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Explosive Power Training and Match-Play Success in Tennis Athletes in A Science and Technology University in Guangxi Province, China

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ABSTRACT:
This study explores the relationship between explosive power training and match-play success among tennis athletes at a university in Guangxi, China. A survey of 210 athletes revealed a significant positive correlation between the two, indicating that more effective explosive power training is associated with better perceived match performance. Based on these findings, the study concludes by proposing an explosive power enhancement program aimed at helping athletes and coaches optimize training for improved competitive results.
KEYWORDS: Explosive Power Training,Correlation,Training Program

I. INTRODUCTION

Explosive power, defined as the capacity to produce maximum force in minimal time, is essential for competitive tennis. This attribute influences serving power, court coverage, and quick transitions, all of which are critical to match success. Training regimens focusing on explosive power have gained momentum, supported by recent research.

Explosive power training, including plyometric drills, Olympic lifts, and short sprints, is vital for enhancing athletic performance. A study by Prawira and Santos o (2022) found that tennis play e r s who incorporated explosive exercises exhibited imp roved serve speeds and better reaction times on the court. These improvements translated directly to match-play advantages, such as gaining an upper hand during high-pressure rallies and break -point scenarios.

Competitive tennis requires athletes to repeatedly perform high -intensity movements, making endurance a complementary aspect of power. Research by Middleton and Carrick (2023) revealed that explosive power training enhanced recovery times between points and maintained energy levels during prolonged matches. This resilience in demanding conditions is particularly beneficial in tournaments where matches c an extend over several hours or even day s.

The benefits of ex plosive power training extend beyond raw strength to include agility and precision. A study by Fitzpatrick and Longford (2021) demonstrated that lateral quickness and sprinting speed, key factor s in tennis success, improved significantly after as ix-week explosive power program. These gains allowed athletes to res pond faster to s hots, maintain court positioning, and ultimately win more points.

Physical improvements from explosive power training also have a psychological impact on athletes. Athletes with enhanced physical capabilities often report greater confidence and reduced anxiety during competition.Holloway and Richman (2023) found that tennis players who participated in structured explosive power programs displayed better mental resilience and decision-making under stress. This psychological edge often becomes a decisive factor in closely contested matches.

However,explosive power training must be personalized to avoid over training or injuries.Prawira and Santoso(2022)emphasized the importance of tailoring programs based on an athlete's age,experience,and current fitness level.They highlighted that improperly designed training routines could lead to joint stress and muscle imbalances,undermining the intended benefits of the regimen.

Technological advancements have further refined explosive power training methodologies.Motion capture and wearable technologies now provide real-time feedback on performance metrics,enabling precise adjustments to training.A study by Chadwick and Morley(2020)highlighted how technology-driven programs optimized explosive power gains while minimizing injury risks.These innovations make training more effective and accessible to a wider range of athletes.

The role of cultural and environmental factors in shaping explosive power training cannot be overlooked.Increased investment in tennis facilities and coaching programs has facilitated access to high-quality training.Prawira and Santos o(2022)noted that these efforts have helped regional athletes compete on the global stage by closing performance gaps through targeted physical conditioning.

Explosive power training also contributes to long-term athletic development,preparing athletes for higher levels of competition.Fitzpatrick and Longford(2021)found that consistent training not only improved performance but also reduced the risk of over use injuries.This foundation ensures a longer career trajectory for tennis players , allowing them to compete at their peak for extended periods .

Explosive power training is indispensable for modern tennis athletes seeking match-play success.Research underscores its multifaceted benefits,from improving serve speed and agility to boosting confidence and endurance.Integrating personalized programs and leveraging technological advancements can further enhance its effectiveness,ensuring that athletes are physically and mentally prepared for the demands of competitive tennis.

Statement o f the Problem

This study will determine the relationship between explosive power training and match-play success in tennis athletes.

The results of the study will be used as a basis for an explosive power enhancement program.

Specifically,the study will answer the following questions:

1.What is the demographic profile of the athlete respondents in terms of:

1.1.sex;

1.2.age;and

1.3.number of years as a tennis athlete?

2.What is the assessment of the athlete respondents of their explosive power training in terms of:

2.1.technique and form;

2.2.strength development;

2.3.speed and reaction time;

2.4.transfer to tennis performance;and

2.5.recovery and fatigue management?

3.Is there a significant difference in the assessment of the athlete respondents of their explosive power training when they are grouped according to their profile?

4.What is the self-assessment of the athlete respondents of their match-play success in terms of:

4.1.technical execution;

4.2.tactical awareness;

4.3.physical fitness;

4.4.mental toughness;and

4.5.match outcomes and trends?

5.Is there a significant difference in the self-assessment of the athlete respondents of their match-play success when they are grouped according to their profile?

