motivational questionnaire (Sterkowicz, 2006). The judokas answered three questions for each of nine motivational categories (excellence, health and fitness, affiliation, independence, stress, ambition for power, extrinsic success, intrinsic success, and aggression). In the female judokas, the importance of the motivational factors remained similar before and after joining the EU. The most important factors were attaining health and fitness, the pursuit of excellence, and the need for independence. In male judokas, the most important factors before joining the EU were attaining health and fitness, the need for independence, and excellence. However, after joining the EU, excellence dropped down to fifth in importance. In general, the motivational profiles of female and male judokas were moderately similar before joining the EU and less similar after joining the EU. This change was due primarily to a change in the male judokas. While the authors did not speculate on the possible reasons for the changes in the male judokas' motivational profile, it is possible that social and cultural changes after joining the EU had an impact on the judokas. However, the small sample size of male judokas and the lack of control for other influencing variables (e.g., changes in training emphasis, changes in training staff) leads to uncertainty regarding the reasons for the observed changes.

One study was found to be associated with an achievement goal theory. Goal orientations explain one's tendency to be task- or ego-involved in a specific situation (Gernigon et al., 2004). Being task-involved means attempting to master the task at hand, while being ego-involved suggests that the goal is to outperform others or to avoid being outperformed and judged critically for it.

In another study, the goal orientation of 80 young (mean age = 12.1 ± 1.4 years) and 84 adult (mean age = 28.5 ± 8.3 years) judokas and aikidokas was examined (Gernigon and Le Bars, 2000). Unlike judo, aikido is not a competitive sport, and therefore differences in goal orientation were to be expected. No significant differences in goal orientation were found between beginner (less than three months of participation in the sport) judokas and aikidokas. However, in experienced children and adults, ego orientation was higher in judokas when compared to aikidokas. It was explained by the authors that ego-orientation did not influence the initial choice of sport. In addition, task orientation was present in both the judokas and aikidokas. In a competitive sport such as judo, both task and ego orientations are of importance. Task orientation relates to mastering skills and advancing to higher belt ranks, while ego orientation relates to striving to win in combats.

Stress, anxiety, and mood states: *Chronic stress* has been defined as an imbalance (perceived or actual) between what is expected of an athlete and his or her ability to respond to these expectations (Gould and Whitley, 2009). As Eysenck et al. (2007) suggested: "Anxiety is an aversive emotional and motivational state occurring in threatening circumstances" (p. 336). *Mood* has been defined as "a set of feelings, ephemeral in nature, varying in intensity and duration, and usually involving more than one emotion" (Lane and Terry, 2000, p. 17).

A three-study research examined a number of aspects of stress in elite Korean judokas (Han, 1996). In Study 1, the profiles of 24 judokas were examined by using interviews. The judokas registered high scores in four categories: negative aspects of competition, negative significant-other relationships, personal struggles, and traumatic experiences. More specifically, the most important stressors were concerns about the coaches' criticism after the combat and individual conflicts with coaches. This finding can be explained by the one-directional communication path from coaches to athletes in the Korean sport culture. As the author suggested, athletes were required to always follow their coaches' instructions. It should be noted that such instructional methods can lead to passivity and to the adoption of a "learned helplessness" approach. In addition, the judokas reported that stress and poor performance occurred when significant others (e.g., their mother) were present in the crowd.

In Study 2, differences between medalist and non-medalist judokas were examined. While all the medalists reported no negative feelings or negative thoughts, only 40% of the non-medalists reported the same. The medalists also reported making heightened efforts and commitment, while only 47% of the non-medalists reported the same. The two key factors that were found to distinguish between medalists and non-medalists were the ability to visualize judo performances and the ability to use a "focus-refocus" technique.

In Study 3, differences in state anxiety between medalist and non-medalist judokas and between male and female judokas were examined in 24 Korean judokas participating in the World Cup. Judokas were asked to

recall their anxiety and mood states in their most successful and least successful combats, and during regular practice sessions. The results showed no differences between female and male medalists. State anxiety was highest in the least successful combats and was lowest in practice sessions. In addition, the judokas reported that it was not easy to recover from the high anxiety level and return to previous levels. The author suggested that a "catastrophe" model best explained the relationship between anxiety and poor performance in Korean judokas. In such a model, once an athlete passes a certain threshold of arousal and anxiety, a dramatic decline in performance follows.

