

Improving Active Range of Motion of Athletes with Down Syndrome Through Strength Training

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Introduction

- Successful athletes typically possess a combination of strength and dynamic flexibility
 - *Active Range of Motion (AROM)*: the range of motion that athletes can produce themselves; significantly correlated w/ sport performance (Brandon, 2002).
 - Flexibility and strength both contribute to the AROM (Roberts & Wilson, 1999).
- This presents a unique challenge for athletes with Down syndrome due to various physical limitations and health issues associated with each of these components.

Down Syndrome

- Affects more than 300,000 individuals in the US alone.
 - In 95% of those with Down syndrome, trisomy 21 (three rather than 2 genes on the 21st chromosome) is the cause (Hayes & Batshaw, 1993).
- Gross motor developmental delays due to:
 - 1. Hypotonia
 - 2. Ligamentous laxity
 - 3. Deficient muscular strength
 - 4. Short limbs
- Potentially limits AROM and, ultimately, performance in the Special Olympics athlete.

Previous Research

- Strength training has been found to result in increased passive flexibility and AROM in older women (Raab et al., 1988) and older men (Fatouros et al., 2001).
- Application of resistance in training also resulted in increased AROM in youth gymnasts (Sands & McNeal, 2000) – but strength was not measured as an outcome.
- Application and efficacy for a unique population such as the athlete with Down syndrome has not been investigated.
 - Weight training programs have been successfully applied to the Special Olympics athlete (e.g., Wekesa & Onsongo, 1992), but the only measured outcome has been medals won.

Purpose

- To determine the effects of a dynamic resistance and flexibility training program on strength and AROM in Special Olympics Athletes with Down syndrome.

Method

- *Participants:*
 - Active Special Olympics participants diagnosed with Down syndrome ($N = 11$). All participants were preparing for their Summer Games.

Method

Measures:

- Strength:
 - 8RM Bench Press
 - 8RM Leg Press
- Upper Body AROM:
 - Shoulder Flexion
 - Shoulder Extension
- Lower Body AROM:
 - Hip Flexion
 - Hip Extension
 - Hip Abduction

Method

- *Procedures:*
 - 1 week orientation period prior to initial testing
 - Each testing session consisted of a 5-10 minute general warm-up followed by AROM measurements and then 8RM testing.
 - After the initial testing, the athletes participated in an 8 week resistance training program.
 - 2 days/week (1 upper, 1 lower)
 - 3 sets of 6 exercises
 - 90-100% of 8RM with 60s rest between sets

Sample Workouts

- **Upper Body**

- Bench Press
- Seated Row
- Shoulder Press
- Post. Deltoid
- Triceps Pushdown
- Biceps Curls

