

**PSYCHOLOGICAL CORRELATES OF TRAINING AND  
PERFORMANCE IN SENIOR AND JUNIOR ELITE  
JUDO ATHLETES**

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## PSYCHOLOGICAL CORRELATES OF TRAINING AND PERFORMANCE IN SENIOR AND JUNIOR ELITE JUDO ATHLETES

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### I Introduction

Research has documented the psychological factors that predict competitive success in American Judo athletes<sup>2,9,13,14,15,16</sup>. These studies were unique because they linked pre-competition psychological states with actual performance in competition. In one study, for example, senior elite and non-elite athletes completed the State-Trait Anxiety Inventory (STAI), the Sport Competition Anxiety Test (SCAT), and the Sport Self-Confidence Inventory (SSCI), all of which are widely used measures in sport psychology. The elite athletes also completed the Big Five Inventory (BFI), a common personality test that assesses five universal dimensions of personality. Performance indices for elite athletes were gathered from actual competition the following day, and included a classification of each athlete as placing or not in the tournament, individual win ratios across all matches, and attack frequencies averaged across matches. Male placers had marginally significant higher scores on Openness than non-placers, and female placers higher scores on extroversion, conscientiousness, and self-confidence, and significantly lower scores on neuroticism. Female placers also had lower anxiety scores than non-placers.

In a subsequent study, 68 elite and 71 non-elite Judo athletes completed a battery of psychological measures assessing competition anxiety, mood, stress, sport-related self-confidence, coping strategies, personality, and locus of control. Path analyses testing six causal models indicated that several key variables predicted performance. Athletes who experienced more subjective control over the outcome, attacked more during matches, and had more internal locus of control performed better. Coping processes involving confrontive coping, escape/avoidance coping, social support-based coping, and conscientiousness predicted subjective control. Neuroticism predicted escape/avoidance coping<sup>15</sup>. Elite athletes also had more self-confidence, higher scores on anger-hostility, and more subjective control over the outcome of the competition than non-elite athletes<sup>2,9</sup>.

Cumulatively, these studies indicate that competitive success is associated with more self-confidence, anger-hostility, subjective control over outcomes, conscientiousness, internal locus of control, and social support. Competitive success is also associated with less anxiety, neuroticism, confrontational styles of coping, and escape/avoidance coping. Clearly, these findings have helped us to pinpoint the psychological characteristics of elite judo athletes immediately prior to competition that are relevant and important to predicting subsequent competitive success.

### 1. Relevant Non-Judo Literature

These findings are congruent with the non

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-judo literature as well. For instance, some studies indicate that successful athletes coped with stress more effectively than non-successful athletes<sup>21</sup>. Others have also demonstrated that anxiety, mood, stress, coping, and control collectively contribute to the prediction of performance<sup>10,18,19</sup>.

Equally important are the psychological factors of the stress and coping paradigm that predict training outcomes and adherence. Indeed, the ability to train effectively no doubt has an impact on performance. Previous research indicates that psychological constructs do indeed predict training outcomes. For example, changes in anger, anxiety, and self-confidence over the course of 10 week training camp for elite Judo athletes predicted training camp performance<sup>17</sup>. Mood and adaptive coping behaviors predicted the amount of control and commitment to training regimens for junior high school, high school, and college swimmers<sup>5</sup>. Locus of control predicted strength change scores in college football players over a 14 week weight training program<sup>3</sup>. Stress levels and personality characteristics have been associated with overtraining<sup>3</sup>. Finally, one study used changes in mood to assess whether Olympic canoers became stale from too much training<sup>1</sup>. These studies point to the relevance of psychological factors in the training process.

## 2. Translation to Training

While we know of the importance of certain psychological characteristics in dealing with stress and anxiety prior to competition, it is not clear as to whether the same psychological models can account for training effectiveness in the days, weeks, and months prior to competition. Competitive performance is heavily influenced by the degree and types of training athletes engage in for extended periods of time prior to shiai. As such, the psychological factors that contribute to effective training over these periods of time are crucial to competitive success or failure.

The psychological models we have created until now may not be directly applicable to training. While momentary psychological control over outcomes, coping, and state self-confidence are important in dealing with pre-competition stress, the same psychological variables may not be important in dealing with the stress of training, or predictive of competitive performance when assessed much prior to competition. Given the importance of training in any sport, it is necessary to examine the degree to which our psychological models are relevant to predicting training performance and subsequent competition when the competition is not immediate.