The relationships of hormonal psychological responses and competition were examined before and during two judo competitions (regional and inter-regional) in a group of 12 experienced judokas (2nd and 3rd Dan black belt) (Filaire, Sagnol et al., 2001). Three weeks prior the competitions, saliva samples were collected during a resting day at 8 a.m., 12 p.m., and 5 p.m. On competition days, saliva samples were obtained at 8 a.m., five minutes prior to the first combat, and five minutes after the last combat. Questionnaires regarding state and trait anxiety were administered three weeks before the competitions and five minutes before the first combat on competition days. The results showed significantly higher cortisol levels in both competition days compared to the values obtained three weeks prior to the competitions. In addition, in the inter-regional tournament, cortisol values before the first combat were higher than those obtained at 8 a.m. on the competition day. No differences in testosterone levels were found between the resting day and both competition days.

In this study, the results of the psychological measures showed significantly higher state, cognitive, and somatic anxiety and lower self-confidence in the inter-regional competition compared to the regional competition. In addition, cognitive anxiety and somatic anxiety correlated significantly with cortisol levels in both competition days (r values ranging from 0.62-0.90). The combination of non-invasive hormonal testing and psychological questionnaires can be useful in assessing judokas' stress and anxiety before competitions. Such data can be used by SPCs and judo coaches to determine whether coping strategy interventions can work in alleviating stress.

Differences in hormonal and psychological states between winning and losing judokas were examined in judokas who participated in the same two judo competitions (regional and inter-regional) (Filaire, Maso, Sagnol et al., 2001). Both the losers and winners had significantly higher cortisol levels during the day of the competition when compared to resting values taken three weeks before the competition. Trait anxiety and type A behavior (i.e., motivated by a need to control the environment, ambitious, impatient, pressured for time, reacts to frustration with hostility) were higher in the winners, while type B behavior (i.e., the lack of type A characteristics) and cognitive anxiety characterized the losers. In addition, ways of coping with anxiety differed between groups. Compared to the winners, losers scored higher on self-blame,

wishful thinking avoidance, and social support approbation. The winners, on the other hand, scored higher on the positive re-evaluation factor. Although no differences were found in hormonal levels between the winners and losers, the results of the psychological questionnaires suggest that successful performance is associated with lower levels of cognitive anxiety, higher levels of confidence, and the use of coping strategies such as positive re-evaluation.

An additional study examined both the hormonal and the psychological status of 17 male judokas during resting and during competition (Salvador et al., 2003). Saliva samples were taken twice (at 10 a.m. and 10:30 a.m.) at eight resting sessions every 14 days during the season. Approximately in the middle of this period, the judokas participated in a regional competition in which two saliva samples were taken at similar times. In all sessions, state anxiety and mood state questionnaires were completed by the judokas. Levels of cortisol, but not testosterone, were higher during competition compared to resting days. However, as the authors suggested, great individual variability was observed in the obtained data. The psychological data revealed higher state anxiety values on competition days compared to resting days, and higher anxiety scores early before competition when compared to right before the competition. It is important to note that cortisol levels right before the competition correlated positively ($r = .64$) with the perceived possibility of winning. Therefore, as the authors suggested, higher cortisol levels, with the addition of the high motivation and self-confidence found in all judokas, could facilitate an appropriate mood state for fighting. However, since these are correlational data, they should be interpreted with caution. It is unclear from this study whether there is a threshold for cortisol levels above which mood states and performance decline. Such a threshold would be in line with the "catastrophe" model discussed by Han (1996).

