Fitness and Physical Activity in Children with Haemophilia

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Background

- Physical activity previously discouraged due to risk of bleeding
- Children with haemophilia have reduced aerobic fitness and muscle strength compared with their healthy peers (Koch et al 1984, Falk et al 2000)
- Resistance training may improve strength and reduce number of haemarthroses (Tiktinsky et al 2002)
Why Exercise?
Prevention of Obesity

- 19 to 23% of Australian children and adolescents are obese (Booth et al 2001)

- Obesity in adolescence is associated with increased risk of mortality from all causes independent of adult weight (Must et al NEJM 1992)

- Treatment studies disappointing
Bone Mineral Accrual

- Weight-bearing exercise in the pre-adolescent years is important for bone mineral accrual.

- Greatest effect when weight-bearing exercise is performed in the early pubertal years - Tanner stage 2 and 3.

  (McKelvie et al 2001)
The incidence of Type 2 diabetes in children and adolescents is increasing (Pinhas-Hamiel et al 1996)

Aerobic exercise $\rightarrow$ $\uparrow$ insulin sensitivity, $\uparrow$ HDL and $\downarrow$ LDL

Potential $\downarrow$ life expectancy (Olshansky et al NEJM 2005)
Well-Being / Quality of Life

- Evidence for improved QoL in sub-populations of children
- Little evidence in healthy populations
Why should children with haemophilia exercise?

- Improve fitness
- Reduce obesity
- Bone health
- Reduce bleeding episodes into joints / reduce joint deterioration
- Improve quality of life
The Evidence to Date
Aerobic Fitness

- ↓ aerobic fitness in 11 boys with haemophilia
  (Koch et al 1984)

- No significant difference in aerobic capacity in 13 boys with severe haemophilia A on prophylaxis
  (Van der net et al 2006)
Muscle Strength

- Isokinetic strength at the elbow and knee reduced in children with haemophilia
  (Falk et al 2000, Falk et al 2005)
Muscle Strength

- Isometric quadriceps strength 32-38% less in adults with haemophilia (Hilberg et al 2001)
Anaerobic Fitness

Bone Health

- 19 children with severe haemophilia ↓ areal BMD lumbar spine (-0.92SD)
  (Barnes et al 2004)

- No difference in bone properties in children with haemophilia compared with controls
  (Falk et al 2005)
CHW Fitness Study

43 boys with haemophilia
- Shuttle run
- Basketball throw
- Physical activity questionnaire

Compare with 2760 healthy boys from NSW Schools Fitness Survey
CHW Participants

- Age 6 – 16 years
- 83% Haemophilia A
  10% Haemophilia B
  7% vWB disorder
- 63% severe
- 83% prophylaxis
Results - BMI

Age in years

BMI

- 5-6
- 7-8
- 9-10
- 11-12
- 13-14
- 15-16

Haemophilia
Controls

* Indicates significant difference.
Results - Aerobic Fitness

![Graph showing laps of MSFT by age group for Haemophilia and Controls.](image-url)
Results - Strength

The bar chart shows the throw in metres for different age groups comparing Haemophilia and Control. The age groups are 9-10, 11-12, 13-14, and 15-16 years. The chart indicates a significant difference (*) in the 15-16 age group between Haemophilia and Control.
Results – Endurance Strength

![Bar chart showing the number of situps by age group for participants with haemophilia and controls.](chart.png)

- **Age in years:** 9-10, 11-12, 13-14, 15-16
- **Number of situps:**
  - 9-10: Haemophilia group
  - 11-12: Haemophilia group
  - 13-14: Control group
  - 15-16: Haemophilia group

*Note: An asterisk indicates a significant difference between the groups.*
Intervention Studies

- ↑ strength & proprioception with exercise intervention (n=9 adults) (Hilberg et al 2003)
- ↑ muscle strength and ↓ bleeding tendency in 32 adults and children following a 6 month resistance training program (Greene & Strickler 1983)
Quality of Life

- No previous studies in children with haemophilia
- Evidence from other populations of children with chronic disease eg. Asthma, cystic fibrosis
Exercise & Joint Health

- **Rationale for aerobic and resistance training**
  - Muscle strengthening and proprioceptive training may act to stabilise joints
  - Submaximal exercise $\rightarrow$ transient $\uparrow$ in coagulation parameters in individuals with & without haemophilia
Exercise & Joint Health - the research to date

- ↓ frequency & severity of bleeding episodes with resistance training (Tiktinsky et al 2002)

- ↑ overall joint ROM in adults who exercised 3 x week compared with those who did not (Harris & Boggio 2006)
CHW Intervention Study

- To determine the effect of exercise on QoL, aerobic fitness & strength in children with haemophilia
70 children with haemophilia

Initial assessment & baseline measures of strength, VO2 peak, habitual activity & Quality of Life

Participants randomised

Usual medical care: Education, Reassurance, Treatment of bleeds

Exercise + usual medical care:
2 x 1hr x session/week
12 weeks
Resistance and aerobic

Remeasure at 3 months
Remeasure at 3 months
Primary Outcomes

ID: __________
Date: __________

CHO-KLAT
Canadian Hemophilia Outcomes – Kids’ Life Assessment Tool

HAEMO-QOL
Primary Outcomes (cont.)

Isokinetic Strength

VO₂ peak
Intervention
Intervention (cont)
Eligible Participants

- Aged 6-18 years
- Mild, moderate or severe haemophilia A or B or Von Willebrand disorder
- Excluded if
  - Contra-indication to aerobic or resistance training
  - Involved in sport > 3 sessions/week
  - Presence of inhibitors
84 boys with moderate or severe haemophilia from CHW & RCH
Followed for one year
Report bleeding episodes and specific activities occurring in a case and control period

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(CHW, USyd, RCH)
Future Directions

- Estimate transient risk of bleeding associated with various sporting activities
Summary

- Evidence for the role of exercise in healthy paediatric populations
- May be of additional benefit in children with haemophilia (↑ BMD & ↓ bleeding episodes)
- Exercise prescription should become part of routine management