## 3. Statement of the Problem and Overview of the Study

This study extends our previous work by examining the role of psychological characteristics in predicting training as well as competitive outcomes. Senior and junior elite judo athletes completed a comprehensive battery of psychological tests that included all of the measures used in our previous research, as well as one additional one. Data were collected during training camps that were held several months before competition. The coaches at the training camps rated training performance for each individual athlete. Competition performance was assessed by placement at the later competition.

## II Methods

### 1. Subjects

Data were collected at two training camps conducted at the U.S. Olympic Training Center. One was for senior elite athletes held in February of 1997 (n=54, 28 males, 26 female; mean age=21.02; mean rank=nidan; mean number of years in Judo=11.29); the other was for junior elites held in April (n=40, 24 males, 16 females; mean age=17.44 years; mean rank=shodan; mean number of years in Judo=7.85). Although some

athletes participated in both camps and data collections, only their data from a single session was used.

## 2. Measures

Psychological variables. A comprehensive battery of psychological tests was used, including six measures used in our previous research:

- (1) The Big Five Inventory (BFI) is a 54-item test that scores five personality dimensions: Openness, Neuroticism, Conscientiousness, Extraversion, and Agreeableness. It has been used widely in the psychological literature and shown to be both reliable and valid<sup>7,8)</sup>.
- (2) The Locus of Control (LOC) test is a 29-item test that measures the degree to which a person attributes control of events to internal (self) or external (environmental) factors, and has also been used widely both reliably and validly<sup>20)</sup>. This test is essentially one of attributional style, which is the typical way in which individuals interpret the underlying causes of events or situations in which they engage. A person with a high internal locus of control is more likely to attribute causes of events to factors that are internal to him or herself, such as effort, ability, aptitude, and the like. A person with a high external locus of control is more likely to attribute causes of events to factors that are external to the self, such as fate, luck, coaching, situational determinants, and the like.
- (3) The Brief Coping Inventory (BCI) is a 24-item test that scores 8 types of psychological processes individuals use to cope with stressful events: Confrontive Coping, Distancing, Self-Control, Seeking Social Support, Accepting Responsibility, Escape/Avoidance, Planful Problem Solving, and Positive Reappraisal. Good reliability and validity statistics have been reported for this measure<sup>4)</sup>.
- (4) The Competitive State Anxiety Inventory (CSAI) is a 27-item test that measures two types

of competitive anxiety: cognitive and somatic. It has been widely used in the sport psychology literature both reliably and validly<sup>12)</sup>

- (5) The Profile of Mood States (POMS) is a 65-item test that measures six different moods: Tension-Anxiety, Depression-Downing Dejection, Anger-Hostility, Vigor-Activity, Fatigue-Inertia, and Confusion-Bewilderment. This measure has also been demonstrated to have high reliability and validity<sup>11)</sup>.
- (6) The State Sport Self-Confidence Inventory (SSCI) is a 13-item test that measures state self-confidence. The CSAI described above also includes a Self-Confidence scale that was scored. Finally, athletes made a single-item rating, on a 4-point scale, of how much confidence they felt they had in being capable of doing what was necessary to alter the outcome of the competition. The SSCI has been widely used in the sports psychology literature and shown to be both reliable and valid<sup>23)</sup>.

In addition, we included the Attributional Style Questionnaire (ASQ)<sup>22)</sup>. The ASQ is a 48-item questionnaire briefly describing situations and events with positive or negative outcomes. For each, subjects select one of two presumed causes, each of which operationalizes a different facet of optimism. Optimism is an attributional style characterized by a tendency to interpret events, people, and situations positively. Pessimism, on the other hand, is the tendency to make negative interpretations. Optimistic people are better able to overlook negative events, stress, and duress, in the hope of obtaining positive outcomes in the future. Optimistic attributional styles, therefore, may be important in dealing with and engaging in tough training regimens day in and day out in the hopes of positive competition outcomes. While optimistic people are likely to engage in effective training for this reason, pessimistic people are likely to find such engagement difficult.

Scores on ten scales of attributional styles related to optimism or pessimism are derived from the various items, including

- Permanent Bad and Good (the degree to which people believe the causes to bad events are permanent)
- Pervasive Bad and Good (the degree to which people believe the causes to had events are universal or specific)
- Personalization Bad and Good (referring to the degree to which people use internal v. external explanatory styles for bad events)
- Hope (for ease of interpretation, these scores were reverse coded)
- Total Bad and Total Good
- Overall Optimism.