Eating attitudes and weight control: Sports that have weight classes can lead athletes to abnormal eating attitudes, which can lead to clinical eating disorders (ED). In one study (Sundgot-Borgen and Torstveit, 2004), 13.5% of elite athletes had clinical or subclinical ED compared to 4.6% in controls (non-athletes). In a study of female athletes (Torstveit et al., 2008), more of the athletes had clinical ED in leanness sports (46.7%) compared to those in non-leanness sports (19.8%) and compared to controls (21.4%). ED can have detrimental physical, psychological, and social implications, among them body image distortion and weight preoccupation (Montenegro, 2006). In addition, athletes with ED suffer more from depression, anxiety, and substance abuse, and might be at risk for serious medical complications (Montenegro, 2006). Based on the above findings, it is important to examine the implications of weight control in a weight-class sport such as judo.

One study (Rouveix et al., 2007) examined the prevalence of ED in 12 female (mean age = 17.2 ± 1.1 years) and 12 male (mean age = 16.5 ± 5 years) judokas compared to 14 female (mean age = 20.2 ± 3.0 years) and 17 male (mean age = 21.8 ± 1.8 years) controls (not ju-

dokas). Participants filled in questionnaires that dealt with eating attitudes, perfectionism, self-esteem, body esteem, and mood states. Seventy percent of the judokas had lost more than 2.8 kg during the season and 60% reported consciously limiting food choices. In females, menstrual dysfunction among judokas was 58.3% compared to 7.1% in controls. While no male judokas met the criteria for ED, three out of the 12 female judokas (25%) did meet the criteria for ED. Eating behaviors did not differ between male judokas and controls. In contrast, disordered eating attitudes and bulimia nervosa scores were higher in female judokas compared to controls (bulimia scores were higher by 200%). Both female and male judokas did not differ from controls in psychological characteristics or mood states. Lastly, in female judokas, body-esteem and weight satisfaction explained 54.6% of the variance in global eating attitudes, and BMI further predicted 17%. Importantly, while no male judokas had ED, 37% of them were involved in weight loss methods that could put them at risk for developing ED. In this study, 8.3% of the judokas reported that their coaches promoted weight loss. Coaches should be aware that instructions or comments regarding their judokas' weight can be detrimental to the judokas' performance and health. One limitation of this study should be noted: the age differences between judokas (approximately 17 years old) and controls (20-21 years old) could have affected the results, as eating attitudes can change from the adolescent years to the adult years.

Coach/athlete interactions: Two studies on the relationships between coaches and judokas were found. One study of 11 male coaches and 58 male and female judokas examined the relationships between instructions provided by the coaches in the preparation phase for combat in an official competition and the retention of those instructions by the judokas (Mesquita et al., 2008). The observed instructions were classified into four categories (prescriptive, descriptive, positive evaluation, and negative evaluation) based on the nature of the information provided, and four categories (verbal, visual, kinesthetic, and combined) based on the form of information provided. The retention of the judokas was assessed by interviewing them directly after the provision of the coach's instructions. The coaches delivered their instructions mostly in a prescriptive manner (84.7%) and by positive evaluation (11.3%), and they delivered 37.7 ± 21.0 words and 3.48 ± 1.19 ideas per instructional episode. Out of those, the judokas retained between 13.8 to 18.5 words and between 2.3 to 2.43 ideas. When examining the data based on the type of information, 2.3 ideas were retained under the verbal information (71.1% of information delivered) and 2.5 ideas were retained under the combined information (audio-visual or audio-kinesthetic). The coherency, namely the ratio between ideas delivered and ideas retained, was approximately 70% for both female and male judokas. However, female judokas showed greater coherency (80.52%) than male judokas (57.93%). Importantly, coherency was inversely related to the number of transmitted ideas, emphasizing the importance of delivering concise and specific ideas to the judokas prior to the combat.

While the study by Mesquita et al. (2008) focused

on the interactions between coaches and judokas during the preparation phase for a combat, a qualitative study of three highly experienced male coaches and six elite females holding international titles from the French national judo team examined the perceived effectiveness of interactions between coaches and judokas during practice sessions (d'Arripe-Longueville et al., 1998). The conducted interviews led to six categories of coaches' interaction strategies, namely (a) simulating interpersonal rivalry: social comparison and unfair selection process; (b) provoking judokas verbally: aggressive tones and negative feedback; (c) displaying indifference: lack of interest and communication; (d) direct conflict: lack of interest and threats regarding selection; (e) developing team cohesion: facing challenging situations; and (f) showing favoritism: increased instructions, feedback, and tolerance. From the judokas' point of view, five interaction categories were described, namely (a) showing diplomacy: competing non-adapted training tasks and accepting unfair attitudes; (b) achieving exceptional performance: regular presence in training and achieving their best results in competition; (c) soliciting the head coach directly; (d) diversifying sources of information: selecting appropriate information based on the coaches' competencies; and (e) bypassing conventional rules: seeking and utilizing other assistants.

