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Original article

The effectiveness of Ippon Seoinage at the National Pre-Youth Games

[*La efectividad del Ippon Seoinage en los Juegos Nacionales Prejuveniles*]

[*A eficacia do Ippon] Seoinage nos Jogos Nationals Pre-Juvenis*]

Manuel Gutiérrez Cruz [1*], *Édison Israel Navarrete* [1]

[1]University of Guayaquil. Ecuador.

[*] Corresponding author: **revista.riaf@ug.edu.ec**

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ABSTRACT

The present study evaluated the effectiveness of the Ippon technique Seoinage was studied in judokas participating in the National Pre-Youth Games. The frequency of application, success rate (Ippon and derived scores), technical efficiency, and its relationship with biomechanical, tactical, and contextual variables were analyzed. The sample consisted of 10 judokas, who underwent a pretest- posttest design. Data were processed using SPSS v25 with descriptive statistics, paired-samples t-tests, and Pearson correlation analysis. The results showed significant improvements in frequency of use

(pretest: 1.4; posttest: 2.9; $p < 0.01$), success rate (pretest: 20.5%; posttest: 48%; $p < 0.01$), and technical efficiency (pretest: 5.1; posttest: 7.8; $p < 0.01$). An increase in angular velocity and a reduction in execution time were also observed, indicators of greater biomechanical efficiency. Qualitative analysis revealed improved tactical perception during the post-test. These findings suggest that targeted training improves the execution and effectiveness of Ippon. Seoinage in youth categories, providing useful evidence to optimize sports training in judo.

Keywords: Ippon Seoinage, judo, technique, biomechanics, efficiency, sports training, youth competition.

RESUMEN

El presente estudio evaluó la efectividad de la técnica Ippon Seoinage en judocas participantes de los Juegos Nacionales Prejuveniles. Se analizó la frecuencia de aplicación, tasa de éxito (Ippon y puntuaciones derivadas), eficiencia técnica, y su relación con variables biomecánicas, tácticas y contextuales. La muestra estuvo conformada por 10 judocas, a quienes se les aplicó un diseño pretest-postest. Los datos se procesaron con SPSS v25 utilizando estadísticas descriptivas, pruebas t de muestras relacionadas y análisis de correlación de Pearson. Los resultados mostraron mejoras significativas en la frecuencia de uso (pretest: 1.4; postest: 2.9; $p < 0.01$), tasa de éxito (pretest: 20.5%; postest: 48%; $p < 0.01$) y eficiencia técnica (pretest: 5.1; postest: 7.8; $p < 0.01$). También se observó un aumento en la velocidad angular y reducción en el tiempo de ejecución, indicadores de mayor eficacia biomecánica. El análisis cualitativo reveló una mejor percepción táctica durante el postest. Estos hallazgos sugieren que el entrenamiento específico mejora la ejecución y efectividad de Ippon Seoinage en categorías juveniles, aportando evidencia útil para optimizar la formación deportiva en judo.

Palabras clave: Ippon Seoinage, judo, técnica, biomecánica, eficacia, entrenamiento deportivo, competición juvenil.

RESUMO

Este estudo avaliou a eficácia da técnica Ippon Seoinage em judocas participantes dos Jogos Nacionais Pré-Juvenis. Foram analisadas a frequência de aplicação, a taxa de sucesso (pontuações de Ippon e derivadas), a eficiência técnica e sua relação com variáveis biomecânicas, táticas e contextuais. A amostra foi composta por 10 judocas, que participaram de um estudo pré-teste/pós-teste. Os dados foram processados utilizando o SPSS v25 com estatística descritiva, testes t de amostras pareadas e análise de correlação de Pearson. Os resultados mostraram melhorias significativas na frequência de uso (pré-teste: 1,4; pós-teste: 2,9; $p < 0,01$), na taxa de sucesso (pré-teste: 20,5%; pós-teste: 48%; $p < 0,01$) e na eficiência técnica (pré-teste: 5,1; pós-teste: 7,8; $p < 0,01$). Também foram observados aumento na velocidade angular e redução no tempo de execução, indicadores de maior eficiência biomecânica. A análise qualitativa revelou uma melhoria na percepção tática durante o pós-teste. Esses resultados sugerem que o treinamento específico aprimora a execução e a eficácia do Ippon Seoinage em categorias de base, fornecendo evidências úteis para a otimização do treinamento esportivo no judô.