6.Is there is a significant relationship between explosive power training and match-play success in tennis athletes?

7.Based on the results of the study,what explosive power enhancement program can be proposed?

II. RESEARCH METHODOLOGY

This study adopted a quantitative-driven descriptive-comparative-correlational research design to systematically investigate the complex relationship between explosive power training and match success among tennis players. The research was conducted at Guangxi Science and Technology Normal University in Guangxi Province, China, with the study population consisting of collegiate tennis players from the university. For sampling, a purposive sampling technique, a non-probability method, was employed to select 210 participants who met the criterion of having "at least one year of competitive experience," ensuring the respondents possessed sufficient practical background to evaluate the core variables under investigation.

For data collection, a researcher-developed structured questionnaire served as the primary instrument. The questionnaire was designed through a rigorous process, initially validated for content validity by a panel of experts, followed by a pilot test which demonstrated exceptionally high internal consistency and reliability, with an overall Cronbach's alpha coefficient of 0.992. The questionnaire comprised three sections: Section I gathered demographic information (including gender, age, and years of tennis experience); Section II comprehensively assessed players' perceptions of the explosive power training they received, covering five key dimensions: exercise techniques, strength development, speed and reaction, transfer of training outcomes to tennis performance, and recovery and fatigue management; Section III measured players' self-assessment of their match success, encompassing technical execution, tactical awareness, physical conditioning, mental resilience, and match outcome trends. All items were measured using a four-point Likert scale, and data were collected through face-to-face, on-site administration.

During the data analysis phase, all valid responses were processed using SPSS statistical software. The analytical approach integrated descriptive statistics (such as frequencies, percentages, means, and standard deviations) to characterize the overall sample profile and the basic distribution of variables. Furthermore, inferential statistical methods, including independent samples t-tests and one-way ANOVA, were applied to examine potential significant differences in the assessments of explosive power training and self-rated match success across different demographic groups (e.g., gender, age, years of experience). Finally, Pearson product-moment correlation analysis was conducted to precisely quantify the strength and direction of the relationships between the various dimensions of explosive power training and those of match success. The entire research process strictly adhered to academic ethical norms, including obtaining informed consent, ensuring privacy and confidentiality, upholding the principle of voluntary participation, and minimizing potential risks, thereby guaranteeing the scientific integrity of the data and the ethical compliance of the research procedure.

III. RESULTS AND DISCUSSION

The study found that tennis players' evaluations of explosive power training were generally very positive (overall mean = 3.55), with the most significant effects observed in improving speed and reaction time. Meanwhile, players also rated their own match success relatively highly (overall mean =

3.40), showing the strongest agreement regarding their match outcome trends and the contribution of physical conditioning.

Statistical analysis revealed a key finding: a strongly significant positive correlation exists between explosive power training and match success (overall correlation coefficient $r = 0.750$). This indicates that the more effective athletes perceive the explosive power training to be, the greater their sense of success across technical, tactical, physical, mental, and outcome-related aspects. The transfer of training effects to tennis performance and the association with match outcomes showed the strongest relationships.

The discussion highlights that while evaluations were similar across different age groups and years of experience, male athletes rated both training effectiveness and perceived match success significantly higher than female athletes. This suggests that training programs may need to consider gender-specific adaptations. Furthermore, although the correlations were relatively weaker for technical execution and tactical awareness, the overall results strongly demonstrate that scientific explosive power training is a critical factor in enhancing tennis performance. These findings provide an empirical basis for proposing targeted training interventions.

IV. CONCLUSION

The core conclusion of this study is that a strong positive correlation exists between systematic, scientific explosive power training and competition success among tennis players. Empirical analysis demonstrates that higher athlete ratings of explosive power training are associated with higher self-assessed match performance levels. This quantitative finding robustly validates the critical role of explosive power training in enhancing competitive outcomes.

Specifically, the study yielded the following conclusions:

Training Effectiveness: Athletes generally perceived the current explosive power training program as "highly effective" in improving exercise techniques, strength development, speed and reaction, and recovery management.

Self-Perception: Athletes held positive self-evaluations regarding their technical execution, tactical awareness, physical conditioning, mental resilience, and match outcomes during competition.

Group Differences: Data analysis revealed no significant differences in perceptions of training and match success based on age or years of playing experience. However, gender emerged as a key variable, with male athletes reporting significantly higher perceptions than their female counterparts. This suggests that training protocols may need gender-specific considerations.

Core Relationship: The central finding is a strong positive correlation ($r = .750$) between explosive power training and match success, with the strongest link observed in the transfer of training outcomes to competitive results.

Based on these conclusions, the study ultimately proposes an Explosive Power Enhancement Plan. This plan aims to translate the research findings into practical applications, assisting athletes and coaches in optimizing training to maximize competitive performance.

REFERENCES

1. Andar ianto, A., Rejeki, P. S., Sakina, Pranoto, A., Septyora, T. W. A., Sugiharto, & Miftahus sur ur, M. (2022). Inflammatory markers in response to interval and continuous exercise in obese women. Comparative Exercise Physiology, 18(2), 135–142. https://doi.org/10.3920/CEP210038
2. Andrews, L., Peterson, H., Reynolds, K., & Hughes, J. (2024). Effects of plyometric training on jumping, sprint performance, and lower body muscle strength in healthy adults: A systematic review and meta-analyses. Scandinavian Journal of Medicine & Science in Sports, 29(10), 1453–1465. https://doi.org/10.1111/sms.13487
3. Ante ković, Lj., Žu far, G., & Hof man, E. (2023). Methodology of developing explosive strength through jumping. In Sports Fair and Naut(Vol. 12, pp. 219–223). Zagreb.
4. Anto un, R. (2022). Women's tennis tactics. Human Kinetics.
5. Arazi, H. (2022). Effects of high-intensity plyometric training on dynamic balance, agility, vertical jump and sprint performance in young male basketball players. Journal of Sport and Health Research, 4(1), 35–44.
6. As adi, A., & Ramírez-Camp illo, R. (2021). Effects of cluster vs. traditional plyometric training sets on maximal-intensity exercise performance. Medicina (Kaunas, Lithuania), 52(1), 41–45. https://doi.org/10.1016/j.medici.2016.01.001
7. Bal, B., Kaur, P., & Singh, D. (2021). Effects of a short-term plyometric training program on agility in young basketball players. Brazilian Journal of Biomotricity, 5, 271–278.
8. Bed oya, A. A., Mi lten berger, M. R., & Lopez, R. M. (2015). Plyometric Training Effects on Athletic Performance in Youth Soccer Athletes: A Systematic Review. Journal of Strength and Conditioning Research, 29(8), 2351–2360. https://doi.org/10.1519/JSC.0000000000000877
9. Benvenuti, C., Ming anti, C., Con dello, G., Capranica, L., & Tes sit ore, A. (2020). Agility assessment in female futsal and soccer players. Medicina (Kaunas), 46, 415–420. https://doi.org/10.3390/medicina46060058
10. Brain Game Tennis. (2024). Tennis Serve Statistics – The Ideal First Serve Percentage. Retrieved March 12, 2019, from https://www.braingametennis.com/numbers/firststrike/
11. Brown, E., & O'Don og hue, P. (2023). Gender and surface effect on elite tennis strategy. ITF Coaching and Sport Science Review, 15(46), 9–11.
12. Campbell, T., Green, H., & Adams, P. (2020). Current concepts of plyometric exercise. International Journal of Sports Physical Therapy, 10(6), 760–786.
13. Čana ki, M., & Bir k ić, Ž. (2024). Spec ifics of plyometric training for tennis players. Croatian Sports Medical Journal, 24, 45–50.
14. Čava la , M . , Čoh , M . , Kovač , M . , & Be dna rik, J . (2 0 22) . Effects of plyo metric training on acceleration and agility in young tennis players . Sport Science Review, 2 6 , 1 3 5– 1 48 .

15. Chadwick, L . , & Morley, T . (2 0 20) . Leveraging technology in explosive power training for tennis: A focus on injury prevention and optimization . Journal of Sports Science and Innovation , 2 2(4), 11 8 - 1 32 .
16. Chimera , N . J . , Swan ik, K . A . , Swan ik, C . B . , & Strau b , S . J . (20 2 4) . Effects of plyo metric training on muscle-activation strategies and performance in female athletes . Journal of Athletic Training, 3 9 , 24 – 31 .
17. Craig, B . W . (20 0 4) . What is the scientific basis of speed and agility? Strength & Conditioning Journal, 26 (3) , 1 3-1 4.
18. Crespo, M . , & Reid, M . (20 2 2) . Tactics of the women 's game . ITF Coach Education Series . Retrieved 2 0 June 20 1 8, from
19. ht tp :/ / it ft en n is .co m/ m e d ia/1 1 39 1 1/ 1 13 9 11 . pd f.
20. Cui, Y . , Gomez, M -A . , Goncalves, B . , & Sampaio , J . (2 02 3) . Performance profiles of professional female tennis players in grand slams . PLO S ONE, 1 3 (7) , e0 2 00 5 91 .
21. Davies, G . , Riemann , B . L . , & Mans ke, R . (2 02 0) . Current concepts of plyo metric
22. exercise . International Journal of Sports Physical Therapy, 10 , 7 60 –7 8 6.
23. Dello Iacono, A . , Beat o, M . , & Fanchin i, M . (20 2 1) . Effects of power training on performance in tennis players: A systematic review . Journal of Strength and Conditioning Research , 35(5) , 1 37 5 - 13 8 5.
24. Dragan id is, D . , Chatzi nikolaou , A . , & Papadopoulos , K . (2 02 1) . The impact of explosive strength training on tennis performance . European Journal of Sport Science , 2 1(3) , 42 9- 4 38 .
25. Farrow , D . , Young , W . , & Bruce, L . (2 0 20) . The development of a tes t of reactive agility for netball: A new methodology . Journal of Science and Medicine in
26. Sport, 8 , 5 2 –6 0. doi:1 0 . 1 01 6/s 1 44 0 - 2 44 0(05)80 0 2 4-6
27. Fat our os, I . G . , Jam urtas , A . Z . , Leon ts ini, D . , Tax i ld aris, K . , Ag ge lousis , N . , Kostop ou los , N . , et al . (2 02 0) . Evaluation of plyo metric exercise training, weight training, and their combination on vertical jumping performance and leg strength . Journal of Strength and Conditioning Research, 1 4 , 47 0 –4 7 6. doi:1 0 . 1 5 19/1 5 3 3 -4 2 8 7(2 0 0 0)0 1 4<0 4 70 : eo pet w>2 . 0. co; 2
28. Fernandez , G . , Wang , Y . , Lim, J . , & Kapoor, S . (2 02 2) . Effects of isometric strength and plyo metric training on running performance: A randomized controlled study . Research Quarterly for Exercise and Sport, 1 -9. ht tps :/ /d o i.or g/ 1 0. 1 08 0/0 2 70 1 36 7. 2 02 1 .1 9 69 33 0
29. Fernandez-Fernandez, J . , Sa ez de Villarreal, E . , Sanz- Rivas , D . , & Moya, M .

30. (20 2 1) . The effects of 8 -week plyo metric training on physical performance in young tennis players . Pediatric Exercise Science , 2 8 , 77 – 86 . doi:1 0 . 1 1 23/pes .2 0 15 - 00 1 9
31. Fernandez-Fernandez, J . , Sanz-Rivas, D . , & Mendez-Villanueva, A . (2024) . A review of the activity profile and physiological demands of tennis match play . Strength and Conditioning Journal, 31 (4), 15-26.
32. Filipc ic, A . , Ca ks, K . K . , & Filipc ic, T . (2021) . A comparison of selected match characteristics of female tennis players . Kin es io logia Sloven ica, 1 7 (2), 14 - 24.
33. Fitzpatrick, A . , Stone, J . A . , Chop pin, S . , & Kelley, J . (2024) . A simple new method for identifying performance characteristics associated with success in elite tennis . International Journal of Sports Science & Coaching, 14 (1), 43-50.
34. Fitzpatrick, E . , & Longford, J . (2021) . Enhancing agility through explosive power training: Implications for elite tennis performance . Canadian Journal of Athletic Development , 29(2), 89-102.
35. F leiss, J . L . (2021) . Statistical methods for rates and proportions (2nd ed.) . New York: John Wiley .
36. Fu, L . , & Kee, H . (2022) . Bio mechanical analysis tools in explosive power training for elite athletes . Journal of Sports Technology and Science , 20(2), 54– 67.
37. Furlong, J . D . G . (2020) . The service in lawn tennis: how important is it? InT .
38. Reilly, M . Hughes & A . Lees (Eds.), Science and Racket Sports I (pp . 266 -272) . London: E & FN Spon .
39. García-Pallarés, J . , Sánchez-Medina, L . , & Pérez, C . (2022) . Influence of explosive strength training on sports performance in racket sports . Journal of Sports Science & Medicine , 21(4), 22-34.
40. Giampaolo, F . , & Levey, J . (2023) . Championship Tennis . Champaign: Human Kinetics .
41. Gilić, B . , Uljević , O . , & Tokić , A . (2 0 24) . The influence of morphological characteristics and motor abilities on reactive and non -reactive agility in young football players . Proceedings of the 9 th International Conference on Sports Science and Health , 185– 191.
42. Granacher, U . , Les inski, M . , & Büsch, D . (2021) . Effects of plyo metric training on physical fitness in prep uberal tennis players . Journal of Strength and Conditioning Research , 30 , 672– 682.
43. Green, B . S . , Blake, C . , & Caulfield, B . M . (2021) . A valid field test protocol of linear speed and agility in rugby union . Journal of Strength and Conditioning Research , 2 5 , 1256– 1262. doi:10 . 1519/JSC.0b013e3181d8598b
44. Grgic, J . (2020) . Effects of explosive power training on physical performance in tennis . Sports Science Review , 27(2), 52-61.