As the authors of this study suggested, while the interaction strategies between coaches and judokas differed, they shared two main goals: optimizing the selection process and optimizing performance. For example, in order to optimize the selection process the coaches stimulated rivalry, provoked the judokas verbally, displayed indifference, and entered into direct conflict. In their mind, such practices would lead to mental toughness. The judokas, on the other hand, coped with their coaches' strategies by exercising diplomacy and trying to achieve the best performance. Those processes together could have led to an effective selection process. It is important to note that the interaction styles of coaches differed in some aspects from those described in the conventional leadership literature (i.e., democratic rather than authoritative leadership). In addition, the coping strategies used by the judokas suggest that the authoritative style of the coaches was not appreciated. As suggested in this qualitative study, most SPCs would agree that the interactions observed in this study were unhealthy and needed to be changed. Still, this national team was objectively highly successful. It is not known whether the judokas' mental toughness, maturity, and success were due to this type of coaching, or perhaps were in spite of it.

Experimental studies

In experimental studies, researchers can manipulate treatments or conditions that have the potential to enhance behavior (Thomas et al., 2011). One of the main objectives of the experimental studies in judo was to examine eating attitudes and weight control in competitive judokas after participation in a food restriction regime or a weight loss program.

Eating attitudes and weight control: Even when

abnormal eating attitudes do not lead to clinical ED, restricted eating – a common practice in judokas before competitions – can have a negative effect on the psychological profile of a judoka. This was demonstrated in a study of 11 male 2nd and 3rd Dan black belt judokas who underwent a 7-day food restriction regimen (Filaire et al., 2001). The judokas lost approximately 4 kg of body mass and 2 kg of fat-free mass after the food restriction period. The results showed significantly higher mood states of tension, anger, fatigue, and confusion, and a significantly lower mood state of vigor. Interestingly, physical performance remained relatively stable (i.e., no differences in right hand grip, squat jump, countermovement jump, or 7-sec jumping), except for a small reduction in left hand grip and 30-sec jumping performances. The adverse psychological effects of a 7-day food restriction regimen (mainly due to inadequate intake of carbohydrates and micronutrients) can affect mood states negatively, and as a consequence (although not reported in this study) it is possible that performance will be negatively affected.

The results of Filaire et al.'s (2001) study were supported by two other studies (Degoutte et al., 2006; Koral and Dosseville, 2009). In one study (Koral and Dosseville, 2009), 10 judokas (five females and five males) participated in a 4-week combined gradual and rapid weight loss program, and 10 judokas (five females and five males) served as controls (did not participate in the designated program). During the first three weeks of the program a food restriction program was used, and during the final six days before the competition exercising in plastic suits in order to lose weight through the loss of water was added. From the beginning to the end of the 4-week weight loss program, the participating judokas lost approximately two to three kg of body mass and approximately 2% of body fat, compared to no changes in the control judokas. The results showed no differences in physical performance but adverse changes in mood states. Specifically, confusion was elevated and vigor was reduced in both male and female judokas, and tension was elevated in the females of the weight loss program. No changes in mood states were found in the judokas in the control group.