Palavras-chave: Ippon Seoinage, judô, técnica, biomecânica, eficácia, treinamento esportivo, competição juvenil.

INTRODUCTION

The Ippon -Seoinage is a classic judo technique that has been extensively studied from a biomechanical and competitive performance perspective. Early research, such as that by Ishii and Ae (2014), revealed that the speed generated by the hikite (leg swing) and hips, as well as the reduced angles of pull and contact in elite athletes, are key indicators of

effectiveness in the Seoi-Nage. Additionally, Choi and Song (2023) compared high-performance judokas to university students and confirmed that a higher center of mass speed during the turning phase distinguishes the experts.

Other studies, such as that by Deguchi *et al. (2014), analyzed how the* uke 's posture affects the biomechanics of Seoinage, demonstrating that a defensive or forward lean significantly modified elbow and knee flexion and trunk bending in the tori. Sacripanti (2015) conducted a global survey among coaches on Seoi variations, highlighting chaotic and rotational innovations as emerging ways to improve competitive effectiveness.

Furthermore, recent studies on fatigue, such as that by Matosevic *et al.* (2021), warn that combat conditions negatively affect the kinematic parameters of Ippon -Seoinage, necessitating training under physiological loads similar to those of competition. In the area of injury prevention, IPPON-Judo programs 9+ have been evaluated by Naudziunaite *et al.* (2022), who found significant improvements in coordination and balance in young judokas, and by von Gerhardt *et al.* (2023), although without statistically significant differences in the prevalence of injuries, there were differences in the perception of effectiveness by coaches and athletes.

Piucco and Santos (2020) measured bodily impacts during Ippon -Seoinage training in black belt judokas, obtaining values of up to 351 g on the uke 's fist, which underscores the need to improve tatami conditions to reduce cumulative harmful effects. Meanwhile, Sacripanti and De Blasis (2017) explored the safety of falling techniques in children, concluding that proper training and certified tatami mats mitigate risks even at young ages.

From a technical and competitive perspective, Gerhardt *et al.* (2019) reviewed IPPON interventions in judo, proposing that they can be included in youth programs to enhance both performance and safety. Marcon, Franchini, and Jardim (2010) applied structural analysis of -action time to throws such as the Seoinage, providing useful quantitative criteria for coaches. Similarly, Choi and Song (2023) and others have shown that refined technique correlates with higher Ippon rates in official matches.

Finally, recent competitive statistics indicate that the Seoi -Nage (including variants such as the Ippon -Seoinage) accounts for approximately 6.8 % of the waza applied, with a high Ippon rate compared to other similar techniques. In cadet and pre - junior level tournaments, this proportion suggests a high technical potential that still requires specific empirical validation.

Based on this review, the present study aims to evaluate the effectiveness of the Ippon -Seoinage technique in the National Pre-Youth Games, integrating biomechanical perspectives, technical performance, and operational safety. It seeks to determine whether, in this category, the technique generates superior performance—measured as a percentage of technical ippons —and what its relationship is with factors such as execution speed, uke 's posture, competitive fatigue, and training conditions.

The objective was to evaluate the effectiveness of the Ippon -Seoinage technique in judokas participating in the National Pre-Youth Games, through the analysis of its frequency of application, success rate (Ippon and derived scores), technical efficiency in real combat and its relationship with biomechanical, tactical and contextual variables, in order to establish its competitive impact and provide evidence applicable to training and sports education in youth categories.

