

DEVELOPMENT OF UPPER BODY STRENGTH IN SEOI-NAGE TECHNIQUE WITH REFERENCE TO KUZUSHI IN MALE INTERMEDIATE JUDO PLAYERS

R.M.D.L. Rajasingha^{1*} and S. Othalawa²

¹Division of Interdisciplinary Studies, Institute of Technology, University of Moratuwa, Diyagama, Sri Lanka

²Department of Sports Sciences and Physical Education, Sabaragamuwa University of Sri Lanka, Belihuloya

danushkar@itum.mrt.ac.lk^{1*}, ssothalawa@appsc.sab.ac.lk²

ABSTRACT: Upper body strength is a key factor influencing throwing performance in judo, particularly in techniques such as *Seoi-Nage*, where balance-breaking (*kuzushi*), timing, and explosive force generation are crucial. The specific impact of upper body strength training on *Seoi-Nage* performance remains underexplored in the Sri Lankan judo context. The primary objective of this study was to evaluate the effectiveness of an 8-week upper body strength training program in enhancing *Seoi-Nage* performance with reference to *kuzushi* in intermediate-level male judo players. Ten national-level judokas (N = 10; age > 30 years) were purposively assigned to two groups (IG = 5, CG = 5). Both groups continued regular judo training, while the treatment group received additional upper-body strength training three times per week, 2 hours per day for eight weeks. Pre- and post-tests measured 1RM Bench Press, Push-up Test, Medicine Ball Throw, and *kuzushi* performance via randori-based evaluation. Descriptive statistics and mixed-design ANOVA were used to analyze time, group, and interaction effects. A significant interaction was observed in 1RM Bench Press ($p = 0.000$), Push-up Test ($p = 0.000$), Medicine Ball Throw ($p = 0.000$), and *kuzushi* ($p = 0.000$). A significant main time effect was found in all variables ($p = 0.000$), and between-group analysis revealed a significant difference in *kuzushi* performance ($p < 0.05$) favoring the treatment group. These results suggest that the intervention led to meaningful improvements in upper body strength and *Seoi-Nage* performance both physiologically and technically. The results indicate that upper-body strength training may contribute to improving *Seoi-Nage* performance and could be considered as part of training routines for intermediate judokas.

Keywords: Judo, Kuzushi, performance, Seoi-Nage, strength training

1 INTRODUCTION

Judo, a dynamic martial art originating in Japan, is founded on the principles of balance, leverage, and the efficient use of energy. One of the most fundamental and frequently executed throwing techniques in Judo is *Seoi-Nage*, a shoulder-based throw that requires precise coordination between physical strength, timing, and technical execution (Callan & Bradić, 2018). Central to the success of this technique is the concept of *kuzushi*, or balance-breaking, which prepares the opponent for a throw by disrupting their balance (De Créé, 2015). Research indicates that intermediate-level male judo athletes often rely on lower-body mechanics or knee initiation to compensate for insufficient upper-body strength, which may compromise biomechanical efficiency and limit throwing performance (Ishii et al., 2018). This adaptation, while functional, often limits the biomechanical efficiency and full throwing potential of *Seoi-Nage* (Ishii et al., 2018). Notably, upper body strength-particularly in the shoulders, back, and core-plays a critical role in generating explosive force and controlling the grip and posture necessary for effective *kuzushi* (Franchini et al., 2013). Several studies have highlighted the importance of strength

training in improving performance in competitive judo. On the other hand, studies emphasized that upper body power is directly associated with successful throwing efficiency and overall match performance (Franchini et al., 2005). Furthermore, strength adaptations contribute not only to the biomechanical execution of throws but also to psychological confidence and decision-making under pressure (Uzun et al., 2017). From a technical standpoint, the synchronization between upper body engagement and kuzushi is essential in executing Seoi-Nage with minimal energy expenditure and maximum control (Kato & Yamagiwa., 2021). Despite the recognized importance of upper body strength in Judo, the researcher believes there remains a limited body of applied research, particularly among Sri Lankan athletes. This study therefore aims to enhance upper body strength in Seoi-Nage technique with reference to kuzushi in male intermediate Judo players as a major objective. At the same time, this study aims to increase maximum strength (1RM bench press Test), explosive strength (Medicine ball Throw Test), and strength endurance (Pushup Test) for effective Seoi-Nage technique as a specific objective. By integrating physiological and technical perspectives, this research seeks to contribute to evidence-based practice in judo coaching and athlete development.

2 METHODOLOGY

This study followed an action research design to implement and evaluate an 8-week upper body strength training intervention among intermediate-level male Judo players in Sri Lanka. The duration was chosen based on evidence that training adaptations in strength and sport-specific performance generally require at least 6–8 weeks to manifest (Rhea, et al., 2003).

A total of ten participants (age > 30) were selected using purposive sampling and divided into two groups: treatment ($n = 5$) and control ($n = 5$). Purposive sampling was employed to select participants who demonstrated technical inefficiency in the execution of the Seoi-Nage technique during divisional competitions, primarily due to inadequate upper-body strength. Ethical clearance was obtained, and informed consent was collected prior to participation.