+ Core/Ab

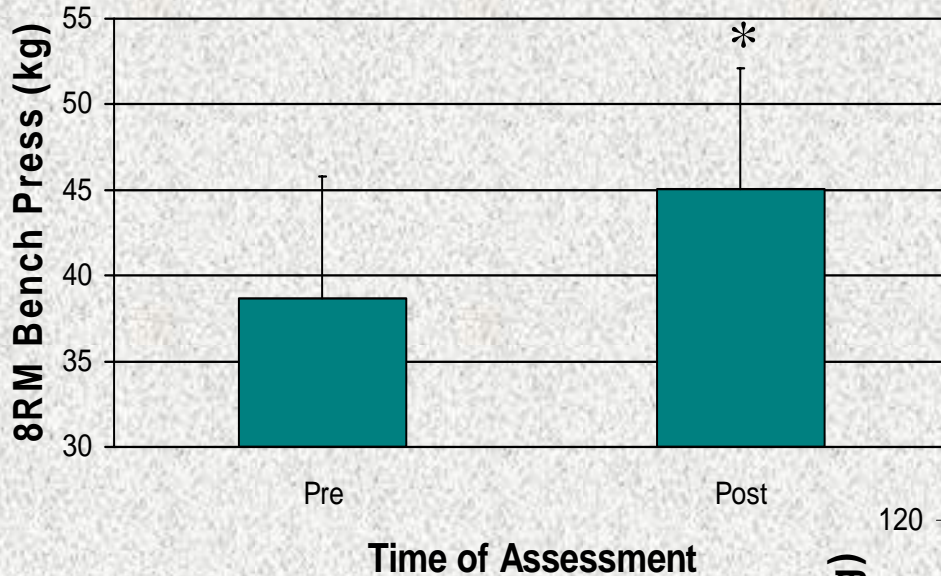
- **Lower Body**

- Leg Press
- Leg Extension
- Wall Squat
- Leg Curls
- Abduction
- Adduction

+ Core/Ab

Results: Strength

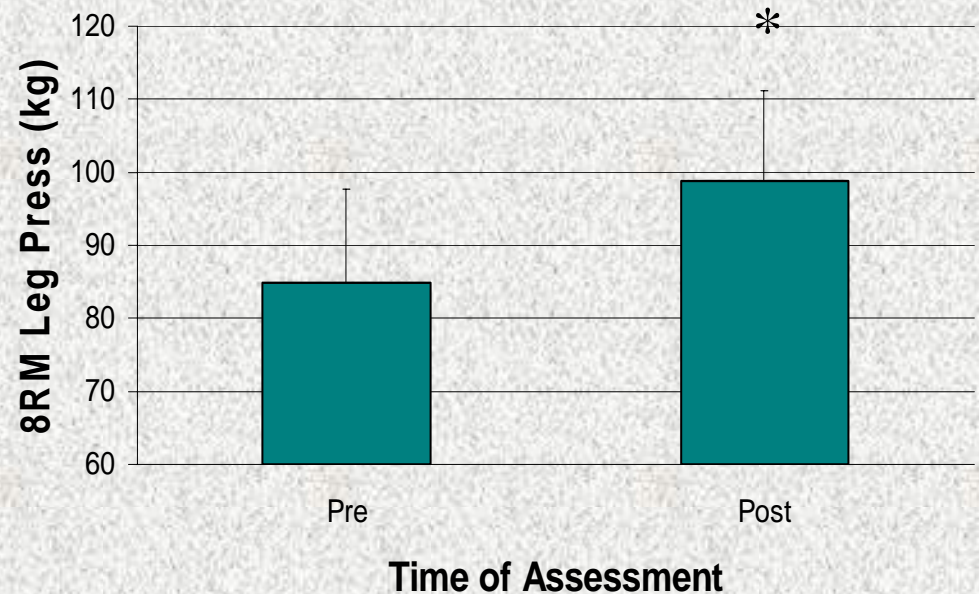
Bench Press



6.4 ± 1.2 kg

$P < .001$; ES = 0.27

Leg Press

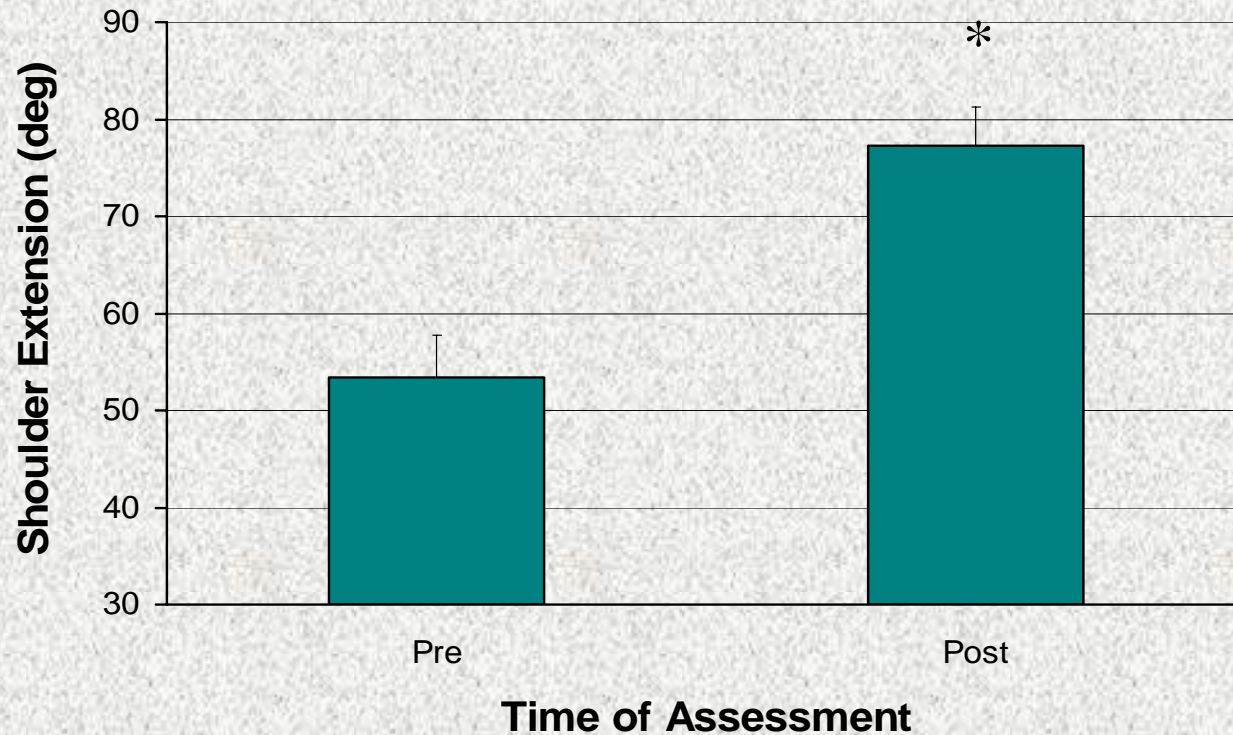


14.0 ± 2.2 kg

$P < .001$; ES = 0.33

Results: Shoulder AROM

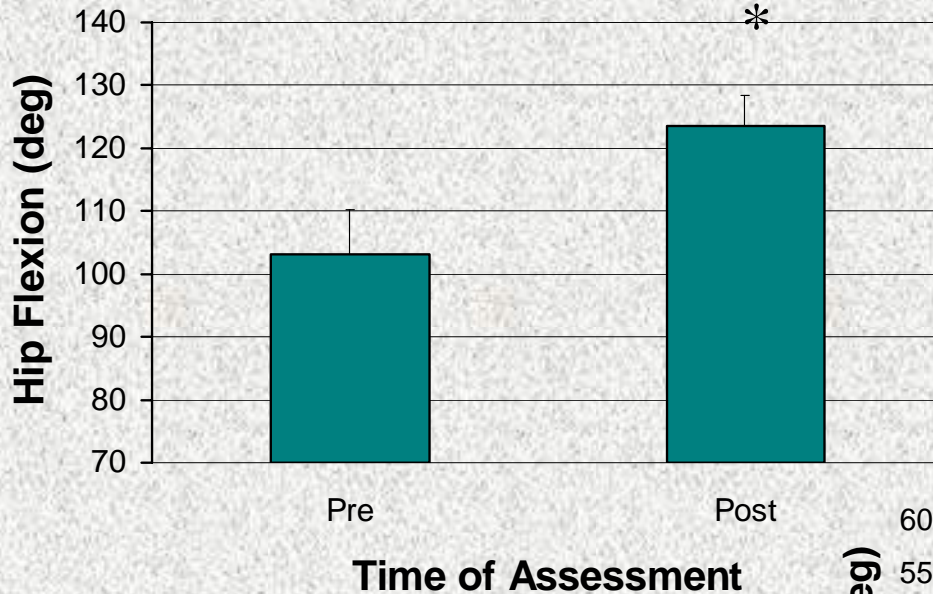
Shoulder Extension



$29.9 \pm 3.7^\circ$
 $P < .001$; ES = 1.64

Results: Hip AROM

Hip Flexion



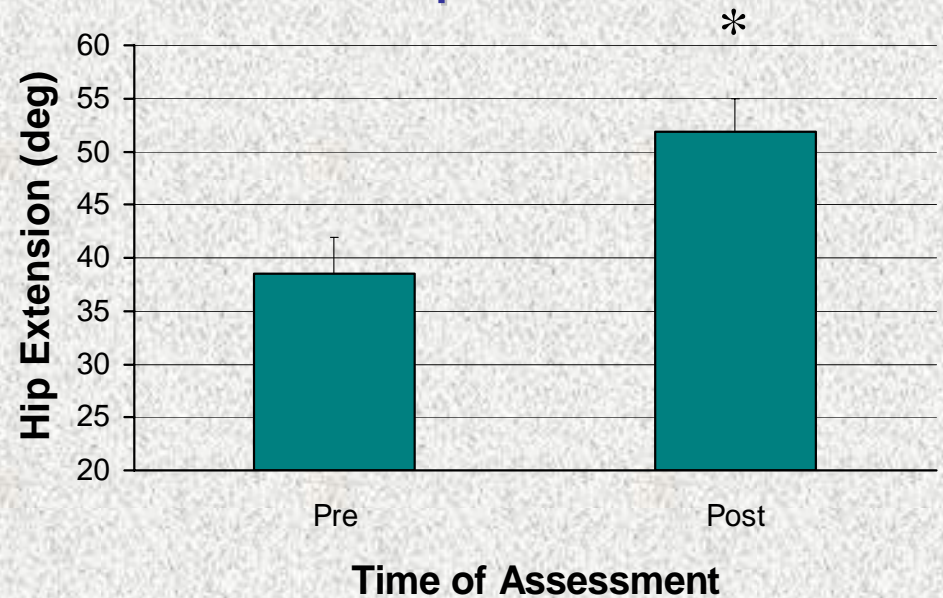
$20.4 \pm 5.8^\circ$