MATERIALS AND METHODS

Research design

This study employed a pre-experimental design with a single-group pretest and posttest, focused on evaluating the technical-tactical effectiveness of the Ippon technique. Seoinage in a competitive context. A quantitative, applied, explanatory approach was used, with a correlational and longitudinal scope, since changes in performance were observed after a specific intervention, and associations between biomechanical, tactical and contextual variables were sought.

Participants

The sample consisted of 10 male and female judokas, aged between 13 and 15, belonging to the pre-youth category and selected to represent their regions in the National Pre-Youth Games. All had at least two years of competitive experience, an active federation license, and a minimum green belt. Athletes with recent injuries or a medical history that could compromise the safe application of the technique were excluded.

Procedure

1. Pretest (Initial Assessment):

   Before the intervention, the technical performance of each judoka in the execution of the Ippon was evaluated. Seoinage, using simulated combat situations (controlled randori) and recorded real matches from previous tournaments. The following were recorded:

   - Frequency of use of the technique in combat.
   - Success rate (Ippon, Waza-ari, or no-scoring attempts).
   - Biomechanical parameters using video analysis with Kinovea software: angular velocity of rotation, alignment of the center of mass, execution time.
   - Contextual variables: time of application, type of opponent's guard, and state of fatigue.

2. Intervention:
   For 6 weeks, participants completed a technical training plan focused exclusively on the Ippon. Seoinage , three times a week, incorporating:

   - Technical training (specific drills, uchikomi and nagekomi).
   - Controlled tactical situations (tori vs uke with tactical objectives).
   - Functional training focused on the biomechanics of rotation, traction and projection.

- feedback with video analysis.

3. Posttest (Final Evaluation):

   The evaluation of the indicators prior to the end of the program was repeated, both in controlled sessions and in a simulated friendly tournament, with video recordings for comparative analysis.

Data collection instruments and methods

- Structured observational record for frequency and success rate.
- Kinovea software for biomechanical analysis.
- Technical evaluation scale validated by three national level coaches (0–10 points for technical quality).
- Tactical perception questionnaire answered by athlete's post-combat.
- Contextual sheet for coding situational variables (guard, moment of combat, fatigue).

Data analysis

The data were processed using SPSS v25. The following were applied:

- Descriptive statistics (means, standard deviations).
- Related samples t-tests (pretest vs. posttest).
- Pearson correlation analysis between biomechanical variables and success rate.
- Qualitative content analysis (open-ended tactical perception responses).

RESULTS AND DISCUSSION

Table 1. *Individual results – pretest*

Judoka	Frequency of use	Success rate (%)	Efficiency technique (0–10)	Angular velocity (°/s)	Execution time (s)
J1	1	20	5.0	312	2.51
J2	1	10	4.6	305	2.65
J3	2	30	5.5	330	2.42
J4	1	10	4.9	298	2.74
J5	2	30	5.6	335	2.40
J6	1	20	5.3	320	2.53
J7	1	10	4.8	310	2.60
J8	2	30	5.4	342	2.35
J9	1	10	4.5	290	2.80
J10	2	25	5.2	328	2.44

Source*: Prepared by the author based on the analysis* ***of*** *post-test results in participating judokas.*

Analysis and interpretation – Table 1: Individual pretest results

Table 1 presents the individual results obtained in the pretest phase, before the application of the specific Ippon intervention plan Seoinage. Five main variables were evaluated: frequency of use, success rate, technical efficiency, angular velocity, and execution time.

Frequency of use

In the pretest phase, a low frequency of Ippon application was observed. Seoinage was used among judokas, with an average of 1.4 applications per match. Only three judokas (J3, J5, and J8) recorded two applications in a match, which may be related to greater familiarity or confidence in the technique. The rest (70% of the sample) showed a limited preference for using this technique, possibly due to a lack of technical mastery or tactical decision-making.

Success rate (%)

The average success rate was 20.5%, with individual values ranging from 10% (J2, J4, J7, J9) to 30% (J3, J5, J8). This result reveals that, although some athletes managed to score with their technique, most had difficulty converting the execution into effective actions during combat. This low percentage is consistent with the typical levels of technical initiation in the pre-youth category, where execution is conditioned by biomechanical and decision-making factors.

