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Environment, social behavior, and growth – Proceedings of the 30th Aschauer Soiree, held at Krobielowice, Poland, June 18th 2022

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Abstract

Twenty-four scientists met for the annual Auxological conference held at Krobielowice castle, Poland, to discuss the diverse influences of the environment and of social behavior on growth following last year's focus on growth and public health concerns (Hermanussen et al., 2022b). Growth and final body size exhibit marked plastic responses to ecological conditions. Among the shortest are the pygmoid people of Rampasasa, Flores, Indonesia, who still live under most secluded insular conditions. Genetics and nutrition are usually considered responsible for the poor growth in many parts of this world, but evidence is accumulating on the prominent impact of social embedding on child growth. Secular trends not only in the growth of height, but also in body proportions, accompany the secular changes in the social, economic and political conditions, with major influences on the emotional and educational circumstances under which the children grow up (Bogin, 2021). Aspects of developmental tempo and aspects of sports were discussed, and the impact of migration by the example of women from Bangladesh who grew up in the UK. Child growth was considered in particular from the point of view of strategic adjustments of individual size within the network of its social group. Theoretical considerations on network characteristics were presented and related to the evolutionary conservation of growth regulating hypothalamic neuropeptides that have been shown to link behavior and physical growth in the vertebrate species. New statistical approaches were presented for the

evaluation of short term growth measurements that permit monitoring child growth at intervals of a few days and weeks.

Proceedings

Aman Pulungan presented a cross-sectional study on anthropometric, biochemical and hormonal profiles of the partially admixed pygmoid group in Rampasasa, Flores, Indonesia (Pulungan et al., 2021). The adults were categorized into three groups: pygmoid (P/P, offspring of pygmoid parents, n=8), mixed pygmoid (P/N, offspring of pygmoid and non-pygmoid parents, n=12) and non-pygmoid (N/N, n=10). 28 children were P/N. Mean height SDS of the children declined from $P/P - 4.0$ to $P/N - 3.2$ to $N/N - 2.3$, respectively to -3.4, -3.1 and to -2.2 when adjusted for age-associated shrinkage. Similar gradients were found in sitting height and head circumference. The serum IGF-I-SDS levels were similar among the groups, but the IGFBP-3-SDS tended to parallel the height SDS with -1.9 (P/P) to -1.5 (P/N) and to -1.1 (N/N). In most children, the head circumference SDS were more than two points larger than their height SDS. With increasing age, children progressively dropped in height SDS and bone age, girls entered puberty late. In conclusion, children with two pygmoid parents showed shortest stature with relative macrocephaly and relatively low IGFBP-3. Children with mixed parental ethnicity showed an intermediate growth pattern and low IGF-I and IGF-I/IGFBP-3 levels.

Jyoti Ratan Ghosh and Arup Ratan Bandyopadhyay presented data on the nutritional status and its association with age at menarche and per capita income from West Bengal, India. Malnutrition is a major public health problem; especially in females who are highly vulnerable to malnutrition throughout their life-cycle, for social and biological reasons. Severe environmental stress such as malnutrition delayed maturation in females until conditions improve. Moreover, nutritional status and the social context of females, such as the family composition, which on the other hand determines per capita income, have important influence on the age at menarche. The objective of the present study was to understand the nutritional status and its association with age at menarche and per capita income in adult women. The study was conducted in one hundred seventy-five adult Bengali women of West Bengal, India. Height and weight were measured following standard technique. Nutritional status was assessed by using international BMI cut-off values. Data on age, age at menarche and per capita income were collected through schedule. The overall prevalence of thinness, overweight and obesity was 30.3%, 9.1% and 4.6%, respectively in the studied population. The results of the regression analysis revealed that both age at menarche and per capita income were significant ($p<0.05$) predictors of BMI. However, age at menarche showed a negative association ($\beta=-0.21$) with BMI and explained 4% of the variance of BMI. On the other hand, per capita income explained 11% of the variance of BMI and was positively associated ($\beta=0.34$) with BMI. The results of the chi-square analysis revealed a significant ($p<0.01$) association of the nutritional status with age at menarche and per capita income.

