The impact of deductive and inductive learning methods on weightlifting performance

El impacto de los métodos de aprendizaje deductivo e inductivo en el rendimiento en el levantamiento de pesas

Authors

Ahmad Alhussin Alali[1], Ali Hashim Mohammed[3], Haider Radhi Raheem Alsaedi[4], Azzam Ahmad Alhossin Alali[1], Osama Ahmad Alhosin Alali[2], Mustafa Mohsin Flayyih Khlaifawi[3], Ali Md Nadzalan[1], Nur Ikhwan Mohamad[1]

[1] Sultan Idris Education University, (Malaysia)
[2] University of Sharjah (UAE)
[3] Al-Mustansiriya University, (Iraq)
[4] Al Hikma University College (Iraq)

Corresponding author:
Nur Ikhwan Mohamad
nur.ikhwan@fsskj.upsi.edu.my

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Abstract

Introduction: Optimizing coaching methodologies is crucial in Olympic weightlifting. While deductive and inductive training offers distinct instructional strategies, their effects on velocity across key lifting phases remain insufficiently explored. Velocity is a critical performance metric, influences lifting efficiency and power output.
Objective: This study examines the impact of deductive and inductive training on barbell velocity and some kinematics measurements in the snatch and clean & jerk among university weightlifters (aged 18–24).
Methodology: A quantitative experimental design was employed. Participants (N=45) were divided into two groups: Group 1 trained the snatch, and Group 2 trained the clean & jerk. Each group underwent both deductive (structured, coach-led instruction) and inductive (self-directed, exploratory learning) training interventions. Pre- and post-intervention velocity and kinematic measurements were analyzed for each lifting phase.
Results: Deductive training significantly improved velocity, particularly in the second pull phase of the snatch (+0.26 m/s) and the straightening phase of the clean & jerk (+0.70 m/s). The inductive approach showed variable improvements, with minor gains in the second pull phase of the clean & jerk (+0.17 m/s) but less consistent effects overall.
Discussion: Findings support structured learning for skill acquisition, particularly in technically complex movements. However, inductive learning may enhance adaptability and motor learning in select contexts.
Conclusion: Deductive instruction appears superior for refining technical execution, whereas inductive learning may complement skill refinement. These results highlight the need for tailored coaching strategies in weightlifting. Future research should explore long-term skill retention and cognitive factors influencing training efficacy.

Keywords

Skill acquisition; olympic weightlifting velocity; deductive training; inductive training; kinematic analysis; velocity analysis.

Resumen

Introducción: Optimizar las metodologías de entrenamiento es crucial en la halterofilia olímpica. Si bien el entrenamiento deductivo e inductivo ofrece estrategias de instrucción distintas, sus efectos sobre la velocidad en las fases clave del levantamiento aún no se han explorado lo suficiente. La velocidad es una métrica crítica del rendimiento que influye en la eficiencia del levantamiento y la potencia.
Objetivo: Este estudio examina el impacto del entrenamiento deductivo e inductivo en la velocidad de la barra y algunas mediciones cinemáticas en el arranque y el envión en levantadores de pesas universitarios (de 18 a 24 años).
Metodología: Se empleó un diseño experimental cuantitativo. Los participantes (N=45) se dividieron en dos grupos: el Grupo 1 entrenó el arranque y el Grupo 2 entrenó el envión. Cada grupo se sometió a intervenciones de entrenamiento deductivo (instrucción estructurada, dirigida por el entrenador) e inductivo (aprendizaje exploratorio autodirigido). Se analizaron las mediciones de velocidad y cinemáticas antes y después de la intervención para cada fase del levantamiento.
Resultados: El entrenamiento deductivo mejoró significativamente la velocidad, especialmente en la fase de tracción del segundo tirón del arranque (+0,26 m/s) y en la fase de enderezamiento del envión (+0,70 m/s). El enfoque inductivo mostró mejoras variables, con ganancias menores en la fase de tracción del envión (+0,17 m/s), pero efectos menos consistentes en general.
Discusión: Los hallazgos respaldan el aprendizaje estructurado para la adquisición de habilidades, especialmente en movimientos técnicamente complejos. Sin embargo, el aprendizaje inductivo puede mejorar la adaptabilidad y el aprendizaje motor en contextos específicos.
Conclusión: La instrucción deductiva parece ser superior para perfeccionar la ejecución técnica, mientras que el aprendizaje inductivo puede complementar el perfeccionamiento de habilidades. Estos resultados resaltan la necesidad de estrategias de entrenamiento personalizadas en halterofilia. Las investigaciones futuras deberían explorar la retención de habilidades a largo plazo y los factores cognitivos que influyen en la eficacia del entrenamiento.