Unlike the two previous studies (Filaire et al., 2001; Koral and Dosseville, 2009), somewhat different results were reported in a study of 27 male and 16 female judokas in Japan (Yoshioka et al., 2006). The judokas were divided into a group that was required to participate in a weight reduction program (22 males and 8 females) and a group that was not required to take part in such a program (5 males and 8 females). The weight reduction program lasted 20 days and ended one day before a judo competition. Both the males and females in the weight reduction group had lower values of body mass (~3kg), percent fat (~2%), body fat (~1 kg) and fat free mass (~2 kg) at the end of the program. No changes were observed in the judokas who did not take part in the program. Changes in mood states were found only in the males who participated in the weight reduction program. These judokas had higher values of fatigue and tension, and lower values for vigor. In addition, the total mood disturbance (TMD) – an index representing the unpleasant mood

states – was higher in males after the program. In contrast, in the females who participated in the weight reduction program there was a trend for the TMD to improve. These results suggest that while the process of weight reduction increased psychological pressure in male judokas, this pressure was actually reduced in females. These data, with the addition of the fact the TMD was higher in the females compared to the males before the weight reduction began, suggest that psychological support for female judokas may be warranted before the program begins, while the same support is needed for male judokas while the program is in progress.

One possible explanation for the findings that emerged from the studies described in this section is the different cultures in which the judokas were raised. It is possible that the psychological effects of food restriction on judokas living in European societies differ from those experienced by judokas in Japanese society. Although this is only an assumption, it is worth examining. At the least, the different findings of these studies emphasize the importance of adopting an individual approach for each judoka.

Case studies

A case study is an in-depth exploration of a bounded system (e.g., activity, event, process, or individuals) based on extensive data collection (Creswell, 2012). The term *bounded* means that the case is separated out for research in terms of time, place, or some physical boundaries. In judo, two case studies were found focusing on two psychological aspects – motivation, and stress, anxiety, and mood states.

Motivation: It appears that, at least in judo, goal involvement can be highly dynamic and individualized. This was observed in a case study of two male judokas where both quantitative and qualitative methodologies were used (Gernigon et al., 2004). The two judokas, part of a team of judokas, were videotaped during a practice session in their training facility. During this session, 5-min practice combats were conducted by all judokas. The researchers were introduced to all of the judokas, and the two judokas who participated in the study did not know that they were the ones on whom the video cameras were focused. After the 5-min combat, the two judokas were asked to watch the fight on a laptop computer and to use a mouse to indicate how involved they were in three goal-involvement states: mastery involvement ("At this time, I desire to completely master my technique"), performance-approach involvement ("At this time, I am motivated by the thought of outperforming my partner"), and performance-avoidance involvement ("At this time, I just want to avoid doing poorly faced with my partner"). The computer recorded moment-to-moment levels of involvement of the two judokas. This procedure was followed by oral interviews regarding the judokas' activities during the combat. The results showed that the states of mastery, performance approach, and performance avoidance showed rapid – sometimes abrupt – variations during a combat. In addition, both patterns of correlations (high and low) were found among the three states. The qualita-

tive data suggested that the changes in goal involvement varied, based mainly on the course of action of the combat. Lastly, there were clear differences in the pattern of changes between the two judokas. The data of this case study suggest that goal involvement states fluctuate, undergo abrupt changes, and develop varied relationships between them, according to the ecological constraints of the situation. These data also suggest that the psychological processes occurring during a judo combat are complex and individualized, and therefore psychological interventions that help one judoka may not help another in improving performance.

Stress, anxiety, and mood states: Similar to the fluctuations in achievement goals, one case study of an elite male judoka reported fluctuations in mood states, coping styles, and goals (Stevens et al., 2006). Personality, self-esteem, mood states, coping strategies, and performance-related goals were recorded during a competition. Data were collected prior to the first combat, after the first combat (win), after the second combat (win), after the third combat (loss and continue to reportage), and after the fourth combat (loss). Mood fluctuated at each assessment. After winning the first two combats, anger, depression, and fatigue appeared. After the third combat, the judoka realized he needed to face a difficult opponent in the next (fourth) combat. This led to a decrease in the judokas' self-efficacy to achieve his goals, and an increase in confusion and tension. After losing the final combat, an intense emotional reaction was evident. This was evidenced by an increase in anger and depression and by reduced vigor. The fluctuations in mood states were related to changes in the self-efficacy of achieving goals. In addition, coping strategies also changed in accordance with changing mood states. This study illustrates how the psychological profile of a judoka can change abruptly by both intrinsic (e.g., mood states, goal settings) and extrinsic (e.g., winning or losing, coach's instruction, quality of opponent) variables.