Ayşegül Özdemir and Başak Koca Özer evaluated chest size and proportions in children and adolescents aged 6–17 years from Turkey during the past 70 years. The growth and development process is dynamic and changes occur in body dimensions and proportions due to genetics and socio-economic conditions. Studies on aux-

ology generally focus on height and weight, but measurements of different parts of the body are also important for the evaluation of the growth of the body over time (Jaeger and Kromeyer-Hauschild, 1999). The thorax is important in terms of reflecting the environmental conditions that the child is exposed to, starting from intrauterine life. Negative conditions affect chest size of newborns (Kryst et al., 2017). Factors such as respiratory capacity, exercise, nutritional status, geography, and altitude affect the development of the thorax during later growth. Children living at high altitudes and exposed to low oxygen levels have larger chest sizes than their peers living at low altitudes. The present study aimed to evaluate chest size and dimension changes over time using data obtained from three surveys conducted in 1950, 2005, and 2017 years in Ankara, Turkey (Table 1–4 in Supplement 1). The 1950 survey included 1,990 school children (1,020 boys, 970 girls) aged 8 to 17 years (Bostancı, 1954), and the 2005 survey included 1,415 school children (700 boys, 715 girls) aged 6 to 17 years (Özer, 2007), and the 2017 survey was included 1,494 school children (771 boys, 723 girls) aged 6 to 17 years. The chest depth and chest width measurements were taken from children following standard anthropometric protocols, and thoracic index [(Chest depth/chest width)*100] was calculated. Centiles were obtained using the LMS method (Cole and Green, 1992). The present results showed that there has been a change in the development of the thorax both for boys and girls during the past 70 years in different trends. The chest depth decreased for boys during the last two decades, whereas the chest width increased (approximately 2 cm) since the 1950s, i.e., the chest flattened over time. More recent data showed that the chest width of girls had decreased and that this decrease was more pronounced after the age of 14 years. Various studies emphasized that especially in recent years, lack of physical activity and sitting in front of a computer or television affect chest development. Physical activity was positively related to the increase in chest width. In addition, adolescent girls paid more attention to weight and body structure control depending on their body perceptions and visual concerns, and had flatter and more narrow chest depths and widths (Henneberg and Ulijaszek, 2010; Jaeger and Kromeyer-Hauschild, 1999; Kryst et al., 2017; Silventoinen et al., 2012). Özdemir and Özer believe that evaluating different parts of the body through generations might give a better understanding of the effects of the changing lifestyle and socio-economic conditions on human biology.

Martin Musalek studied the morphofunctional disposition of youth elite ice hockey players in the context of biological age. In collective youth sports, the overall preference for biologically accelerated (BA) players is evident (Malina et al., 2015, 2004, 2000). The reasons are clear. BA individuals are taller, heavier, stronger, and faster (Burr et al., 2008; Glaister, 2005; Lau et al., 2001) and usually impress coaches to be talented. On the other hand, biologically delayed (BD) players leave the sport with higher frequency during puberty, known as sports dropouts (Kreipe and Gewanter, 1985; Malina et al., 2015; Reeves et al., 2018). Even though research studies have repeatedly supported a preferred selection of BA ice-hockey players for final teams the author has limited information about the ratio between BA and BD players in elite competitions and their anthropometry and motor performance profiles. The aim of this study was the comparison of anthropometric and motor performance profiles of Czech youth elite ice-hockey players considering their biological age. The research sample consisted of 342 elite ice hockey players selected for future broader youth

national teams from age categories U13, U14, and U15 (age 11.74–15.06 years). The Tanner-Whitehouse 3 method was used for assessing the players' biological age. In all players, body composition (BODY STAT Quadscan4000) was assessed as well as off-ice performance (flexibility, pull-ups), and on-ice performance (Illinois skills agility tests with and without the puck and skating on 6x54 meters) measured with photocells equipment. The ANOVA for unbalanced data and mixture modelling with biological age as a predictor were used for data analysis. 27 (7.9%) of the 342 ice hockey players were BD, and 122 (35.7%) were BA. In absolute values, BA players were significantly taller $\overline{x}$ = 17.7cm and heavier $\overline{x}$ = 18.3kg $p<0.001$ than BD players. This difference however, disappeared in mixture modelling after controlling for biological age of the players. Mixed modelling showed that the BD ice hockey players had significantly less body fat $p<0.05$, performed significantly better in pull-ups, and were faster in skating on 6x54 meters and in both Illinois skills agility on ice tests $p<0.01$. In addition, BD players achieved significantly less difference in time $p<0.05$ between Illinois skills agility tests without and with the puck: BD=3.8% compared with BA=5.9% which means that BD players were more skillful. In the Czech elite youth ice hockey the distribution of BD and BA was significantly shifted towards BA players although the physical and hockey perspective of BD players seemed to be significantly better than that of BA players.