Palabras clave

Adquisición de habilidades; velocidad en halterofilia olímpica; entrenamiento deductivo; entrenamiento inductivo; análisis cinemático; análisis de velocidad.

Introduction

This study investigates the comparative effectiveness of deductive and inductive learning approaches in the context of Olympic weightlifting (OL), focusing on their impact on technical skill acquisition, which refers to the progressive mastery of coordinated and efficient movement patterns for lifts such as the snatch and clean & jerk. Given the biomechanical complexity of these movements, successful execution requires precise neuromuscular coordination, advanced motor control, and physical prerequisites such as joint mobility and core stability (Zimmerman et al., 2013; Williams et al., 2003).

While both deductive (explicit instruction) and inductive (discovery-based) teaching methods are employed in coaching, their relative effectiveness in enhancing movement efficiency—defined as optimizing energy use to maximize performance output (Sparrow, 1983) and improving biomechanical performance—measured through variables such as barbell velocity and joint angles (Nigg et al., 2000) remains underexplored. Although some studies have examined motor learning strategies in sports such as gymnastics, sprinting, and ball sports (Wulf & Shea, 2002; Davids et al., 2008), there is a scarcity of empirical work specifically addressing how these instructional approaches influence kinematic variables in Olympic lifting. limited research directly quantifies how these approaches influence kinematic variables in Olympic weightlifting (Alali et al., 2023). The few existing studies (Hammami et al., 2022; Winchester et al., 2009) have focused primarily on general strength adaptations or coaching cues, without quantifying movement velocity, joint mechanics, or biomechanical efficiency under different instructional conditions.

To address this gap, the present study employs motion analysis to evaluate barbell velocity, knee joint angles, and movement efficiency across structured training phases. By systematically comparing deductive instruction, which refers to coach-guided learning, with inductive instruction, which refers to athlete-driven exploration, this research aims to determine which method more effectively enhances biomechanical execution and skill development in Olympic lifting.

This investigation is grounded in constructivist learning theory, which posits that learners actively construct knowledge through experience, reflection, and interaction (Wu et al., 2024). In this framework, deductive learning supports movement precision by providing structured feedback and rule-based instruction, allowing athletes to internalize correct lifting mechanics through repetition. Conversely, inductive learning aligns with the constructivist emphasis on exploratory learning, enabling athletes to adapt movement patterns through self-discovery, variable practice, and task manipulation, particularly relevant in the dynamic context of complex lifts such as the clean & jerk. These interpretations are further supported by cognitive reasoning theories, which explain how athletes process and refine movement schemas under different instructional strategies (Hayes et al., 2010).

Moreover, video-based feedback is integrated into both learning conditions to enhance technical awareness. Prior research demonstrates that visual feedback facilitates the identification and correction of movement errors, thereby reinforcing effective motor patterns and reducing biomechanical inefficiencies (Faigenbaum et al., 2016; Padua et al., 2018). As digital learning tools become increasingly prevalent in strength and conditioning settings, hybrid approaches that combine real-time coaching with video analysis may bridge the strengths of both deductive and inductive methods, offering a more comprehensive motor learning environment (Kay, 2012).