Methodological concerns and research limitations

Before implementing those interventions found to assist judokas in their practice sessions and combats, coaches and SPCs should be aware of a number of methodological concerns and research limitations associated with the reviewed studies. Based on the studies reviewed in this article, the following seven methodological concerns and research limitations are discussed.

The lack of experimental design

Among the 18 studies discussed in our review, only three were found to be experimentally designed (Degoutte et al., 2006; Filaire et al., 2001; Koral and Dosseville, 2009). Although we acknowledge the methodological challenges of performing experimental studies on competitive judokas (e.g., the small number of potential participants, the elite judokas' lack of time to participate in experimental studies conducted under controlled-laboratory conditions), an effort should be made to conduct not only observational studies, but also studies that can lead to a cause and effect relationship (i.e., experimental). Studies

using experimental designs are necessary in order to provide answers to questions associated with the effectiveness/lack of effectiveness of psychological interventions in judo. Although data exist on a number of psychological aspects of judokas, such as anxiety, mood states, and motivation, no studies on psychological interventions in judo were found. For example, data regarding the stress and anxiety profiles of judokas exist, but there are almost no studies that provide data on how judokas cope with these feelings. Moreover, it is not known whether some levels of stress are beneficial to performance in judo or whether performance deteriorates above a certain level. In this respect, either a two-group design comparing one interventional group with a control group (no-intervention group) or a three-group design comparing two different interventional groups with a control group (no-intervention group) can be used.

The lack of longitudinal studies

In only one study among the 18 reviewed studies in the current article was a longitudinal approach used (Le Bars et al., 2009, Phase 2). By using a longitudinal approach, relevant information on developmental aspects of psychological attributes of judokas, as well as on the effectiveness of certain psychological interventions to achievement in judo, can be obtained. It would be useful for researchers and practitioners alike to obtain information on the use of psychological interventions during different periods of the competitive season (e.g., the preparation phase, the competition phase, and the transition phase), and among different skill levels and age groups. This information would result in an improvement in the coach's ability to compare achievements among competitive judokas and to effectively plan individual training programs for them. Unfortunately, longitudinal studies are also not often conducted in other individual and team sports (see Lidor and Ziv, 2011; Ziv and Lidor, 2009).

The lack of studies on the use of imagery

Imagery practice is widely used in competitive sports, among both elite (see, for example, Morris et al., 2005) and beginning (see Lidor and Ziv, 2011) athletes. However, there is a lack of studies examining the effectiveness of imagery on judo performances. In our review, only two descriptive studies on imagery in judo were found (Campos et al., 2001; Han, 1996). In one study (Campos et al., 2001), the type of imagery used by the judokas was not provided. The use of imagery can help judokas to better prepare themselves for practice sessions and competitions. It is assumed that if athletes in both individual and team sports can benefit from the use of imagery training, then also judokas can gain an advantage implementing this skill-enhancement psychological technique. Therefore, additional descriptive and interventional studies are needed in order to determine which types of imagery practices are beneficial for competitive judokas.

The lack of qualitative studies

Most of the studies discussed in our review assessed judo performances based on quantitative measurements. In order to obtain relevant data on the feelings, perceptions,

and thoughts related to the psychological preparation of competitive judokas, qualitative data should also be collected by researchers. It has been well established in the sport psychology literature that qualitative measurements should be mixed with quantitative measurements in order to fully understand the examined sport psychology phenomena (see Smith and Sparkes, 2012). For example, reading the personal logs of elite judokas, or conducting in-depth interviews with them before and after practice sessions or prior to and after major combats, can help researchers collect data that cannot be obtained from studies using quantitative measurements. This qualitative information can be used by researchers to effectively design studies examining the effectiveness of a given psychological intervention on judo performances, as well as by SPCs when implementing this intervention in their practical work with competitive judokas.

The lack of case studies

Only two case studies associated with psychological preparation in judo were found in our review – one case study on the goal involvement of two male judokas where both quantitative and qualitative methodologies were used (Gernigon et al., 2004), and another case study of an elite male judoka which examined fluctuations in mood states, coping styles, and goals (Stevens et al., 2006). It is assumed that the educational, professional, and psychological experiences gained by competitive judokas from early phases of talent development can be shared, and therefore could potentially help both professionals (e.g., coaches and SPCs) and other judokas enrich the judokas' psychological preparation. The use of a case study approach can provide the judokas with the opportunity to share their experiences, perspectives, and reflections – not only the positive but also the negative ones. In addition, researchers can use the information provided by the judokas to plan additional studies on the use of psychological interventions in judo, in which both quantitative and qualitative measurements are performed.