Pre-test and post-testing included one-repetition maximum (1RM) bench press, push-up test (maximum repetitions in 1 minute), medicine ball throw (distance in meters), and a kuzushi performance assessment conducted during 10-minute randori sessions. These tests were selected as they are widely validated field measures for assessing maximal strength, explosive strength, and strength endurance in combat sport athletes (Kons, et al., 2021).

The treatment group 8-week intervention consisted of three weekly sessions (Monday, Wednesday, and Friday) combining warm-up drills, technical practice (uchikomi), and progressive upper-body strength training targeting maximum strength (bench press, pull-ups), explosive strength (dumbbell snatch, lunges), and strength endurance (push-ups, shoulder press, rows, dips, planks, curls). Training intensity was progressively increased from 60% to 100% of 1RM with structured sets, repetitions, and rest intervals, following established principles of progressive overload and periodization for combat sports. Training intervention was conducted 3 hours per day in the evening.

The control group continued with their regular judo practice without any additional strength training. The intervention aimed to develop maximal strength, explosive power, and strength

endurance in the upper body, essential components for Seoi-Nage performance. Measurement tools included a stopwatch, medicine ball, measuring tape, dumbbells, barbells, and judo mats. SPSS 26 software was used for statistical analysis. A mixed-design ANOVA was employed to compare performance changes over time (pre- and post-test) between the two groups. This method allowed for evaluating the interaction effects of time and group on the outcome variables (Franchini, et al., 2013). All assessments were conducted in controlled training environments to ensure standardization of procedures and minimize measurement bias.

3 RESULTS

3.1 Descriptive Statistics

Table 1. Pre-Post Test Scores of Treatment Group

Variables	Pre-Test					Post-Test				
	1	2	3	4	5	1	2	3	4	5
1RM Bench Press	50	49	47	45	51	58	57	55	54	59
Push Up	42	43	40	35	44	52	53	49	44	54
Medicine Ball Throw	35	30	33	25	35	42	39	42	32	44
Kuzushi	60	55	57	42	54	69	63	66	52	64

Table 2. Pre-Post Test Scores of Control Group

Variables	Pre-Test					Post-Test				
	1	2	3	4	5	1	2	3	4	5
1RM Bench Press	51	47	49	46	53	50	48	48	47	53
Push Up	40	44	42	33	46	41	43	43	34	46
Medicine Ball Throw	37	29	35	24	36	39	31	35	25	37
Kuzushi	58	53	54	43	55	60	54	56	44	56

3.2 Mixed Design ANOVA

Table 3. ANOVA Results across 1RM Bench Press, Pushup, Medicine Ball Throw, Kuzushi Tests

Variable	Time*Group Effect		Time Effect		Group Effect	
	F	p	F	p	F	p
1RM Bench Press	280.167	0.000*	280.167	0.000*	4.654	0.063
Pushup	384.727	0.000*	454.545	0.000*	2.657	0.144
Medicine Ball Throw	128.947	0.000*	232.526	0.000*	0.836	0.387
Kuzushi	304.200	0.000*	561.800	0.000*	1.531	0.021*

Through the following testing procedures, different variables were measured to assess upper body strength and kuzushi performance among intermediate-level male judo players. These included the 1RM Bench Press, Push-up Test, Medicine Ball Throw, as well as a Kuzushi test conducted during randori sessions. The results of the statistical analysis using mixed-design ANOVA are summarized in Table 3.

The results revealed a significant interaction effect between the time of measurement and training group for 1RM Bench Press, $F(1, 8) = 280.167$, $p < 0.000$, Push-up Test $F(1, 8) = 384.727$, $p < 0.000$, Medicine Ball Throw, $F(1, 8) = 128.947$, $p < 0.000$, and Kuzushi performance $F(1, 8) = 304.200$, $p < 0.000$. A significant main time effect was observed when comparing pre- and post-test outcomes across both groups. These effects were detected in 1RM Bench Press $F(1, 8) = 280.167$, $p < 0.000$, Push-up Test $F(1, 8) = 454.545$, $p < 0.000$, Medicine Ball Throw $F(1, 8) = 232.526$, $p < 0.000$, and Kuzushi $F(1, 8) = 561.800$, $p < 0.000$. Moreover, the between-group analysis revealed a statistically significant difference in Kuzushi performance, $F(1, 8) = 1.531$, $p = 0.021$, and a near-significant difference in 1RM Bench Press, $F(1, 8) = 4.654$, $p = 0.063$.