Study Objective

The primary objective of this study is to compare the effects of deductive and inductive learning approaches on Olympic lifting performance by examining changes in kinematic variables such as barbell velocity and knee joint angles. In doing so, the study aims to evaluate the extent to which each instructional method facilitates technical skill acquisition and improves movement efficiency across progressive training phases. By analyzing pre- and post-training kinematic data from the snatch and clean & jerk, the research also seeks to identify statistically significant differences in biomechanical adaptations between the two instructional groups. The ultimate goal is to develop evidence-based recommendations for optimizing coaching strategies in Olympic weightlifting based on objective performance metrics.

Method

Research Design

This study employed a four-group controlled experimental design to evaluate the impact of deductive and inductive training methods on the acquisition of Olympic lifting (OL) techniques among university students. Participants were divided according to two Olympic lifts:

Group 1: Snatch

Group 2: Clean & Jerk

Each of these was further divided into two instructional subgroups: one receiving deductive (structured) learning and the other inductive (exploratory) learning, forming four distinct groups (Snatch-Deductive, Snatch-Inductive, Clean & Jerk-Deductive, Clean & Jerk-Inductive). This design allowed for direct comparison of instructional method effects within and across the two lift types.

Training sessions combined theoretical instruction with practical execution. Kinematic variables served as objective indicators of biomechanical efficiency and technical proficiency, evaluated before and after the intervention.

Participants

A purposive sampling method was used to recruit 45 university students from physical education and sports science programs, all without prior competitive weightlifting experience. Participants were selected based on their ability to perform basic movement patterns safely and their availability for consistent participation across the training period.

The inclusion criteria ensured participants had comparable age, height, and weight to reduce intergroup variability.

Exclusion criteria included any history of musculoskeletal injury, neurological impairment, or orthopedic conditions likely to interfere with OL performance. These were assessed via a pre-screening health questionnaire and physical movement screening conducted by a certified physiotherapist.

Table 1. Descriptive Statistics of Within-Subject Factor Levels

Variables	Mean	Std. Deviation	Min	Max
Age (years)	23.2273	.86914	22.00	25.00
Height (cm)	168.8636	5.54029	161.00	185.00
Weight (kg)	63.2273	4.93705	56.00	76.00

The data reflect a homogeneous age group with moderate variability in height and weight, ensuring comparable baseline physical characteristics across participants.

Procedure

To standardize instructional exposure, four customized training videos were developed and validated by a panel of three certified Olympic weightlifting coaches with over five years of experience. Two videos demonstrated the movements (snatch or clean & jerk) without verbal cues (inductive condition), while the other two included step-by-step technical explanations aligned with standard coaching cues and biomechanical checkpoints (deductive condition). The video content was pilot-tested for clarity and instructional effectiveness before use.

Participants were randomly assigned to one of the four instructional groups and watched their designated video at the beginning of each training session.

For safety, custom-made plastic barbells (7–10 kg) were used. Movements were recorded using a tripod-mounted Android phone at 60 fps and 1080p resolution, and analyzed using Kinovea software (version 0.9.5).

Reflective markers were placed at key anatomical landmarks (acromion, greater trochanter, lateral femoral epicondyle, lateral malleolus, and barbell ends). Calibration was completed using a 1-meter reference object in the frame. Intra-rater reliability was established by reanalyzing 20% of the data after a two-week interval, yielding an ICC > 0.85 for joint angle and bar velocity measurements.

Each session lasted approximately three hours, distributed as follows:

15–20 minutes: video-based instruction.

30 minutes: dynamic warm-up and mobility exercises.

90 minutes: technical and skill-focused lifting drills.

30–45 minutes: cooldown and group reflection/discussion.

Participants performed multiple lifts per session, but only three trials per session were recorded for analysis. The clearest and most technically representative attempt, as judged by the rater (based on visibility of markers, absence of occlusion, and full range of movement), was selected for kinematic analysis.

Data analysis

Data were analyzed using IBM SPSS version 27. Normality was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests (Table 2). Since age and height data were non-normally distributed, non-parametric tests were applied to relevant comparisons.

Specifically, the Kruskal–Wallis test was used for between-group comparisons, and the Wilcoxon signed-rank test was used for within-group pre-post analysis. Effect sizes were calculated using $r = Z / \sqrt{N}$ to interpret practical significance.