The lack of studies examining cultural issues

Our review was composed of studies in which data were collected on judokas from different countries, such as France (Western Europe; Gillet et al., 2010), Korea (Asia; Han, 1996), and Poland (Eastern Europe; Sterkowicz, 2006). It is assumed that these judokas grew up in sport cultures exhibiting different characteristics. SPCs should be aware of the fact that cultural differences can influence how athletes perform sport psychology interventions (see for example, Lidor and Blumenstein, 2011 and Schinke et al., 2009). This is to say that the effective use of a given intervention by a judoka from one culture may not be observed in a judoka from another culture. Therefore, there is a need to conduct cross-cultural studies where competitive judokas from different sport cultures will practice similar sport psychology interventions. This cross-cultural comparison would enable researchers to assess the contribution of a given psychological intervention while taking into account cultural influences, and therefore may strengthen the ecological validity of the intervention.

The lack of studies on on-court judo performances

In only two studies included in our review were data collected in real judo environments: one study (Mesquita et al., 2008) focused on the interactions between coaches and judokas during the preparation phase for a combat, while a second study (d'Arripe-Longueville et al., 1998) examined the perceived effectiveness of interactions between coaches and judokas during practice sessions. By collecting data associated with on-court performances of judokas in real-judo settings, such as practice sessions and combats, researchers can increase their understanding of what is really happening during practice sessions and combats, and therefore plan effective psychological preparation for the individual judoka. The lack of data collected from on-court judo performances, either in practice sessions or combats, hinders the ability of the SPCs to develop appropriate sport psychology interventions that reflect the specific needs of the competitive judoka. For example, observations on judokas who tend to show decreased performance when under pressure or when the stakes for winning or losing are high can be conducted, and consequently, effective psychological preparation can be individually tailored to help them cope with these situations.

Conclusion

In this article we reviewed 18 studies dealing with motivation, imagery, stress, anxiety, mood states, eating attitudes and weight control, and coach/judoka interactions. The discussed data illustrate complex psychological profiles of judokas participating in competitive judo, from different aspects of motivation through different stress and anxiety responses to competition, and to negative mood states accompanying weight reduction programs. Coaches and SPCs should be aware that individual judokas may require different interventions in order to improve their judo performances. Researchers should strive to conduct additional studies on the effectiveness of imagery on judo performances, coping strategies for stress and anxiety, and strategies that help judokas cope with the phenomenon of choking under pressure. We assume that additional studies on such interventions will help coaches and SPCs develop improved psychological preparations aimed at improving performance in competitive judokas.

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Key points

- This article reviews a series of studies (n = 18) examining psychological aspects of judokas who compete at the intermediate level, national team level, and international level, and who hold international titles.
- Weight reduction programs that judokas undergo prior to a judo combat can lead to unpleasant moods.
- Psychological preparation plans should be tailored to each individual judoka, as there can be significant individual differences among competitive judokas.
- An effort should be made to conduct experimental-designed studies in order to assess the effectiveness of psychological interventions in judo.

AUTHORS BIOGRAPHY

**Gal ZIV****Employment**

Lecturer at the Zinman College of Physical Education and Sport Sciences, Wingate Institute, Israel.

Degree

PhD

Research interests

Attentional strategies, cognitive strategies, gaze behavior.

E-mail: galziv2@gmail.com

**Ronnie LIDOR****Employment**

Professor at the Zinman College of Physical Education and Sport Sciences, Wingate Institute, Israel.

Degree

PhD

Research interests

Cognitive and learning strategies, early talent development, sport development.

E-mail: Lidor@wincol.ac.il

✉ Dr. Ronnie Lidor, Professor

The Zinman College of Physical Education and Sport Sciences
Wingate Institute, Netanya 42902, Israel