Lidia Lebedeva and Elena Godina presented data on the impact of socio-economic factors on male body height in 1920th in the USSR. Based upon the common assumption that secular changes in body height and age of maturity were connected with improvements of the quality of life, such as advances in hygiene, medical care and nutrition, as well as the decline in morbidity and infant mortality (Bogin, 2020; Cameron and Schell, 2012; Tanner, 1986), the authors tried to estimate the statistical impact of those factors in the Russian population. Lebedeva and Godina used the variety of indicators that characterized different aspects of quality of life, quality of nutrition, level of education, and level of sanitary and hygienic conditions, published in the Reference book (Central Statistical Committee, 1929) to study the impact of socio-economic factors on final height in rural and urban areas in males born 1906–1909. Twenty-nine territories were considered. Pearson coefficients and multiple regression analysis showed significantly high correlations between body height of rural and urban males and morbidity level of dysentery (-0.48 and -0.52) and soft chancre (0.46 and 0.42) as well as strong connections between final male height in urban areas and the level of trachoma morbidity (-0.54). High levels of dysentery morbidity as an indicator of poor sanitation and hygienic conditions, and soft chancre as a venereal disease that occurs mainly through sexual contacts and could be an indicator of poor standards of living and migration of the population causing unemployment, were significantly associated with male body height in urban and rural areas and explained up to 0.53 and 0.54 of the variance in average body height of Russian men in the 1920s. Further analysis is needed to also study the prevalence of these illnesses in children during the years 1910–1914, but social and economic data are scarce, differences exist in the sources and credibility of information, administrative boundaries have changed, and many other factors have up to this point limited growth studies during this historic period.

Barry Bogin presented the data of the MINA project (MINA, 2023) with information on reserve capacity, childhood growth,

