Abstract

The aim of this diploma thesis was to study and evaluate the relationships between body parameters, such as height and weight, and facial morphology based on 3D facial scans. The study included a total of 115 individuals, representing two semi-longitudinal cohorts. In the younger age group, the individuals were scanned twice over a period of 2 years, first at age 10 and then again at age 12, with a total of 61 participants (30 girls and 31 boys each time). In the older age group, the individuals were similarly scanned twice over a period of 2 years, first at age 12 and then again at age 14, with a total of 54 participants (27 girls and 27 boys each time). In total, 230 facial scans were analyzed. The data were evaluated using two approaches: geometric and classical morphometry. Geometric morphometry methods primarily included CPD-DCA (coherent point drift dense correspondence analysis), which was used to track partial differences and growth changes in facial form among individuals with normal weight and those with overweight. Results were visualized using superprojection color maps. Classical morphometry assessed 14 facial dimensions to analyze how facial morphology changes under the influence of four main factors (age, sex, weight (BMI z-score), body height) and possible second-order interactions using a linear mixed model (LMM).

In the first part of the diploma thesis, differences in facial morphology between children with normal weight and those with overweight were examined. Differences favoring individuals with overweight were observed in the lateral areas of the cheeks and the lower part of the face for both sexes. With age, the differences between weight categories became less pronounced for both sexes. In girls, individuals with normal weight showed more significant growth changes than those with overweight in both age categories. In contrast, for boys in the younger age group, the effect of weight on growth appeared more pronounced, while in the older age group, the growth trends for individuals with normal weight and overweight were almost identical.

In the second part of the thesis, it was found that the most significant factor influencing facial dimensions was age for both age groups. The effect of sex was noted only in the younger age group, where girls had higher values for dimensions such as face width (zyR-zyL) compared to boys. Weight, assessed using BMI z-scores, significantly affected face width (zyR-zyL) and lip width (chR-chL), but only in the older age group. This effect favored individuals with overweight, who had wider faces and lips than children with normal weight. Direct effects of body height on facial dimensions were recorded in both age groups. Taller individuals aged 10

to 12 years had smaller nose height (n-sn), whereas taller individuals aged 12 to 14 years had larger values for face width (zyR-zyL). Examination of interactions between two factors on the respective dimensions did not reveal a more significant effect compared to the influence of individual factors alone.