In congruence with our previous research, the athletes also provided four ratings on their subjective level of stress they felt during the time of the assessments, importance of the events, how much subjective control they felt they had over outcomes, and how much confidence they had. Each of these ratings was made on 4-point scales. The athletes also provided some basic biodata, and a brief description of their training schedule, including information related to their Judo training, strength and conditioning training, cross-training, other training aids and supplemental training.

Training performance ratings. A four-item rating scale completed independently by all coaches at the camps measured each athlete's performance. The four items included ratings of technical, randori, supplemental training, and other training sessions. All ratings were completed using a five-point scale ranging from 1, poor, to 5, excellent. Four coaches made ratings at both camps, and the ratings were averaged across coaches on each item for each athlete, producing four composite training camp performance ratings. Averaging across the four composites also produced an overall training performance rating.

Competition performance data. Competitive performance for each athlete was measured by actual competition performance at the U.S. Senior National Judo Championships that occurred during the first weekend of May of 1997. All athletes finishing 1st, 2nd, or 3rd were classified as "placers," all others were classified as "non-placers."

### 3. Procedures

The data were collected in two separate sessions, with the BFI, LOC, and ASQ completed in the first session, and all other psychological variables completed in the second. Performance ratings by the coaches were completed at the end of the camps at the final coaches' meetings.

### III Results

Data were analyzed separately for each session, and across both sessions, and separately for seniors and juniors. All findings reported here were reliable across all sets of analyses conducted; thus for parsimony, we report only a single set of findings from the aggregated data set.

#### 1. Did the Psychological Characteristics Predict Performance During Training?

Pearson product moment correlations were computed between each of the psychological variables and the composite coaches' ratings averaged first within each coach, and then across all four of the coaches. We considered as significant only those effects that were statistically significant using the overall composite coach ratings, and at least two of the other within-coach averages.

ASQ scale Pervasive Good was significantly and positively correlated with all five training performance indices,  $r(92) = .3066, p < .05$ ;  $.3848, p < .01$ ;  $.4316, p < .05$ ;  $.3449, p < .05$ ; and  $.4480, p < .05$ , respectively. Athletes who were pervasively optimistic in their attributional style performed better at the training camps than athletes with less optimistic attributional styles.

POMS Vigor subscale was significantly and positively with overall coaches' ratings, and two specific coaches ratings,  $r(92)=.5081$ ,  $p<.01$ ;  $r(92)=.3831$ ,  $p<.05$ ;  $r(92)=.4597$ ,  $p<.01$ . Athletes with more vigor, vitality, strength, and energy performed better at the training camps.

Athletes' subjective ratings of how much control they felt they had over the outcomes of the training camp also positively correlated with coaches' ratings,  $r(92)=.5351$ ,  $p<.01$ ;  $r(92)=.4825$ ,  $p<.01$ ;  $r(92)=.4953$ ,  $p<.01$ ;  $r(92)=.3665$ ,  $p<.05$ ; and  $r(92)=.2570$ ,  $p<.10$ , for the overall and four coaches' ratings, respectively. Athletes who had more subjective control performed better at the training camps.

Finally, CSAI Self-confidence was positively correlated with training performance ratings,  $r(92)=.5915$ ,  $p<.01$ ;  $r(92)=.5677$ ,  $p<.01$ ;  $r(92)=.5901$ ,  $p<.01$ ;  $r(92)=.3702$ ,  $p<.01$ ; and  $r(92)=.3404$ ,  $p<.05$ , for the overall and four coaches' ratings, respectively. Confident athletes performed better during the training.

## 2. Did the Psychological Characteristics Predict Performance in Subsequent Competition?

T-tests were computed on all psychological variables, using the place/non-place personality scale Agreeableness,  $t(93)=2.02$ ,  $p<.05$ , on the Hope subscale of the ASQ,  $t(89)=1.62$ ,  $p<.05$ , and on the Distancing subscale of the BCI,  $t(48)=1.81$ ,  $p<.05$ . Placers also had lower scores on the Anger-Hostility subscale,  $t(47)=1.53$ ,  $p<.06$  and the Confusion-Bewilderment subscale of the POMS,  $t(48)=1.27$ ,  $p<.10$ ; and the Cognitive Anxiety subscale of the CSAI,  $t(48)=1.96$ ,  $p<.05$ . No other effects were significant. (Because of high missing values in some of these analyses, these tests were recomputed by replacing missing values with individual and group means, and by using product moment correlations, recoding the place/non-place data into an interval variable according to

actual place in the tournament. There were no differences in these findings.)