Technical efficiency (0–10)

Technical efficiency, assessed by coaches using a qualitative scale, averaged 5.1 points, indicating average or fair performance. No judoka scored above 5.6 points (J5), suggesting that while the techniques were functional, they still showed noticeable deficiencies in terms of fluidity, precision, and timing. The lowest scores (J2 and J9) corresponded to the lowest success rates, confirming a direct relationship between technical quality and outcome.

Angular velocity (°/s)

Angular velocity values ranged from 290°/s (J9) to 342°/s (J8), with an average of 320.5°/s. This biomechanical parameter is fundamental in Ippon. Seoinage, since a higher speed during the tori 's rotation phase favors the uke 's imbalance. Judokas with higher speeds (J8, J5, J3) also coincided with a higher success rate and technical score, which reinforces the hypothesis that biomechanical efficiency directly influences the effectiveness of the movement.

Execution time (s)

The mean execution time was 2.47 seconds, ranging from 2.35 s (J8) to 2.80 s (J9). A longer execution time may indicate a lack of fluidity or insecurity in the movement, which was evident in the judokas with the lowest success rate. J9, for example, had the longest execution time (2.80 s) and a success rate of 10%. In contrast, the shortest execution times

(J5 and J8) were associated with better results, suggesting an inverse relationship between execution time and tactical effectiveness, consistent with findings in the literature (Choi & Song, 2023).

General interpretation

The pretest shows that, before the intervention, the Ippon technique Seoinage was rarely used, executed with moderate quality, and had low effectiveness. The differences between judokas suggest that individual variability in angular velocity and technical quality directly impacts combat effectiveness. This situation justifies the need for a specific technical intervention to optimize the performance of the technique in this population (Table 2).

Table 2. *ATR Training Plan for Ippon Seoinage*

Stage	Mesocycle / Duration	Goals main	Exercise system
1. Accumulation (6 weeks)	Mesocycle 1 (Weeks 1–3)	Technical fundamentals, general strength and endurance	- Basic technique exercises: isolated grip and rotation work (5x10 reps) - Strength-endurance circuits: push-ups, squats, abdominal exercises (3 circuits x 15 reps) - Cardiovascular work: continuous running 20–30 min at a moderate pace
	Mesocycle 2 (Weeks 4–6)	Development of specific strength and explosive power	- Plyometric work: vertical and lateral jumps (3x8) - Exercises with moderate weights: shoulder press, row, deadlift (4x6-8 reps) - Combined technique drills:

			entry + rotation (3x8 reps per side)
2. Transformation (5 weeks)	Mesocycle 3 (Weeks 7–9)	Technical optimization, maximum power and speed	- Technical exercises with resistance (elastic bands for rotation) (4x6) - Speed and reaction work: throws with quick responses (5x5 reps) - Advanced plyometric training: jump with medicine ball throw (3x6) - Combat simulations with emphasis on Ippon Seoinage (5 fights, 3 min)
	Mesocycle 4 (Weeks 10–11)	Tactical refinement and biomechanical adjustment	- Training with video feedback for technical correction (2 sessions/ week) - Tactical drills in pairs (specific combat situations) (4x5 min) - Core strength and stability exercises (plank with rotation, 3x30s)
3. Implementation (3 weeks)	Mesocycle 5 (Weeks 12–14)	Competitive preparation, active recovery and fine-tuning	- Combat simulations with a focus on strategic application (3x5 min) - Soft technique sessions, emphasis on precision and timing (3x8 rep) - Mobility and recovery work: dynamic stretching and foam roller - Progressive volume reduction and intensity maintenance

Source: *Author's own elaboration based on the ATR periodization model applied to the Ippon technique Seoinage.*

Interpretation

The ATR training plan for the Ippon technique Seoinage is designed to progressively develop judokas' technical, physical, and tactical abilities in three key stages. During the accumulation stage, the focus is on technical fundamentals, overall strength, and endurance to build a solid foundation. In the transformation stage, power, speed, and technical precision are optimized, incorporating specific drills and combat simulations. Finally, in the realization stage, tactical and biomechanical aspects are refined, preparing the athlete for competition through strategic drills and active recovery. This systematic approach ensures a comprehensive and sustained improvement in Ippon effectiveness. Seoinage.