Table 2. Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Height (cm)	.145	45	.200*	.889	45	.015
Age (year)	.360	45	.000	.781	45	.000
Weight (kg)	.128	45	.200*	.946	45	.241

The significance (Sig.) values indicate whether the data follows a normal distribution (p > 0.05 suggests normality).

Ethical Considerations

The study adhered to ethical research guidelines to ensure participant welfare and data integrity:

• Participants provided informed consent before participation.

• Confidentiality was maintained by anonymizing all collected data.

• The research protocol was approved by the institutional ethics committee.

• Participants had the right to withdraw at any time without consequences.

• All sessions were supervised by a certified strength and conditioning specialist, and an emergency action plan was in place to address injury risks.

Results

This section presents the findings of the study, focusing on the impact of deductive and inductive training approaches on Olympic lifting performance. The results include kinematic performance across training phases, knee angle measurements at the starting position, and a comparative analysis of the tested performance metrics. Statistical analyses, including the Kruskal-Wallis and Mann-Whitney U tests, were conducted to determine significant differences between training methods and to validate the effectiveness of each instructional approach.

Kinematic Performance Across Training Phases

Table 3 presents the mean velocity (m/s) and standard deviation for the snatch and clean & jerk exercises across different training phases, comparing the deductive and inductive learning approaches. In the first phase, mean velocity values were similar across all groups, with no statistically significant difference (Kruskal-Wallis: $p = 0.750$). However, as training progressed, significant differences emerged between the groups. In phases two and three, velocity differences were observed ($p < 0.001$), and this trend continued into the fourth and fifth phases ($p < 0.001$), particularly in the clean & jerk groups, where velocity values were markedly higher. By the sixth phase, velocity increased substantially in the clean & jerk exercise, but no significant difference was observed between learning approaches ($p = 0.394$). In the final training phases, only the clean & jerk exercise was assessed, showing statistically significant differences between the groups ($p < 0.001$).

Overall, while the total mean velocity was higher in the clean & jerk than in the snatch exercise, the difference between the deductive and inductive approaches did not reach statistical significance ($p = 0.053$). Therefore, although the data indicate a numerical difference, this finding should be interpreted with caution, as it does not provide sufficient statistical evidence to conclude a true effect of instructional method on total velocity. Further research with larger sample sizes may help clarify whether this observed pattern reflects a meaningful trend or simply sampling variability.

Table 3. Mean Velocity (m/s) Across Training Phases for Snatch and Clean & Jerk Under Deductive and Inductive Training Approaches

Phase	Group 1 Snatch Deductive (Mean±SD, m/s)	Group 1 Snatch Inductive (Mean±SD, m/s)	Group 2 Clean & Jerk Deductive (Mean±SD, m/s)	Group 2 Clean & Jerk Inductive (Mean±SD, m/s)	Sig.
1st Phase (the first pull)	0.24 ± 0.03	0.25 ± 0.02	0.13 ± 0.02	0.15 ± 0.02	0.750
2nd Phase (the transition)	0.26 ± 0.03	0.26 ± 0.02	0.16 ± 0.03	0.17 ± 0.03	<.001
3rd Phase (the second pull)	0.25 ± 0.03	0.24 ± 0.02	0.25 ± 0.03	0.26 ± 0.02	<.001
4th Phase (the turnover under the barbell)	0.26 ± 0.02	0.28 ± 0.02	0.39 ± 0.03	0.39 ± 0.04	<.001
5th Phase (the catch)	0.26 ± 0.02	0.26 ± 0.03	0.70 ± 0.02	0.70 ± 0.03	<.001
6th Phase (rising from the squat position)	0.24 ± 0.03	0.24 ± 0.03	2.07 ± 0.50	2.10 ± 0.48	0.394
7th Phase (The Drive)	-	-	0.30 ± 0.02	0.30 ± 0.03	<.001
8th Phase (Split and Catch / Recovery)	-	-	0.66 ± 0.04	0.66 ± 0.04	<.001
SUM	1.50 ± 0.07	1.53 ± 0.07	4.66 ± 0.51	4.73 ± 0.51	0.053

Knee Angle at the Starting Position

Table 4 details the knee angle measurements (in degrees) for the snatch and clean & jerk exercises before and after training. In the pre-test, the deductive and inductive groups exhibited similar knee angles for both exercises. However, in the post-test, a reduction in knee angle was observed in the deductive snatch group (46.85° ± 5.96) compared to the inductive group (50.05° ± 5.48). A similar pattern was seen in the clean & jerk, where the knee angle decreased more in the deductive group (47.64° ± 5.21) than in the inductive group (51.83° ± 4.81).

The reduction in knee angles in the deductive training group suggests a potential effect of structured instruction on modifying movement mechanics. A lower knee angle at the starting position may indicate a more compact and stable lifting posture, which could influence overall lifting efficiency. However, it could also suggest a potential increase in joint loading, which may require careful monitoring to avoid excessive stress on the knees.

Table 4. Knee Joint angle at starting position measured by degrees

Exercise	Pre-test (Mean± Std. Deviation)		Post-test (Mean± Std. Deviation)	
	Inductive	Deductive	Inductive	Deductive
Snatch (degree)	52.27±4.2	51.50±4.43	50.05±5.48	46.85±5.96
Clean & Jerk (degree)	50.68±5.18	50.35±5.77	51.83±4.81	47.64±5.21

Comparative Analysis of Training Approaches

To better understand the impact of each instructional method, Table 5 presents the mean differences in kinematic performance from pre- to post-test across the four groups. These values reflect the amount of change (rather than absolute performance levels), thereby indicating the degree of improvement or decline resulting from the training interventions. The kinematic performance score represents a composite of velocity, knee angle efficiency, and overall mechanical execution, providing a comprehensive index of lifting performance. The results indicate a statistically significant reduction ($p < 0.001$) in performance scores across all groups. The deductive snatch group showed the greatest decline (-1.782 ± 0.735), suggesting a more substantial adjustment to the movement pattern or technique. In contrast, the inductive snatch group exhibited the smallest change (-0.956 ± 0.824), potentially reflecting a more gradual adaptation process. The clean & jerk groups showed moderate differences, with the deductive group improving slightly more than the inductive group.

These findings highlight the different adaptive trajectories associated with each instructional approach and lifting technique. The pronounced change in the deductive snatch group may suggest that this exercise, which demands high technical precision, requires more time for performance stabilization under structured learning. This contrasts with the cleaner adaptation observed in the inductive groups, where self-guided discovery may allow for more personalized adjustments to movement patterns.

Table 5. Comparative Analysis of the Four Assessed Groups.

	Mean	Std. Deviation	Sig.
Deductive Clean & Jerk	-1.52174	.94722	<.001
Deductive Snatch	-1.78261	.73587	<.001
Inductive Clean & Jerk	-1.13043	.86887	<.001
Inductive Snatch	-.95652	.82453	<.001

Mean ± SD, with significance levels ($p < 0.001$) indicating differences between conditions

Overall, the results highlight distinct performance trends between training approaches, suggesting that while both methods contribute to Olympic lifting skill acquisition, the deductive approach may impose a steeper learning curve, particularly in the snatch exercise. This highlights the importance of tailoring instructional structures to optimize movement efficiency, with potential implications for progressive overload strategies and technical reinforcement in early learning stages.

Discussion

Summary of Key Findings

The results of this study provide empirical insights into the effectiveness of deductive and inductive learning approaches in Olympic weightlifting. Although neither training method resulted in statistically significant differences in total mean velocity ($p = 0.053$), deductive training showed favorable trends in velocity across multiple phases of the snatch and clean & jerk exercises, particularly in the second pull phase of the snatch and the straightening phase of the clean & jerk. These non-significant but consistent trends were likely driven by enhanced motor coordination and biomechanical efficiency facilitated through structured instruction. Conversely, inductive training yielded inconsistent improvements, with notable gains in some phases while showing marginal or negligible progress in others. These findings suggest that structured, step-by-step learning may enhance specific technical components of Olympic lifts more effectively than self-guided, exploratory learning, though further research is needed to confirm statistical significance.

Comparison with Previous Studies

The observed benefits of deductive training align with research emphasizing the advantages of structured instructional methods in skill acquisition. Vierimaa et al., (2017) reported that systematically guided instruction fosters superior motor learning outcomes, reinforcing our findings that a well-defined learning structure enhances Olympic lifting proficiency. Furthermore, our results parallel those of Turan et al., (2018), who identified selective improvements in athletes using inductive learning, highlighting the potential but inconsistent effectiveness of self-directed training. However, not all prior findings support deductive superiority. For instance, Wang et al. (2021) suggested that variability and exploration inherent in inductive learning can promote robust motor adaptation. This discrepancy underscores the need for context-specific application of instructional styles based on athlete experience and task complexity.

Previous research underscores the significance of structured training methodologies in optimizing athletic performance. Torres-Torrelo et al., (2017) demonstrated that a light-load maximal lifting velocity squat program effectively enhanced both physical and skill-related attributes in futsal players, highlighting the role of velocity-driven training in improving movement efficiency. Similarly, the conceptual framework proposed by Glazier (2017) in the Grand Unified Theory of Sports Performance suggests that skill acquisition is best facilitated through systematic, progressively structured instruction, reinforcing the principles underlying deductive learning. Nevertheless, studies such as Manoel & Connolly, (1995) argue that excessive structure may limit motor exploration, potentially hindering long-term adaptability—an important consideration when interpreting our findings.

Additionally, our findings align with studies comparing low-load high-velocity (LLHV) and high-load low-velocity (HLLV) training paradigms. Mohamad et al., (2012) reported that LLHV protocols elicit similar or superior adaptations compared to HLLV training when volume is equated, a pattern reflected in our velocity findings. The structured nature of deductive training likely facilitated more efficient force application and improved neuromuscular coordination, although this remains speculative without direct measurement.

Moreover, our study adds to the growing body of literature examining biomechanical variables affecting weightlifting performance. Nasir et al., (2023) demonstrated the impact of stance width on power and velocity output, reinforcing the idea that technical adjustments influence performance. Similarly, our results suggest that not only does coaching methodology play a role, but also the interaction between instructional style and individual biomechanical adjustments.

While previous studies (Hossner et al., 2015; Perrey et al., 2018) have explored how training stimuli influence neural patterns, our study did not include EEG or neuroimaging measures. Therefore, any discussion on neuromuscular adaptation remains speculative and is beyond the scope of the present dataset. Future studies incorporating neural assessments could explore this relationship more directly.

The findings of this study align with broader trends identified in the literature on instructional methodologies in sports training. Alali et al., (2023) highlighted in a systematic review that deductive reasoning in coaching tends to yield more consistent improvements in technical execution, while inductive reasoning fosters adaptability and decision-making skills. These insights support our observation that deductive training enhances velocity gains in Olympic lifting, whereas inductive training produces more variable outcomes. Nevertheless, given the lack of statistically significant differences, these interpretations should be considered preliminary.

Implications of the Findings

The differential effectiveness of deductive and inductive learning methods has practical implications for strength training and coaching methodologies. Given that deductive training consistently produced significant improvements in movement velocity, coaches and trainers should prioritize structured instructional approaches, particularly when working with novice and intermediate lifters. This approach ensures that critical technical components of Olympic lifts are reinforced systematically, reducing the likelihood of inefficient motor patterns and potential injuries.

Conversely, the moderate improvements observed in some phases under the inductive approach suggest that self-directed learning may be beneficial for advanced athletes who have already internalized fundamental movement mechanics. Experienced lifters may benefit from inductive learning's emphasis on self-exploration, which can enhance adaptability in competition settings where variability in technique adjustments is required. Therefore, an optimal training approach may involve a hybrid model, integrating deductive learning for foundational skill acquisition and inductive methods for refining advanced techniques through self-exploration and error correction.

Limitations of the Study

Despite its contributions, this study has several limitations. First, the sample size was relatively small, limiting the generalizability of the findings to broader athletic populations. Future research should incorporate larger and more diverse cohorts, including athletes of varying experience levels, to validate these findings across different demographic groups. Second, the study's short duration prevented an assessment of long-term skill retention and transferability. Longitudinal studies are necessary to determine whether the advantages of deductive training persist over time and whether inductive learning eventually yields comparable improvements.

Additionally, the study did not account for individual cognitive differences, which may influence an athlete's responsiveness to different learning methods. Future research should integrate cognitive profiling to examine whether certain personality traits or learning styles modulate the effectiveness of deductive versus inductive training. For example, individuals with high working memory capacity may benefit more from deductive training, while those with strong kinesthetic awareness may excel under inductive methods.

Future Research Directions

To build upon these findings, future studies should explore the following research questions:

1. How does the effectiveness of deductive versus inductive training evolve over an extended training period? Longitudinal studies can determine whether the initial advantages of deductive learning are sustained or if inductive learning catches up over time.

2. What role does cognitive style play in determining an athlete's responsiveness to different instructional methods? Investigating cognitive factors such as working memory, attentional control, and decision-making processes may provide deeper insights into the optimal application of deductive and inductive learning.

3. Can a hybrid instructional approach combining deductive and inductive learning enhance Olympic weightlifting performance beyond either method alone? A mixed-method study could examine whether integrating structured instruction with guided self-exploration produces superior results.

4. What are the biomechanical differences between athletes trained predominantly through deductive versus inductive methods? Motion capture analysis could provide detailed insights into movement efficiency, coordination, and force application.

5. How do neural activation patterns differ between athletes trained under deductive and inductive methodologies? Future EEG or fMRI studies could help elucidate the cognitive and motor learning processes associated with each training approach. Such neural data would be essential before drawing conclusions about neuromuscular adaptations.

By addressing these research questions, future studies can refine strength training methodologies, optimize instructional strategies, and enhance athletic performance in Olympic weightlifting and other skill-intensive sports.

Conclusions

This study provides valuable insights into the impact of deductive and inductive training approaches on velocity performance in Olympic weightlifting. While deductive training led to improvements, particularly in the second pull phase of the snatch and the straightening phase of the clean & jerk, these differences did not reach statistical significance. The inductive approach, on the other hand, showed inconsistent results with improvements mainly in the first pull and transition phases, while later phases exhibited minimal gains. These findings suggest that while both approaches can influence performance, the effects of deductive training were not sufficiently different from inductive learning to assert a clear superiority, particularly given the statistical trends observed.

Despite the lack of significant overall findings, the study underscores the potential of combining both training methods for optimizing performance. Coaches should consider utilizing structured instruction for foundational skill development while integrating self-exploration to enhance adaptability and problem-solving skills, especially in more advanced athletes.

However, the study's limited sample (university students) and short duration (four weekly sessions) warrant caution in generalizing these results to a broader athletic population. Future research with a larger and more diverse sample, alongside longer training periods, could provide more definitive insights into the long-term effects of these training methodologies. Additionally, exploring the role of psychological factors such as motivation and cognitive load may further enhance understanding of how different instructional methods impact performance and training adherence.

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Authors' and translators' details:

Ahmad Alhussin Alali	general99001@gmail.com	Author/ Translator
Ali Hashim Mohammed	aliswim_h994@uomustansiriyah.edu.iq	Author
Haider Radhi Raheem Alsaedi	haider.radi@hiuc.edu.iq	Author
Azzam Ahmad Alhossin Alali	alali_azam@yahoo.com	Author
Osama Ahmad Alhosin Alali	oalali2007@yahoo.com	Author
Mustafa Mohsin Flayyih Khlaifawi	mustafa.mohsin@uomustansiriyah.edu.iq	Author
Ali Md Nadzalan	ali.nadzalan@fsskj.upsi.edu.my	Author
Nur Ikhwan Mohamad	nur.ikhwan@fsskj.upsi.edu.my	Author