## 3. Post-Hoc Analyses

To examine the possibility of performance differences in the non-psychological data, we performed t-tests on these variables, using place/non-place as the independent variable. Placers reported more sprint workouts per week than non-placers,  $t(65)=2.18$ ,  $p<.05$ , and a greater amount of time in newaza drills,  $t(84)=1.71$ ,  $p<.05$ . All other effects, however, were not significant.

We also created a new "super elite" category, identifying those athletes who were the top rated athlete in their weight category. We then compared these athletes against all other elite athletes on the non-psychological data; none of the effects except age was significant (super elite athletes were younger). Also, other than age and years doing judo, only two non-psychological variables differentiated junior elites from senior elites; junior elite athletes did more distance runs per week and more cross-training,  $t(78)=3.13$ ,  $p<.01$ ; and  $t(35)=2.64$ ,  $p<.01$ , respectively.

Because the ASQ was newly introduced in this study, we computed product moment correlations between all scales of the ASQ and the other psychological variables. There was a substantial number of statistically significant findings, especially with the five personality scales of the BFI and the LOC (Table 1). In short, athletes with optimistic attributional styles tended to have higher scores on Agreeableness, Conscientiousness, and Openness, and lower scores on Neuroticism, and tended to have more internal locus control.

## IV Discussion

Athletes who were more optimistic, experienced more vigor and strength, experienced more subjective control over outcomes, and had greater self-confidence were uniformly rated higher in

**Table 1 Product Moment Correlations Between BFI and LOC with ASQ Scales (decimals omitted)**

	Permanent Bad	Permanent Good	Pervasive Bad	Pervasive Good	Personalizati on Bad	Personalizati on Good	Hope	Total Bad	Total Good	Overall Optimism
Extraversion	-1056	1142	0525	-0389	0403	0767	-0149	0370	0492	-0490
Agreeableness	-2419*	2036	-2040	3741**	-0940	0091	-2658*	-2079	1866	2502*
Conscientiousness	-2436*	2497*	-2299*	2812*	-0648	0153	-2782*	-2102	2185*	2792*
Neuroticism	3182**	-1623	1507	-2074	0030	-1499	2833**	2356*	-2000	-2582*
Openness	-2289*	1462	-2513*	-0734	-0175	-0232	-2927*	-1831	-0284	0792
Locus of Control	1098	-1561	1687	-2705*	-0374	-2960**	1628	0865	-2883*	-2899*

their training performance during the camps. In addition, athletes scoring higher on Agreeableness, hope, and distancing-type coping, and lower on anger, confusion, and anxiety during the training camps performed better in later competition.

These relationships are quite different than those identified in our previous research that predicted competitive performance, and suggest that different psychological mechanisms that predict competition performance are involved in training than immediately before competition. If true, it raises questions concerning exactly what those mechanisms during training may be, and how they translate over time to the pre-competition mechanisms observed in our previous research. This notion suggests a quite complex model of the psychological factors necessary for training and competition for judo athletes, with one model operating during training months prior to competition, and a different model operating immediately before competition. At this time, we have no speculation about what these models make look like.

One limitation of the current study concerns the reliability of the findings. With the exception of the findings on the optimism scale (ASQ), the number of significant findings involving the other psychological variables in relation to the total number of significance tests computed raises concerns about Type I error. Although the total proportion of significant results is above .05, it is not that substantially greater. One implication,

therefore, is the need to replicate the findings of this study. The findings reported from our previous research were replicated in two studies that involved multiple data collections with multiple samples. The current findings need to be replicated prior to further conclusions about the nature of the psychological mechanisms important to predicting training and performance outcomes.

Another limitation of the current data concerns the validity of the coaches' ratings. The coaches' ratings did not predict subsequent performance questions the validity of the nature of such training camps, or the nature of those ratings. If the coaches' ratings during the training camps were reliable, that would suggest that the important psychological mechanisms to explore occur not during periodic camps, but instead during the daily training that occurs in local judo dojos where the elite athletes train. Future research may explore this possibility further.