$P < .01$; ES = 0.87

Hip Extension

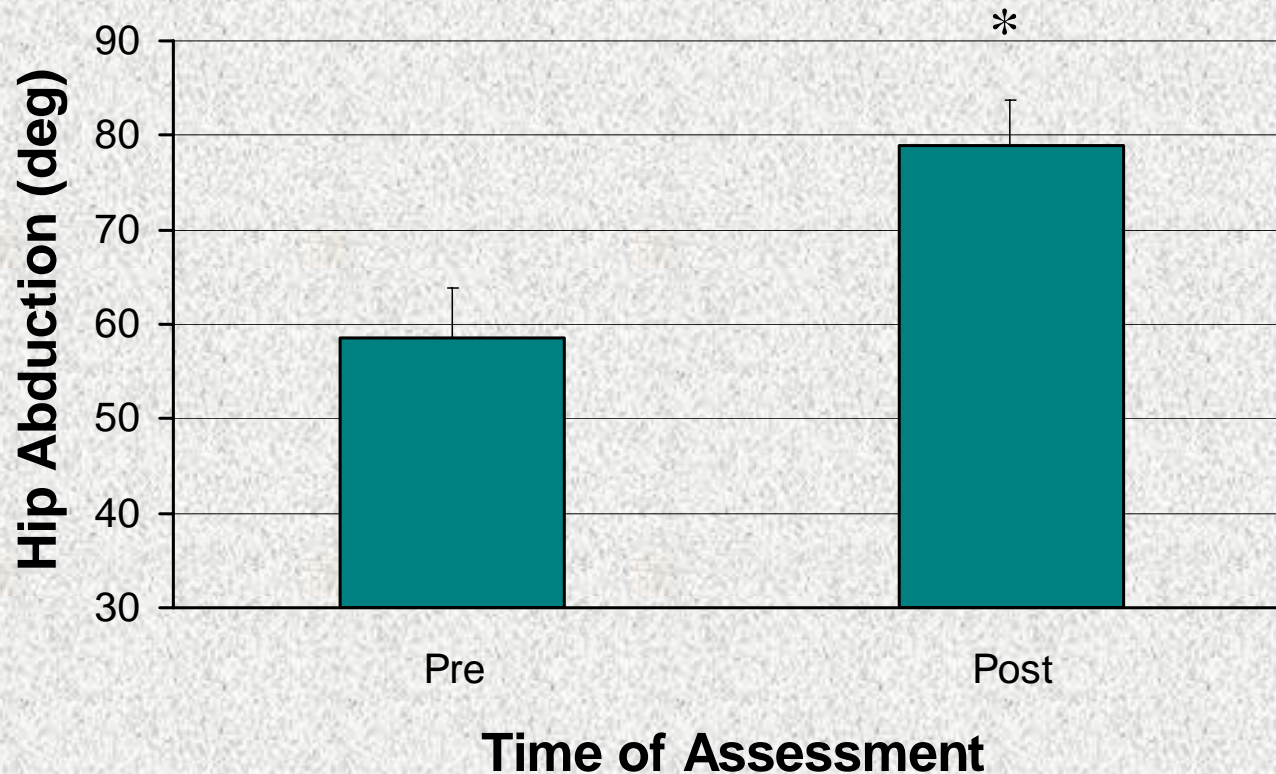
$13.4 \pm 3.5^\circ$

$P < .01$; ES = 1.19



Results: Hip AROM

Hip Abduction



20.3 ± 3.5°

$P < .001$; ES = 1.15

Discussion

- Findings suggest that athletes with Down syndrome can tolerate and adapt to a high-intensity resistance training program and experience significant improvements in both strength and AROM.
 - This may impact joint laxity concerns due to muscular stabilization.
 - Increased AROM & strength can enhance performance.



Health Implications

- For the individual with Down syndrome, decreasing joint laxity and hypotonia may decrease the chances of:
 - 1. Developing hip abnormalities (i.e., dysplasia & dislocation)
 - 2. Developing degenerative arthritis
 - 3. Injury

(Angelopoulou et al., 1999; Gannon & Bird, 1999; Hayes & Batshaw, 1993; Shaw & Beals, 1989)

Lifestyle Considerations

- Opportunity to become healthier and feel stronger
- Way of becoming integrated into the community
 - Enjoyment working out with friends
- Increased independence
- Enhanced confidence?

Acknowledgments

- Special Olympics New Jersey
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- The athletes!