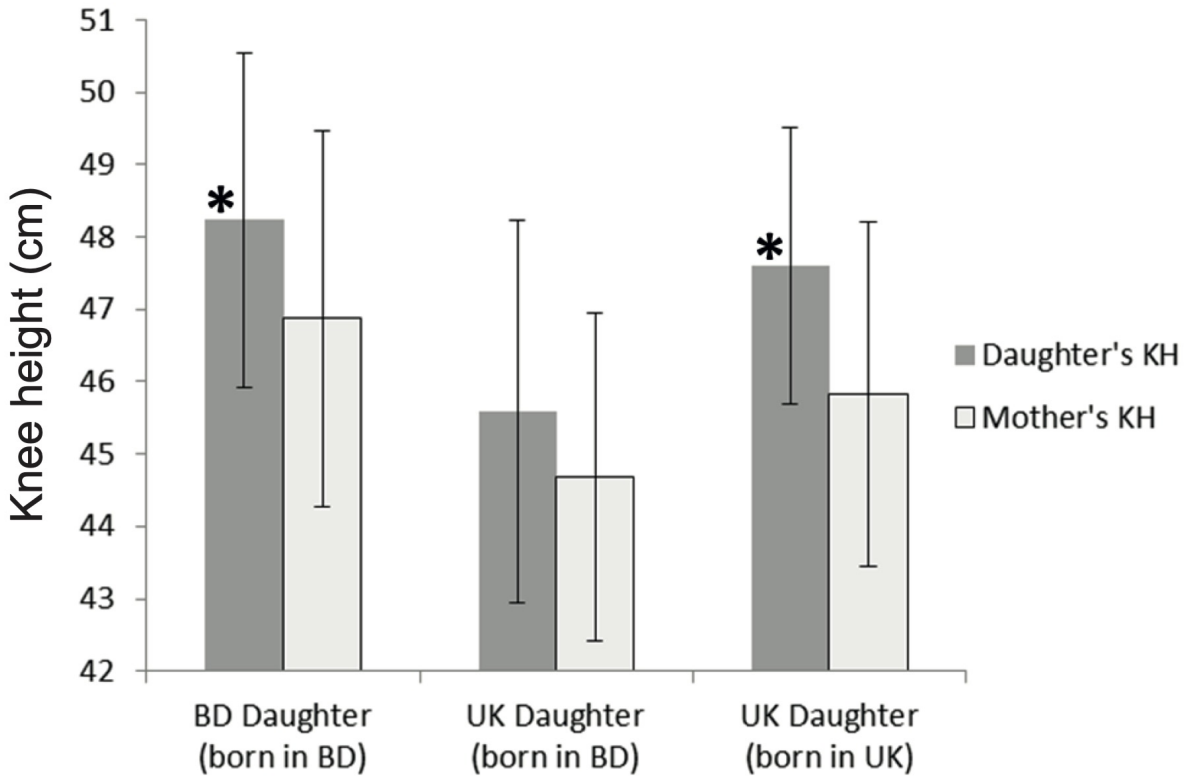

Figure 1 Knee height (KH) in Bangladeshi mothers and daughters born and living in Sylhet, Bangladesh, and living in Cardiff, UK. The asterisks (*) indicate that Bangladesh-living daughters and UK-living daughters born in the UK have significantly greater KH than UK-living daughters born in Bangladesh (p=0.01). The 2.03 cm difference in mean knee height in the latter contributes to 53% of the total height difference.

fertility, physical performance, and the risk for frailty in Bangladeshi women. Data on 40 mothers (mean age 55.8 years) and 37 daughters (20 born in UK and 17 born in Bangladesh; mean age at migration 8 years; mean age 27.6 years) were collected in Cardiff, Wales, UK; data on 22 mothers (mean age 51.9) and 22 daughters (mean age 22.8 years) were collected in Sylhet, Bangladesh. The project aimed at gaining a better understanding of women's nutritional status, food practices and beliefs, and experiences and perceptions of ageing. It explores ways to reduce health inequalities and promote healthy ageing among Bangladeshi women and families (Bogin, 2022). Bogin focused on Biological Reserve Capacity (BRC). BRC as it relates to life history are those somatic resources that exceed the minimum required for sustaining life and allowing reproduction. BRC was estimated by assessing physical performance, i.e. by examining ability to stand with the feet together in the side-by-side, semi-tandem and tandem positions, time to walk 8 feet, and time to rise from a chair and return to the seated position (Guralnik et al., 1994). Cardiff mothers (mean height 147.7 SD 6.2 cm) were equal in height, but significantly heavier (mean weight 66.0 SD 13.4 kg) than Sylhet mothers (mean height 148.8 SD 5.7 cm; mean weight 53.5 SD 15.2 kg). Cardiff daughters born in the UK were similar in height (mean height 153.2 SD 5.8 cm) to Sylhet daughters (mean height 152.7 SD 6.0 cm), but significantly heavier (mean weight 65.0 SD 14.5 kg compared with 50.8 SD 10.6 kg). Cardiff daughters born in Sylhet were shorter than daughters born in