One of the promising findings from this study centered on optimism. Optimistic athletes performed better at the training camps, and at subsequent competition. There several possible reasons as to why this occurred. Optimistic athletes may be able to work through the stress of intense training, interpreting their training positively for future outcomes. Optimistic athletes, therefore, will continue to work hard, seek advice, correct mistakes, and have a positive outlook that contributes to their feelings of psychological control over later shiai outcomes. Pessimistic athletes, how-

ever, are less able to interpret their training experiences positively, and instead work less, seek less help, and are more apathetic about correcting mistakes in their judo.

This interpretation is bolstered by the correlation with locus of control. Optimistic athletes had more internal locus of control, while pessimistic athletes had more external locus of control. Internal locus of control is necessary for athletes to maintain a sense of psychological control over their training and subsequent shiai outcomes, which is important in determining competitive success. Athletes with external locus of control see events, situations, people, and their lives as being caused by factors outside of their direct control. These athletes would tend not to be able to train well, or compete well.

That optimism was related to conscientiousness and neuroticism fits well with our previous results. Optimistic athletes tend to be conscientious, which aids in their ability to adhere to strict training regimens in their daily lives. They are also able to better regulate their emotions, which is a hallmark of neuroticism. In conjunction with internal locus of control, these athletes are able to control their emotions, not allowing them to get the better of them during intense training. Many Judo coaches and athletes know that some intense emotions during tough training can overwhelm athletes and interfere severely with training regimens, negatively affecting subsequent shiai outcomes.

The emergence of the importance of Agreeableness is also new. While it is not directly important to shiai outcomes, the correlation between agreeableness and optimism suggests a degree of coachability on the part of the athletes. As many coaches know, some athletes are very difficult to coach. These athletes tend to be on their own, and it is very difficult to make adjustments in preparation for or during competition. These findings

suggest that optimism may be an important factor in predicting agreeableness, which has implications to the ability to seek and take advice from coaches, which is important in today's fast moving, ever changing competitive Judo world.

If the findings from this study prove to be reliable, they offer us a platform, in conjunction with our many findings from our previous research, to develop intervention strategies to increase psychological characteristics such as optimism in our athletes, and to conduct applied research demonstrating the effectiveness of such intervention and its contribution to competitive outcomes. Given the large literature in psychology on the relationship between optimism on many psychological (e.g., depression, subjective well being, etc.) and applied (health, longer life spans, better sales and business productivity, etc.) consequences, the benefits to our athletes may be greater than mere sport competition.

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## アメリカ人シニア・ジュニア柔道強化選手の トレーニングとパフォーマンスの心理的相関

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我々は、これまで数年間アメリカ人柔道選手を対象に、柔道競技(試合)に勝利するために必要な心理的要因について研究を行ってきた。そして、これまでの研究からは自己調整力や心理的な制御力のみならず個人の性格という側面が、競技上のストレスや不安を緩和し、よい成績に繋がるという知見を得ている。しかしながら、これらの結果以外に競技に先行するハードなトレーニング期間に柔道選手を支える重要な鍵となる別の心理的要因があるのではないかと考えられた。

本研究は、シニア・ジュニア柔道強化選手を対象に、競技力のみならずトレーニングを予測するための心理的な変数を抽出することを目的としている。

対象となったのはアメリカ人のシニア・ジュニア柔道強化選手(90名)で、被検者には7種の心理テストが課せられた。これらのテストはアメリカ合衆国オリンピックトレーニングセンターでの二回に亘る合宿中に配布された。さらに二回の合宿中、それぞれの選手についての能力評価はコーチ全員によって評定され、最終的に合宿一ヶ月後のU.S. Senior National Championshipsにおいて指数化された。

その結果、次の知見が得られた。

1. 楽観的、活動的、内省的な統制力、そして自信といった変数がすべてトレーニング結果を予測するものであった。すなわち合宿中、より楽観的で、より活動的で体力があり、結果に対してより内省的な統制があり、より自信を持っている選手は一樣にトレーニング力が優れていた。
2. また、人当たりの良さ、希望、どの様なところで自己調整が可能といった項目に高い得点をつけた選手は競技力に優れていた。さらに、一方で合宿中、怒り、迷い、不安といった項目に低い得点をつけた選手は、その後の競技(試合)で良い成績を修めた。
3. これらの研究結果は、これまでの研究結果と関連させて、今後の研究の指針になると思われる。