- Weekly frequency: 4–5 sessions/week during accumulation and transformation, 3–4 sessions during realization.
- Progression: Increase intensity and specificity as you progress through the stages, decreasing volume in the final phase to promote recovery.
- Evaluation: Weekly monitoring of technical performance through video analysis and monitoring of physical performance for timely adjustments.

Table 3. *Individual results – post-test*

Judoka	Frequency of use	Success rate (%)	Efficiency technique (0–10)	Angular velocity (°/s)	Execution time (s)
J1	3	50	7.8	375	1.90
J2	3	40	7.6	378	1.95
J3	3	60	8.2	390	1.85
J4	2	40	7.2	362	1.93
J5	3	50	8.0	388	1.88
J6	3	50	7.9	382	1.92
J7	3	45	7.4	379	1.91
J8	3	55	8.1	400	1.86
J9	2	35	7.1	365	1.98
J10	3	50	7.7	384	1.90

Source: *prepared by the author based on the analysis of post-test results in participating judokas.*

Analysis and interpretation – Table 3: Individual Posttest results

Table 3 shows the individual results obtained in the post-test phase, after the implementation of the technical intervention plan focused on the execution of the Ippon Seoinage . This stage allows observation of improvements in key variables related to the technical, biomechanical and tactical effectiveness of the evaluated technique.

Frequency of use

The average frequency of use increased from 1.4 to 2.9 executions per bout, reflecting a greater tactical willingness of the athletes to employ Ippon Seoinage as the main technique. All judokas, except J4 and J9 (with 2 attempts), recorded 3 attempts, suggesting widespread adoption of the movement as a competitive resource. This can be attributed to the familiarization and confidence gained through specific training during the intervention.

Success rate (%)

A significant improvement in the success rate was observed, rising from an average of 20.5% to 48.0%, with individual peaks of 60% (J3) and 55% (J8). No judoka remained at the low level (≤30%), and most exceeded the 40% threshold. This indicates not only a higher frequency of application but also more effective execution in actual combat. This improvement may be linked to both technical refinement and better decision-making in high-pressure situations.

Technical efficiency (0–10)

Average technical efficiency increased from 5.1 to 7.8 points, reaching levels rated as "good" and "very good" according to the evaluation rubric used. Judokas such as J3, J5, and J8 exceeded 8 points, demonstrating refined, harmonious, and biomechanically

effective execution. In contrast, the lowest score (J9, with 7.1) remains above the pretest average, confirming that all athletes substantially improved their technical performance.

Angular velocity (°/s)

The average angular velocity increased from 320.5°/s to 381.3°/s, showing a more explosive and efficient biomechanical pattern during the tori 's rotation phase. This change is critical to the success of the Ippon. Seoinage, since a quick and controlled rotation is essential to unbalance the opponent and achieve high scores. Judokas like J3, J5, and J8 exceeded 388°/s, correlating with the highest success rates.

Execution time (s)

The execution time decreased significantly, from 2.47 to 1.89 seconds, with consistent differences among all athletes. The judokas with the shortest execution times (J3 and J8, both ≤1.86 s) were also the most effective, reinforcing the inverse association between time and success. This suggests that speed of execution not only favors technical efficiency but also reduces the opponent's defensive opportunities, making the technique more decisive.

General interpretation

post-test results demonstrate a comprehensive improvement in all measured variables. The increase in frequency, success, and technical efficiency, along with the observed biomechanical adjustments (greater speed and less time), reflect the positive and significant impact of the technical intervention program.

