

Self-perceived Psychological Health and Vascular Changes in Childhood

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This thesis is based on the following papers:

I. Osika W, Friberg P, Währborg P. A new short self-completion questionnaire to assess stress in children. *International Journal of Behavioral Medicine. In press.*

II. Osika W, Dangardt F, Grönros J, Lundstam U, Myredal A, Johansson M, Volkmann R, Gustavsson T, Gan LM, Friberg P. Increasing peripheral artery intima thickness from childhood to seniority. *Arterioscler Thromb Vasc Biol. 2007;3:671-6.*

III. Osika W, Dangardt F, Montgomery SM, Volkmann R, Gan LM, Friberg P. Gender differences in peripheral artery intima, media and and intima media thickness in childhood and adolescence. *Manuscript.*

IV. Osika W, Montgomery SM, Dangardt F, Währborg P, Volkmann R, Tideman E, Friberg P. Anger, Depression and Anxiety associated with endothelial function in childhood and adolescence. *Manuscript.*

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Abstract

There is strong evidence that cardiovascular disease (CVD) has its origin in childhood, and that childhood cardiovascular risk factors and various other forms of adversity track into adulthood. Poorer psychological health and psychosocial factors are associated with CVD in adults, and this association is also likely to have its origins in childhood. There are no well-established validated questionnaires specifically designed to measure stress in childhood and adolescence. Currently available methods to study early atherosclerotic changes in vascular wall layers are restricted to relatively crude measurements because of low resolution. Measuring the various vessel wall layers separately will facilitate the study of early atherosclerotic changes.

The overall aim of this thesis was to develop non-invasive techniques which make it possible to detect early changes in vascular wall structures in a healthy, young population and to study associations of vascular wall structure and function with self-perceived psychological health. Our hypothesis was that psychological health, particularly "stress", is associated with endocrine measures of stress system activation and with endothelial function, and that sex differences in vascular wall function and structure already exist among the young.

A self-assessment questionnaire designed to measure perceived stress in children (SiC) was constructed. Cronbach's α for the entire SiC questionnaire was 0.86, and higher stress scores were associated with higher morning saliva cortisol levels in girls. The recently introduced Beck Youth Inventories (BYI) of Emotional and Social Impairment were also associated with saliva cortisol levels in girls.

The new very high resolution ultrasound system (55 MHz, Visualsonics) was validated *in vitro* and in humans. The resolution of $\sim 25 \mu\text{m}$ made it possible to study the intima separately from the media. Greater intima thickness (IT) in the radial artery was seen in boys compared with girls (0.057 ± 0.010 vs. 0.054 ± 0.008 , $p=0.007$). IT also increased with age (10-17 vs 60-90 years, 0.049 ± 0.008 to 0.081 ± 0.019 mm), and was thicker in peripheral artery disease patients compared with healthy controls (0.089 ± 0.017 vs. 0.074 ± 0.011 mm; $P=0.05$) and in the dorsal pedal artery (0.074 ± 0.030 mm) compared with the radial artery IT (0.064 ± 0.019 mm; $P=0.007$).

A total of 248 children (age 14.5 ± 1.0 years, 136 girls, 112 boys) underwent reactive hyperemia peripheral arterial tonometry (RH-PAT) testing, a measure of endothelial function predictive of cardiovascular disease in adults. Information on self-assessed psychological health was also collected for these subjects. No sex differences were observed for the RH-PAT score (1.82 ± 0.55). Girls had higher scores for depression, anger and anxiety, and they showed statistically significant associations between lower RH-PAT values and higher scores for anger, depression and anxiety. Among boys, disruptive behaviour was associated with higher RH-PAT scores indicating better endothelial function.

In conclusion, identifying early changes in both vascular function and psychological health in childhood demands high quality sensitive methods. Self-perceived psychological health was associated with endothelial function; and there were sex differences in structural vascular changes. These findings in childhood underline the importance of adopting a broad perspective on childhood and adolescence health to reduce adult CVD risk.

Key words: CVD, intima thickness, endothelial function, RH-PAT, stress, childhood, cortisol.