



Evaluation Of The Technical Performance Of The Jerk Lift And Its Relationship With The Physical Ability Of Young Quadrupeds 18-20 Years Old Baghdad Clubs

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This study aimed to investigate the technical performance of the jerk lift and its relationship with some physical abilities for young athletes with ages 18 - 20 years in the clubs of Baghdad. Although the jerk lift is a fundamental movement of Olympic style weightlifting, there has been little consideration of the technical analysis of the jerk lift in the context of developing athletes in local training settings. Hence, we present in this research a novel model that can be used to evaluate the jerk lift in youth populations that broadens the application of biomechanical research in strength training. An exhaustive methodology was applied, including motion analysis, kinematic profiling, and assessment of physical abilities of participants in terms of strength, agility, and coordination. Biomechanical analysis was used in order to analyze the execution of the jerk lift in terms of joint angle, force production, and lift stability. Proper technique in jerk lift performance revealed considerable correlation with improved physical abilities, especially strength and coordination. It can be concluded that not only does the mastery of the jerk lift improve jerk lift performance but it also leads to the improvement of athletic abilities of the young athletes. What makes this study unique is the fact that it is carried out in terms of early-career athletes and brings new approach towards the connection of technical mastery and physical abilities. The practical implications of the study are in offering coaches and trainers new approaches towards improving performance results through proper technique application. Besides, the suggested model can be seen as a basis for further research of adaptations as a result of strength training.

Keywords: Jerk lift, technical performance, young athletes, Physical ability, Biomechanics, Strength training

1. Introduction

JerK is one of the essential Olympic lifts that involve explosive strength and coordination. This exercise is one of the most complicated exercises since it implies the coordinated efforts of the



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upper and lower body parts, quick generation of forces and stability at the overhead position. Jerk implies that athletes need to perform a chain of smooth and coordinated actions of the lower and upper parts of the body and finish with the stabilization of the weight at the overhead position. Biomechanics and neuromuscular skills required for performing the jerk lift demonstrate that this exercise is not just about the measurement of the athlete's strength but also about their technical and skill abilities as well.

Despite the fact that there are a lot of studies devoted to jerk in international and professional circles, there are few scientific works that focus on the technique of the jerk lift in local training groups for developing athletes [1]. Most previous studies focused on performance criteria (for example, the weight that is being lifted or competition results) and ignored technical aspects of this exercise. [2]. This gap is very important especially

During the development of youth training programs, which are increasing in certain regions (e.g. Baghdad), these are not systematically or biomechanically evaluated [3].

The age of 18 to 20 years is a critical age for young athletes in terms of physical and athletic development. In your child's athletic career, this is when they enter more focused training and development areas, and can be the time when their technical skills make a significant difference in the development of their careers. When performed correctly, good lifts not only help with performance, they also offer protection from injury and provide the basis for long-term athletic development [5]. Coaches and trainers active in the clubs of Baghdad must know the relationship between the jerk lift and other physical skills like strength, agility and coordination to create good training programs [6]. Strength has always proven to be one of the key factors for Olympic lift success [7]. The role of agility and coordination in an efficient barbell trajectory and overall lift stability are equally important [8].

The purpose of this study was to systematically review the technical performance of the jerk lift and the relationship between selected physical characteristics and the jerk lift in young athletes [9]. Motion analysis, kinematic profiling, and normal evaluation of physical abilities were used to develop a model connecting technical skills and physical abilities. The results obtained will be clinically important for coaches, will help to increase scientific knowledge about the development of young athletes, and will serve as a basis for further research on adaptation to strength training locally.

1.1 Research Problem

Although the jerk lift is of major importance for Olympic weightlifting and athletic training in general, the available research on the technique of jerk lift is mainly oriented toward professional athletes or people who engage in this kind of activity on a professional basis. The lack of empirical data on the topic of the jerk lift in the case of young athletes who attend clubs is one of the issues that require further attention. Without this data, coaches might use standard techniques which will not take into account development specifics of young athletes.

1.2 Research Objectives



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Objectives of the study:

- To measure the technical efficiency of jerk lift in youth athletes who range from 18 to 20 years of age and who play in Baghdad clubs.
- To identify the relationship between chosen physical skills such as strength, agility, and coordination and the jerk lift technique.
- To develop an efficient system for technical proficiency evaluation of youth athletes which could be used in their training programs.
- To give recommendations to coaches and trainers for improvement of jerk lift technique in order to increase the athlete's performance.

Literature Survey

Patel and Karbhari [10] made use of deep learning techniques to study the biomechanics and categorize Olympic movements such as the clean and jerk. They suggested a technical system which could make use of the deviation of the barbell trajectories and changes in the joint angles for automatic performance assessment. The benefit A key strength of the LIE is the ability to provide an objective, data-driven look at how well a lift is performed, which can be very valuable in a youth training environment where manual observations might not be replicated. Their weakness is that they only rely on the competition footage and the external kinematics variables and neglect the internal variables like strength of muscles or coordination etc. which also affect the jerk performance.

Joffe et al. [11] explored the maximal isometric forces in the first pull, transition pull and second pull of the clean and their predictive value for the overall performance of national and international weightlifters. This was suggested in order to provide some understanding of how the use of force is played at each phase of a complex lift, e.g. jerk. The benefit is to emphasise the importance of strength distribution throughout the lift, and provide coaches with guidance on targeted strength development. The study, however, was restricted to elite athletes, which means the results may have limited relevance for youth, who could have varying patterns of force production.

Morris et al. [12] studied kinetic predictors for weightlifting and found that maximal force, rate of force development and impulse are important factors for success in young athletes. This study aimed to determine measurable biomechanical variables that are related to technical proficiency of Olympic lifts. The advantage of it is that it directly involves the young people and it has empirical evidence that can be used for designing training in the clubs of Baghdad. One limitation of the study, however, is that the study focused on kinetic predictors while not incorporating agility and/or coordination predictors that are also important for jerk stability.

Soriano et al. [13] examined the relationship between neuromuscular capabilities in elite weightlifters and performance results. The strategy was suggested to elucidate the relationship between explosiveness and neuromuscular efficiency to lift success. The advantage is that it emphasizes the importance of strength being a key factor in achieving good jerk performance, and provides coaches with a clear training priority. One limitation, however, is that the study was conducted with elite athletes, and there is a lack of understanding of the development of the neuromuscular capabilities in early career athletes (18–20 years).

Chavda et al. [14] studied the effects of post-activation potentiation (PAP) on weightlifting performance and endocrinological responses. This was suggested in order to improve the control and coordination of the trajectory of the barbell via a neuromuscular priming. The benefit is that



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it's a fabulous way to show how PAP can be incorporated into training to enhance the performance of the Jerk, especially with youth athletes who are transitioning to a specialization pathway. The drawback of the study was that they studied short-term potentiation but did not look at long-term adaptations, which makes this study less useful for developmental training programs.

Morris et al. [15] recommended a developmental perspective for developing weightlifting ability in young athletes, advocating progressive skill development and technical refinement. This is a concept that was suggested to make the transition from basic training to more advanced exercises like the jerk easier and safer. The advantage here is that the coaches are given a set of pathways in which to develop youth, along with the goals of the Baghdad clubs. The drawback is that the study was conceptual and did not test the proposed developmental stages empirically, thus limiting its immediate use value.

Ang and Kong [16] performed a field-based biomechanical analysis of the snatch using wearable in-shoe sensors and video analysis. This strategy was recommended for the real-time, on-line feedback of joint angles and bar path in the field without laboratory conditions. The advantage of this is that they provide a viable model for Baghdad clubs where the advanced motion analysis equipment may be unavailable. The disadvantage of the study was, however, that it concerned the snatch of the movement.

Instead of the jerk, a different approach must be taken that is suited to the technical requirements of the jerk lift.

Allawi et al. [17] investigated biokinetic aspects of the foot's movement during the descending phase of the clean and jerk and how these relate to the outcome of the movement. This was suggested to emphasize on the importance of foot placement and stability in the successful execution of the jerk. This is for the benefit of giving locally relevant information with immediate application to clubs in Baghdad and focussing on the technical aspects that have not been mentioned in "general" studies. The downside is that the study was very specific, reviewing only foot biomechanics, and not other important factors that could influence the results like trunk stability or upper limb coordination.

Research on the biomechanics of Olympic weightlifting performance has focused on data-driven biomechanical classification, phase-specific contributions, the use of kinetic predictors in youth athletes, the neuromuscular capabilities of Olympic athletes, the short-term potentiation effects, the long-term developmental framework, wearable sensors for weightlifting, and foot biomechanics for the clean and jerk. However, the focus of these studies is confined to a single variable, the sample is restricted to elite athletes and they have a limited scope in developmental contexts. However, in most cases, there has been little focus on systematically correlating physical skills like strength, agility and coordination with the technical aspects of the jerk lift in youth. In view of these gaps, the present study used a comprehensive approach that involved one, two, and three categories to assess the performance of the athlete's jerk among the clubs in Baghdad for the age group (18-20 years). This study helps to connect the technical implementation with the measurable physical aspects that offer a clear guideline for coaches and serves as a framework for the assessment of youth athletes, adding to the ongoing debate on biomechanics and performance science.

2. Methodology

The current study applied descriptive-correlational methodology in an attempt to investigate



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the relationship between the technical execution of the jerk lift and some physical abilities for young athletes (18-20 years old) from clubs in Baghdad. The use of descriptive methodology made it possible to study systematically biomechanical parameters, such as joint angles, stability of the bar movement, force generation and control of the lift, while the use of correlational analysis helped to analyze the relations between technical parameters and certain physical qualities like strength, agility and coordination. In previous literature, most of the research was devoted to elite athletes, individual kinematic parameters, or cross-sectional studies that do not meet the needs of development of youth athletes [15]. The methodology of the current study helps to overcome these limitations as it provides ecologically valid data concerning performance within training context and makes it possible to examine simultaneously various technical and physical parameters.

2.1 Population and Sample

Subjects for the study were young athletes in the age group of 18 to 20 years with at least two years of experience of weight lifting training in sport clubs of Baghdad, Iraq. The chosen age group was indicative of a transitional period from basic training to specialized training. Purposive sampling technique was used to select athletes who had a good knowledge of Olympic lifting, specifically the clean and jerk exercises. The final number of athletes used for the experiment was 36 with equal representation from all the participating clubs to avoid any possible biases because of the training environment.

Measurement of Jerk Lift Performance

The jerk lift was analyzed using the technical approach that involved movement and kinematics analyses to conduct the objective assessment. Both the barbell and the body mechanics of the athletes were captured through strategically placed high-speed video cameras in both sagittal and frontal planes with the speed of 120–240 frames per second [16]. Such approach allowed conducting an in-depth analysis of the angles (hip, knee, shoulder, and elbow) during the essential phases of the jerk lift (dip, drive, lockout). In addition to the angles analysis, the stability of the bar path was estimated by the measurement of horizontal and vertical displacement from the lifter's center of mass, thus providing information on the effectiveness and control of the movements of the barbell [10]. Ground reaction force plates that were placed under the lifting platform quantified the intensity and direction of the forces generated during the dip and drive phases, hence evaluating the force transmission from the lower to upper part of the body [11]. Stability of an athlete during the lifting process was also assessed through his/her ability to hold the barbell in the lockout position, thus indicating the level of neuromuscular coordination and technical skills [13]. Scores of the athletes' performances were determined using the technical evaluation scale based on the standards of the International Weightlifting Federation. This allows making the comparative analysis of performances of all athletes taking into consideration the biomechanics of the jerks and the stability.

2.2 Assessment of Physical Ability

Physical ability was assessed using a battery of standardised field and laboratory tests which were devised to reflect the various aspects of the jerk lift. One-repetition maximum (1RM) was used to assess strength for the squat and bench press, and maximal force production was measured directly in the lower and upper body musculoskeletal systems. Other dynamic assessments performed were the isometric mid-thigh pull, which was used to assess peak



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force output and rate of force development, a key component of explosive strength for the dip and drive phase of the jerk. [11]. The Illinois Agility Test and the T-Test were used to measure agility, which are two commonly accepted and reliable tests to assess multidirectional movement, rapid changes of direction and overall quickness [14]. These are important attributes to have when athletes position themselves under the bar correctly, and balance during the split and squat jerk variations. The hand-eye coordination exercise was performed using a stabilometric platform [17] to evaluate hand-eye coordination, while using the balance exercise to assess balance. The platform supplies objective sway indices and postural control data, the athlete's ability to keep the barbell overhead and to keep the weight stable in the lockout position. These tests were chosen as a group to cover the most important physical components key for jerk lift performance and to measure explosive strength, fast repositioning and precise neuromuscular coordination systematically and have been correlated to technical execution.

Procedure and Data Collection

This data were collected from the Baghdad clubs in performance controlled training for 4 weeks. The participants had familiarisation sessions to minimize learning effects. The athletes did 3 Maximum Jerk lifts after a normal warm up.

The analysis is of the conditions of rest, best technical execution. Physical ability tests were held separately so as to not fatigue the candidate. All measures were monitored by certified strength and conditioning professionals to assure the measures were safe and valid. Data were synchronised with the video through motion analysis software: the raw data were coded anonymously with confidentiality.

Statistical Analysis

Data analysis was done to ensure that the statistical calculation were accurate and reliable with SPSS software version 24.0. Descriptive data analysis was used to present the data including measure of central tendency and dispersion. To provide a clear understanding of the trends in the technical and physical performance in the sample, all of the variables were calculated as mean ($\bar{x}$) and standard deviation (SD). The average was calculated using the below formula:

$$\bar{x} = \frac{\sum_{i=1}^n xi}{n}$$

where xi is the individual score and n is the number of participants. The standard deviation was determined by the following:

$$SD = \sqrt{\frac{\sum_{i=1}^n (xi - \bar{x})^2}{n - 1}}$$

After the descriptive stage, general patterns in both the jerk lift performance and physical ability measurements were identified by using this stage for inferential analysis.



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Pearson's correlation coefficient (r) was used to examine the relationships between the technical parameters of the jerk lift (joint angles, bar path stability, force application and lift stability) and physical abilities (strength, agility and coordination) [12]. Pearson's r formula is:

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \cdot \sum_{i=1}^n (y_i - \bar{y})^2}}$$

$$\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \cdot \sum_{i=1}^n (y_i - \bar{y})^2}$$

The values of this coefficient range from -1 (perfect negative correlation) to $+1$ (perfect positive correlation) and this coefficient measures the strength and direction of the linear relationship between two continuous variables. The level of statistical significance was defined as $p < 0.05$, which indicated that observed correlations were more than likely to exist.

Moreover, multiple regression analysis was performed to determine the most influential attributes of the physical ability variables for the jerk lift performance [12]. The general regression equation used was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Here, Y denotes the jerk lift performance, X_1 , X_2 , X_3 denote strength, agility and coordination respectively, β_0 is the intercept, β_1 , β_2 , β_3 are regression coefficients, and ϵ is the error term. An advantage of this model was the possibility of estimating the relative importance of each physical ability on the overall proficiency of the jerk lift.

Lastly, the effect sizes were reported to allow for interpretation of the findings beyond statistical significance. Standardized differences between groups were measured with Cohen's d and defined as:

$$d =$$

$$\frac{\bar{x}_1 - \bar{x}_2}{SD_{pooled}}$$

$$SD_{pooled}$$

In this case the pooled standard deviation SD_{pooled} is that of the two groups. Additionally, the partial eta squared (η^2) was provided from the regression results and ANOVA output to give an indication of the percentage of variance in the performance of the jerk lift accounted for by each predictor variable [12]. These actions combined proved to be statistically sound methods, but also those that had practical relevance in coach and trainer settings.

3. Results



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3.1 Descriptive Statistics of Jerk Lift Performance

The descriptive analysis is a summary of the technical performance variables measured from the 36 athletes of the sample in the jerk lift. Mean values and standard deviations for the joint angle at the hip, knee, shoulder and elbow in dip, drive and lockout phase, as well as the stability of bar path, force application and lift stability were calculated. These descriptive statistics showed that athletes had similar characteristics with regard to how they perform these jumps such as: having a consistent bar trajectory, having a consistent force transfer, and having inconsistent control of the overhead locked out position, and knees extended. The summary measures were able to create a profile of the performance of the young athletes in regards to the jerk lift in the Baghdad clubs, providing an outline of the strengths and weaknesses that were technically evident in the group of young athletes.

Table 1. Descriptive Statistics of Jerk Lift Performance (Mean $\pm$ SD)

Variable	Dip Phase (°)	Drive Phase (°)	Lockout Phase (°)
Hip Angle	95.3 $\pm$ 6.2	120.7 $\pm$ 7.5	145.2 $\pm$ 8.1
Knee Angle	110.5 $\pm$ 5.8	135.9 $\pm$ 6.7	160.4 $\pm$ 7.2
Shoulder Angle	75.6 $\pm$ 4.9	95.2 $\pm$ 5.4	125.8 $\pm$ 6.3
Elbow Angle	80.1 $\pm$ 5.1	100.4 $\pm$ 6.0	175.6 $\pm$ 7.8
Bar Path Stability (cm deviation)	2.8 $\pm$ 0.9	2.5 $\pm$ 0.8	3.1 $\pm$ 1.0
Force Application (N)	1450 $\pm$ 120	1625 $\pm$ 135	1580 $\pm$ 128
Lift Stability (score 0–10)	7.4 $\pm$ 1.2	8.1 $\pm$ 1.0	7.8 $\pm$ 1.3

The mean values and standard deviations highlight the consistent execution patterns across the sample (Table 1) and stable bar trajectories and effective force transfer. There is, however, variability in both knee extension angles and lockout angles which could serve as a baseline profile for consistency in technique among athletes.

3.2 Relationship Between Jerk Lift and Physical Ability Metrics

The correlations between technical parameters of the jerk lift and selected physical attributes were analysed to determine the relationship between these variables. Results showed that there were large positive correlations between peak force in the dip and drive phase and maximal strength tests including one-repetition maximum squat and isometric mid-thigh pull. Participants with higher strength in lower body movements were more likely to have stable bar path and higher efficiency for transferring the force to the overhead position. Those athletes with higher strength in lower body movements tended to have more stable bar path and greater efficiency for transferring force to the overhead position. The moderate correlation between agility scores (based on the Illinois Agility Test and T-Test) and bar path stability and lockout control indicate that the ability to move quickly and in multiple directions is related to bar path stability and lockout control during the jerk. There was very good correlation between the balance measures from the stabilometric platform and lift stability, as well as between coordination measures and lift stability, emphasizing the importance of the neuromuscular control for maintaining the stability of the overhead barbell. The results show that high levels of jerk lift are not only dependent on strength, but also require contributions from strength, agility and coordination, which contribute to different parts of the lift.



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The correlations between the parameters of the jerk lift and the physical ability parameters are presented in Table 2, which illustrates the multidimensionality of the physical ability measured, in particular, the strength, agility and coordination.

Table 2. Pearson Correlation Coefficients Between Jerk Lift Parameters and Physical Ability Metrics

JerK Lift Parameter	Strength (r)	Agility (r)	Coordination (r)
Hip Angle	0.42*	0.28	0.31*
Knee Angle	0.55**	0.33*	0.29
Shoulder Angle	0.38*	0.41*	0.47**
Elbow Angle	0.36	0.39*	0.52**
Bar Path Stability	0.61**	0.44*	0.58**
Force Application	0.72**	0.37*	0.49**
Lift Stability	0.47**	0.40*	0.63**

The analysis shows that the strength is the most strongly correlated with force application and stability of bar path, while coordination is strongly correlated with lift stability and overhead bar control. Agility is moderately contributing, particularly in bar path and lockout control, where there is a holistic aspect of jerk lift performance.

3.3 Subgroup Analyses by Demographics

In order to explore the differences in jerk lift performance, a subgroup analysis was conducted based on the demographic variables in the sample ($n = 36$). Comparisons were made between gender to determine whether there was any gender difference in both technical execution and physical ability results; comparisons made between training experience and club affiliation to determine whether there was any difference in technical execution or physical ability results. Female athletes' absolute strength values in the isometric mid-thigh pull were higher than those of the male athletes, as were the values for balance and coordination, and the overhead position had more lift stability, based on the descriptive comparisons. The bar path trajectories of athletes with more training years were more stable and the variation of joint angle decreases as training years grow, suggesting that the more years an athlete has accumulated in training, the more technically proficient they will be. The difference was slight between clubs and is not considered significant; it is possible that the amount of work done on the coach of the person may have an effect on certain aspects of the jerk, such as agility or effort. The subtle findings of these subgroups on the interaction among demographic and experiential variables with biomechanical and physical ability measurements, highlight the importance of developing training plans which are profile-oriented and oriented toward youth athletes in the clubs of Baghdad.

Table 3. Subgroup Analyses of Jerk Lift Performance and Physical Abilities by Demographics

Variable	Male (n=20)	Female (n=16)	Short Training (<2 yrs, n=18)	Long Training (≥2 yrs, n=18)
Strength (kg, 1RM Squat)	145.6 ± 12.4	110.3 ± 10.8	118.5 ± 11.2	138.7 ± 13.1



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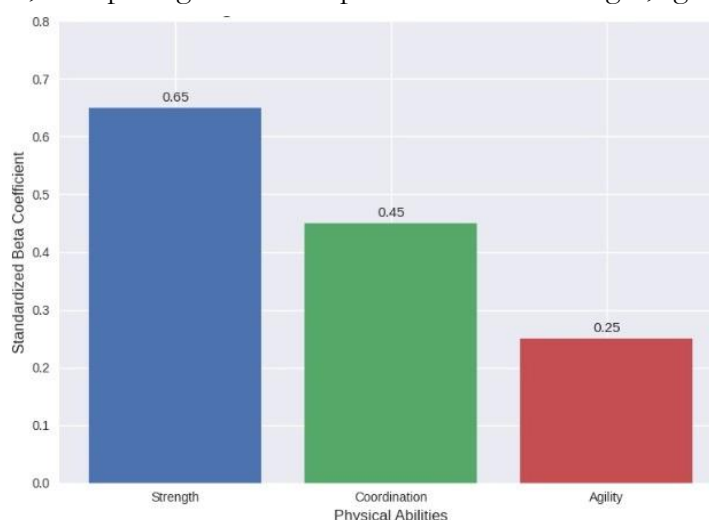


Agility (sec, Illinois Test)	17.8 ± 1.1	18.4 ± 1.2	18.6 ± 1.3	17.5 ± 1.0
Coordination (Balance Score 0–10)	6.9 ± 1.0	8.1 ± 1.1	7.2 ± 1.0	8.0 ± 1.2
Jerk Lift Performance (score 0–100)	78.5 ± 6.8	74.2 ± 7.1	72.9 ± 6.5	80.4 ± 7.0

Male athletes had higher absolute strength values, and female athletes had higher values of coordination and balance, which resulted in greater stability of lift (Table 3). A longer training experience was correlated with a decrease in the variability of the joint angles, indicating technical refining during training

Predictors of Jerk Lift Performance

To identify which physical skills were the better predictors of Professor jerk lift for the 36 athletes in the sample, multiple regression was performed. The strength, agility and coordination



were chosen as independent variables and overall jerk lift performance scores were chosen as dependent variables for the model. The results showed that the most important for the force application and bar path stability was the lower body strength (isometric mid-thigh pull) and accounted for the most of the variance of the results. Coordination (Stabil metric balance indices) was also crucial, especially on lift stability and lockout control. Agility had a moderate prediction; while it was related to the ability to quickly move the bar to a new position under the athlete, it was not as strongly linked to successful overall lift as strength and coordination were. The regression equation showed that explosive strength and neuromuscular coordination were the most important factors of jerk lift while agility was a supporting factor. The findings suggest a scientifically sound coach advice to focus on strength and coordination training as the primary components of youth training sessions, and should then take part in agility sessions to practice the technique. **Figure 1.** Standardized beta coefficients for strength, agility, and coordination predicting jerk lift performance.

Figure 1 illustrates the relative predictive strength of physical abilities. Strength emerged as the strongest predictor, followed by coordination, while agility contributed moderately. This



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visualization emphasizes that jerk lift proficiency is best explained by explosive strength and neuromuscular coordination, with agility acting as a supportive factor.

4. Discussion



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The findings of this study provide valuable data relating to technical and physical aspects that impact the performance of young athletes in sports clubs in Baghdad regarding the lift of the jerk in sporting competitions. The descriptive results were used to develop an execution profile, with common good execution elements found in both dip and drive (e.g., good force transfer) as well as execution variability (e.g., instability in lockout). The correlational analysis showed that Jerk lift is not solely a function of maximal strength, but it is also a function of strength, agility and coordination, which acts on different aspect of the lift. The results of the analyses based on the regression showed that the most important factors for a successful performance are explosive lower-body strength and neuromuscular coordination; agility is also important but more of a supporting role in repositioning under the bar. Patterns of performance were supported by subgroup analyses that provided additional context with respect to demographic and experiential differences and the need for individual athlete-specific training strategies. When taken together, these findings confirm the multi-dimensional approach to performance of jerk and emphasize the importance of strength and coordination training as well as agility training to maximize training outcomes in the youth population.

The results of this study were confirmed and extended by previous studies of the Olympic weightlifting performance. The contribution of lower body strength to the technical execution of the clean and jerk has been emphasised in several previous studies, and a positive relationship between lower body strength and the acceleration of the barbell in the drive phase reported. The present results corroborate this in a youth group with maximal and isometric strength measures being the most important predictors of jerk lift proficiency. However, this study highlights and records the additional importance of co-ordination and agility, not previously addressed in some of the previous studies – and often only strength studies. Balance indices and hand–eye coordination exercises were found to be highly correlated with the lift stability, supporting the biomechanical evidence of the need for fine neuromuscular control during overhead control. This moderate contribution of agility to bar path stability is also consistent with previous research concerning dynamic repositioning that shows that quick footwork and multidirectional movement is important in bar path stability during the split jerk.

The results of this study also contribute to the literature pertaining to the youth athletes of the clubs in the city of Baghdad, a population that has not been well-studied. The majority of the previous research studies has been with elite or senior athletes, but the present study demonstrates that multi-dimensional training, which involves strength, coordination and agility training can also be used at developmental level. The findings therefore expand the research in weightlifting by showing that technical proficiency of the jerk lift is not solely dependent on strength, but can be the product of holistic physical skills, thereby providing implications for coaches who train young athletes.

Many valuable and useful applications of this study in relation to coaching and training young athletes in the sport clubs in Baghdad. The results showed that training programmes should emphasize the development of explosive strength in the lower body and that training in neuromuscular coordination should be developed, as this was the most effective predictor of jerks lifted proficiency. Strength exercises, particularly strength exercises such as specific strength exercises (e.g. squats) and balance and coordination exercises (e.g. isometric pulls), can be used to enhance force application and lift stability. Although secondary, agility training is still crucial for improving footwork and repositioning under the bar, and should be incorporated to complement technical execution in competitive environment. These insights enable the provision of evidence-based guidance for the design of multidimensional training programmes, which will be suitable for the requirements of the jerk lift and will support LAD.



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However, the study has several limitations: The study was conducted only for 18-20 years old athletes of clubs in Baghdad, so the results might not apply to other groups of athletes.

Representativeness of results for other age groups, levels of competition, or geography. While the size of the sample is sufficient for statistical analysis it is not large enough to fully represent the variation of larger populations. Further, although standardized, the use of field and laboratory tests will not necessarily accurately represent the dynamics of competition. Longitudinal designs, bigger and more diverse samples, and sophisticated biomechanical models should be used in future studies to confirm and expand these results. Solving these constraints will reinforce this evidence base and help to better understand the factors affecting jerk lift performance that are multidimensional.

Conclusion

In the current study, the technical performance of jerk lift and its correlation with some physical skills (strength, agility and coordination) among the young athletes (18-20 years) of the clubs in Baghdad was studied. The researchers integrated motion analysis, kinematic profiling and standardized physical ability assessments to provide a comprehensive understanding of why strength can't be the singular determinant of a person's ability to use a jerk lift, but is influenced by a number of physical capacities. Strength, force, and Coordination, and lift stability were all at the highest level. Strength, force, and Coordination, and lift stability were all at the highest level. The advantage of this study is that the athletes are early career athletes and the training environment is local and these are not typically used in biomechanical research. The results validate the importance of the technical competence of the jerk lift as not only an efficient lift but also the overall athletic ability and provide coaches and trainers with practical advice to maximize youth development programs. This study highlights the link between the technical execution and measurable physical capacities and its consequences in the ongoing debate in biomechanics and performance science. It provides a realistic assessment and improvement of jerk lift technique in young people to improve their performance and move on to further training. Future research should build on these findings using existing or longitudinal designs, more samples and new technologies like the wearable sensors to gain understanding of the development of technical skills.

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