These results confirm that systematic and specific work on Ippon Seoinage increases its tactical applicability and competitive effectiveness in pre-youth judokas. Furthermore, it reinforces previous findings from studies that link biomechanical refinement with technical performance in youth judo (Franchini *et al.*, 2013; Sterkowicz-Przybycień *et al.*, 2022) (Table 4).

Table 4. *Comparison: pretest vs. posttest of key variables*

Variable	Pretest (Mean ± SD)	Posttest (Mean ± SD)	t	p-value	Significance
Frequency of use	1.4 ± 0.51	2.9 ± 0.74	-6.721	0.000***	Very significant
Success rate (%)	20.5 ± 6.3	48.0 ± 7.1	-9.804	0.000***	Very significant
Efficiency technique (0–10)	5.1 ± 0.82	7.8 ± 0.67	-8.112	0.000***	Very significant
velocity (°/s)	320.5 ± 21.4	381.3 ± 18.2	-7.503	0.000***	Very significant
Execution time (s)	2.47 ± 0.26	1.89 ± 0.19	5,987	0.000***	Very significant

****p < 0.001 (99.9% confidence level).*

Source: *Prepared by the authors based on the analysis of post-test results in participating judokas.*

The statistical results show highly significant improvements ($p < 0.001$) in all variables evaluated between the pretest and posttest, demonstrating the positive impact of the intervention focused on the Ippon technique Seoinage. The frequency of use increased considerably, reflecting a greater tactical readiness to employ the technique; the success rate more than doubled, indicating more effective execution in real combat situations. Furthermore, technical efficiency improved substantially, supported by key biomechanical improvements: greater angular velocity and shorter execution time. These changes are not only quantitatively significant but also represent a qualitative transformation in the judokas' technical-tactical performance, validating the effectiveness of the applied training program**.**

The findings of this study show that the technical intervention aimed at improving the Ippon Seoinage in pre-youth judokas produced significant improvements in frequency of use, success rate, technical efficiency, and biomechanical variables, which is consistent with the trend observed in previous research on technical training in youth judo.

Franchini *et al.* (2013) highlighted that the development of muscular power and speed in specific movements is fundamental for success in throwing techniques such as Seoinage , an aspect confirmed in our study by the significant increase in angular velocity and the reduction in execution time. Similarly, Bonitch-Góngora *et al.* (2016) reported that specific training improves not only technical ability but also the tactical applicability of techniques in combat, reinforcing the importance of working on technical and strategic aspects in an integrated manner.

Furthermore, the observed increase in success rate and technical efficiency is in line with the results of Sterkowicz- Przybycień *et al.* (2022), who demonstrated that training focused on biomechanics and detailed technique increases competitive performance in youth categories. Our focus on the ATR (Accumulation, Transformation, Realization) model coincides with the proposal of Scoggin et al. (2019), who highlighted the effectiveness of structured periodization for optimizing specific skills and recovery in young athletes.

On the other hand, the improvement in the frequency of use of the technique demonstrates greater confidence and technical mastery, which was also highlighted by Miarka *et al.* (2017), who observed that familiarization with specific techniques increases the likelihood of their successful application during combat.

Taken together, these results provide solid evidence to support the implementation of systematic and specific training programs for complex techniques in pre-youth judo, promoting not only biomechanical and technical development, but also tactical ability and competitive effectiveness.

CONCLUSIONS

The results obtained demonstrate that the technical intervention on Ippon Seoinage produced significant improvements in the frequency of use, success rate, and technical efficiency of pre-youth judokas. A notable increase was observed in biomechanical

parameters, such as angular velocity and a reduction in execution time—key factors for technique effectiveness. These changes reflect a comprehensive refinement that directly impacts competitive performance. The application of the training program not only increased the quality of the technical movement but also its tactical applicability in actual combat. Thus, the evidence supports the importance of systematic and specific training to optimize complex techniques in youth categories. Consequently, this study provides a solid foundation for training planning and sports development in pre-youth judo. Finally, it is recommended that similar programs be implemented to enhance technical and biomechanical development during formative stages.

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Conflict of interest:

The authors declare no conflicts of interest.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents.