

BACKGROUND

Resistance training can positively contribute to the physical development of youth populations. Prior literature in adult populations has investigated the composition of resistance training to gain insights related to physiological adaptation, periodization, and program design. However, limited information regarding resistance training exercise composition is currently available for this unique population.

PURPOSE

The purpose of this study was to quantify the resistance training exercise composition of programs designed for youth populations.

METHODS

- The total and relative composition of repetitions included within resistance training programs designed for elementary and middle school aged children were calculated by organizing exercises into four categories; foundational, muscular strength, muscular power, and linear sprinting speed.
- Foundational exercises were utilized to develop foundational movement patterns such as squatting, hinging, pushing, pulling, and lunging.
- Muscular strength exercises were utilized to develop muscular strength through resisted compound movements and included barbell, dumbbell, and kettlebell variations of the squat, bench press, deadlift and Romanian deadlift exercises.
- Muscular power exercises introduced proper jumping and landing mechanics as well as Olympic weightlifting variations.
- Linear sprinting speed exercises were utilized to develop sprint mechanics, accelerative abilities, and maximal sprinting speed ability.
- The microcyclic structure of this program was designed to include two sessions per week for one hour each day. Following recommendations by Johnson (2025), each session included a foundational, muscular strength, muscular power, and linear sprinting speed component.

RESULTS

- Overall, similarities were observed between groups for measures of general training composition which included foundational, muscular strength, and muscular power exercises.
- However, repetition volumes and week to week percentage distribution of training volumes observably differed between groups.

Participation, competitiveness, and training intensity in youth sports continues to increase. However, limited information is currently available that evaluates specific physical characteristics of athletic performance within resistance trained youth populations that may be prevalent into adulthood.

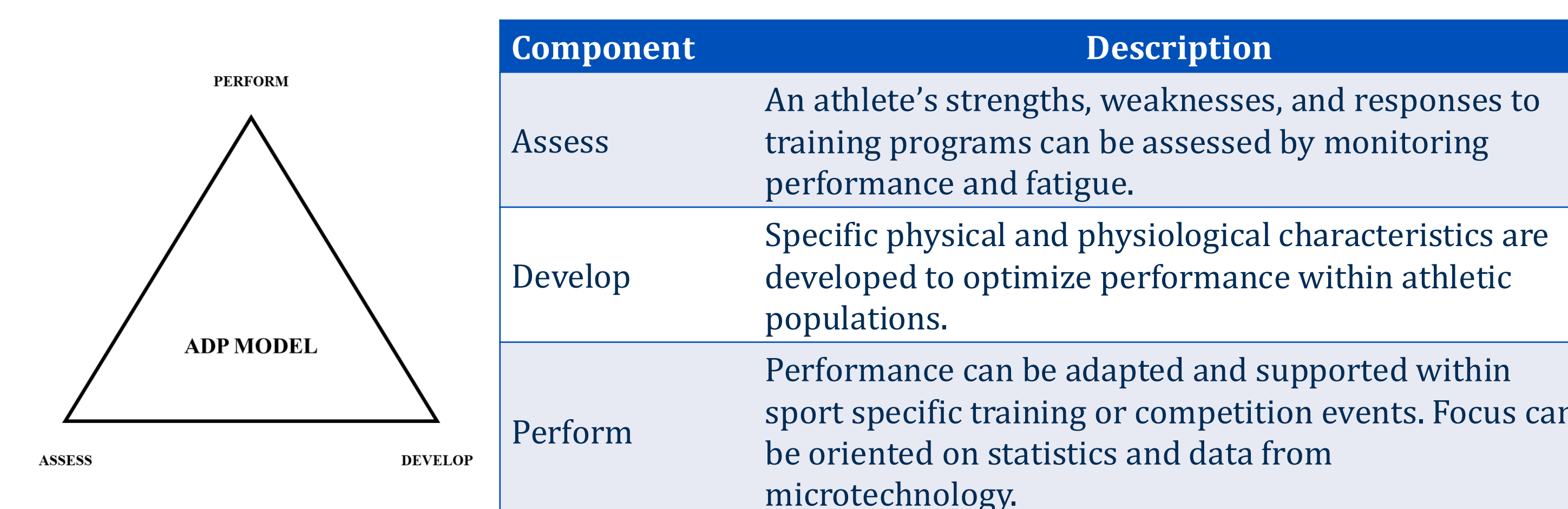
Figure 1 and 2. Youth athletes performing a long jump (left) and deadlift (right).



Table 1. Group Resistance Training Exercise Composition Characteristics.

Resistance Training Exercise Categories	Week 1	Week 2	Week 3	Week 4	Average
Foundational	200	200	180	200	195
% Distribution	25%	26%	23%	26%	-
Muscular Strength	75	112.5	90	-	92.5
% Distribution	27%	41%	32%	-	-
Muscular Power	115	45	67.5	-	75.8
% Distribution	50%	20%	30%	-	-
Sprinting Speed	275	320	400	-	332
% Distribution	28%	32%	40%	-	-

Figure 3. Assess, Develop, Perform Model Adapted from Johnson (2025).



CONCLUSIONS

- Findings from this study provide insight into resistance training exercise categorization and composition for youth populations.
- In addition to repetition volume, percentage distribution of volumes displayed unique characteristics.
- Although youth are not adults, there should be more effort and advanced means to understanding the stimuli that drive physiological adaptation.

PRACTICAL APPLICATIONS

- Resistance training is a safe and effective way to improve the health and fitness of youth populations.
- However, new perspectives and approaches for analyzing resistance training programs for youth populations can contribute to improving the field's understanding, development and implementation of long-term development models.
- Future investigations may benefit from the measurement and assessment of total and relative resistance training exercise composition characteristics over a long-term period, across sports, and competitive levels.

REFERENCES

1. Stone, M. H., Hornsby, W. G., Haff, G. G., Fry, A. C., Suarez, D. G., Liu, J., ... & Pierce, K. C. (2021). Periodization and block periodization in sports: emphasis on strength-power training—a provocative and challenging narrative. *The Journal of Strength & Conditioning Research*, 35(8), 2351-2371.
2. Lloyd, R. S., & Oliver, J. L. (2012). The youth physical development model: A new approach to long-term athletic development. *Strength & Conditioning Journal*, 34(3), 61-72.
3. Johnson, Q. R. (2025). Part I: Development and Implementation of the Ten, Five, Three (TFT) Model for Resistance Training. *Muscles*, 4(2), 14.

ACKNOWLEDGEMENTS

This project was funded by the Clara Wu and Joseph Tsai Foundation.