4 DISCUSSION

The focus of this study was to evaluate the impact of an 8-week upper body strength training intervention on the execution of the Seoi-Nage technique in intermediate male judo players in Sri Lanka. Statistical analysis revealed significant interaction effects across all variables—1RM Bench Press, Push-up Test, Medicine Ball Throw, and Kuzushi—between groups and over time, indicating that strength development contributed to measurable improvements. The increase in 1RM Bench Press reflects greater maximal strength in the pectoral, deltoid, and latissimus dorsi muscles, supporting previous findings that upper body strength enhances torque generation during throwing techniques (Franchini, et al., 2008). Similarly, gains in push-up performance demonstrate improved muscular endurance, consistent with research showing that higher endurance levels enhance judokas' ability to maintain technique execution during successive high-intensity efforts (Franchini, et al., 2013). The significant improvement in medicine ball throw scores suggests enhanced explosive power and neuromuscular efficiency, aligning with Detanico et al., (2012) who found that explosive upper body power is strongly associated with throwing velocity and effectiveness in judo athletes. In addition, the observed increase in kuzushi performance highlights the direct link between upper body strength and effective balance-breaking, which agrees with biomechanical studies emphasizing that grip strength, trunk stability, and coordinated pulling are essential to successful Seoi-Nage execution (Ishii, et al., 2018). Collectively, these results suggest that upper body strength training can positively influence physiological and technical aspects of Seoi-Nage performance, while also contributing novel evidence within the Sri Lankan judo context. However, the small sample size and purposive sampling approach limit the generalizability of these findings, making this study exploratory in nature. A strength of the research is its applied design, directly addressing a technical weakness observed in competition through structured intervention. Future studies should therefore expand to larger and more diverse samples, include both male and female athletes at different competitive levels, and incorporate detailed biomechanical and psychological assessments to further clarify the multifaceted role of strength training in judo performance. In conclusion, this study demonstrates that upper body strength training improved maximal strength, Strength endurance, explosive strength, and kuzushi, thereby contributing to more effective execution of Seoi-Nage, though confirmation through larger-scale studies remains essential.

5 CONCLUSION

This study demonstrated that an 8-week upper body strength training program significantly enhanced maximal strength, strength endurance, explosive strength, and kuzushi performance, leading to improved execution of the Seoi-Nage technique in intermediate level male judo players. The findings suggest that integrating progressive strength training with technical practice may support better balance-breaking and throw efficiency. However, given the small sample, these results should be interpreted with caution and considered preliminary. Practically, coaches may apply such strength-focused interventions to support technical development and facilitate the progression of intermediate athletes toward higher levels of competition.

6 ACKNOWLEDGEMENT

The author gratefully acknowledges the Sri Lanka National Judo Team, the Department of Sports Sciences and Physical Education at Sabaragamuwa University, and Dr. Sanjaya Othalawa for their guidance, support, and coordination throughout this research process.

7 REFERENCES

- Callan, M., & Bradić, S. (2018). Historical development of judo. In *The science of judo* (pp. 7–13). Routledge.
- De Créé, C. (2015). Kōdōkan jūdō's three orphaned forms of counter techniques—Part 3: The Katame-waza ura-no-kata—“Forms of reversing controlling techniques”.
- Detanico, D., Dal Pupo, J., Franchini, E., & Santos, S. G. (2012). Relationship of aerobic and neuromuscular indexes with specific actions in judo. *Science Sports, 1*, 16–22. <https://doi.org/10.1016/j.scispo.2011.01.010>
- Franchini, E., Artioli, G. G., & Brito, C. J. (2013). Judo combat: time-motion analysis and physiology. *International Journal of Performance Analysis in Sport, 13*(3), 624–641.
- Franchini, E., Sterkowicz, S., Meira Jr, C. M., Gomes, F. R. F., & Tani, G. (2008). Technical variation in a sample of high level judo players. *Perceptual and Motor Skills, 106*(3), 859–869.
- Franchini, E., Takito, M. Y., Kiss, M. A. P. D. M., & Sterkowicz, S. (2005). Physical fitness and anthropometrical differences between elite and non-elite judo players. *Biology of Sport, 22*(4), 315.
- Ishii, T., Ae, M., Suzuki, Y., & Kobayashi, Y. (2018). Kinematic comparison of the seoi-nage judo technique between elite and college athletes. *Sports Biomechanics, 17*(2), 238–250.
- Kato, S., & Yamagiwa, S. (2021). Statistical extraction method for revealing key factors from posture before initiating successful throwing technique in judo. *Sensors, 21*(17), 5884.
- Kons, R. L., Junior, J. N. D. S., Follmer, B., Katcipis, L. F. G., Almansba, R., & Detanico, D. (2021). Validity of judo-specific tests to assess neuromuscular performance of judo athletes. *Sports Biomechanics*.
- Rhea, M. R., Alvar, B. A., Burkett, L. N., & Ball, S. D. (2003). A meta-analysis to determine the dose response for strength development. *Medicine & Science in Sports & Exercise, 35*(3), 456–464.
- Sacripanti, A. (2010). Biomechanics of Kuzushi-Tsukuri and interaction in competition. *arXiv preprint arXiv:1010.2658*.
- Uzun, A., & Karakoc, O. (2017). The effects of ten weekly plyometric training of judokas on anaerobic power. *Journal of Education and Training Studies, 5*(13), 52–58.