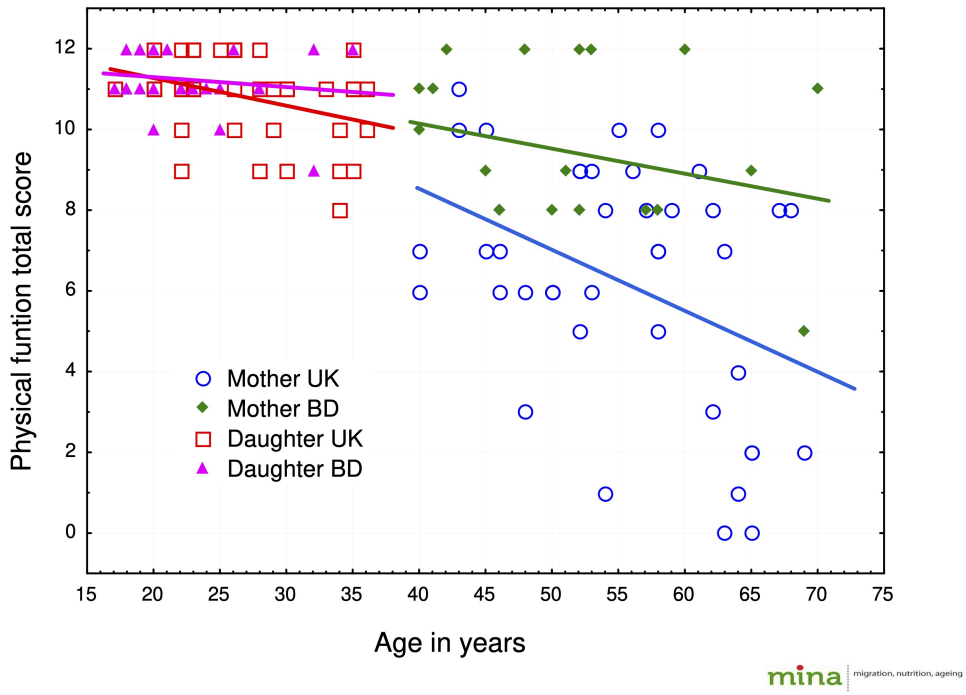

Figure 2 Physical performance in Bangladeshi mothers and daughters born and living in Sylhet, Bangladesh, and living in Cardiff, UK. Physical performance differed significantly (<0.05).

the UK or born and remaining in Sylhet. The differences in height mainly resulted from differences in knee height (Figure 1). Figure 2 illustrates the differences in physical performance highlighting the marked influence of life history on physical performance. A St Nicholas House Analysis found that knee height, a proxy for health and emotional well-being during infancy and childhood, was the strongest predictor of adult physical performance. The lower physical performance score of the Cardiff daughters born in Bangladesh may be due to material and emotional stress they suffered in relation to their migration to the UK.

Janina Tutkuviene, Milda Budryte, and Simona Gervickaite reported on the prevalence of real and of the most attractive facial features in young Lithuanian men and women. Sex-related features, symmetry and averageness of a face have been crucial for attractiveness (Jones and Jaeger, 2019; Kočnar et al., 2019). The evolutionary theory suggests that "average" faces should be related to mate quality, genetic diversity, phenotypic fitness and immuno-competence, while non-average facial features reflect homozygous (less beneficial for general health status) genotypes (Stephen and Luoto, 2021). However, if these were the sole perceptual factors affecting people's sense of facial beauty, then most people would be most attracted to the average face, but the latter phenomenon is under revision today (Jones and Jaeger, 2019). In addition, individuals are more attracted to their own features, i.e. the criterion for beauty is based on the image that the person has of him/herself (Tea-Makorn and Kosinski, 2020; Versluys et al., 2021). The

Table 1 Ten facial features of 120 women and 50 men, aged 18–40 years. Participants had to mark the best match to their own facial features and which they found the most attractive.

Facial feature	Median (min – max values) of different facial feature					
	Real facial feature of women	Female feature, most attractive to women	Female feature, most attractive to men	Real facial feature of men	Male feature, most attractive to women	Male feature, most attractive to men
Eye size	3 (1–5)	**4 (1–5)**	**4 (1–5)**	3 (1–5)	3 (2–5)	3 (2–5)
Distance between eyes	3 (1–4)	3 (1–5)	3 (1–4)	3 (1–5)	3 (1–5)	3 (1–4)
Protrusion of the cheekbones	3 (1–5)	3 (1–5)	3 (1–5)	3 (1–5)	3 (1–5)	3 (1–4)
Prominence of the cheeks	3 (1–5)	**2 (1–5)**	**2 (1–4)**	3 (1–5)	2 (1–5)	**2 (1–4)**
Length of the nose	3 (1–5)	**2 (1–5)**	**2 (1–4)**	3 (1–4)	3 (1–4)	3 (1–4)
Width of the nostrils	3 (2–4)	3 (2–5)	3 (1–4)	3 (1–4)	3 (2–5)	3 (2–4)
Lip thickness	3 (2–5)	**3 (2–5)**	**3 (1–5)**	**4 (1–4)**	**4 (1–5)**	**4 (2–4)**
Chin height	3 (1–5)	3 (1–4)	3 (1–4)	3 (1–5)	3 (1–5)	3 (2–4)
Width of the mandible	3 (1–5)	3 (1–5)	3 (1–5)	3 (1–5)	3 (1–5)	3 (1–5)
Protrusion of the mandible	3 (1–5)	3 (1–4)	3 (1–5)	3 (1–5)	3 (1–5)	3 (2–5)

Bold figures indicate significant differences between real and the most attractive facial features (respectively), $p<0.05$.

aim of present study was to evaluate the prevalence of real and the most attractive facial features among young Lithuanian men and women. For this purpose, an online questionnaire with standardized 10 facial features was developed (separate sets for male and female facial assessment using 5 size categories – min-max, Table 1). Participants (120 females and 50 males, aged 18–40 years) had to mark categories that best matched their own facial features and which was considered most attractive (for both sexes). Interestingly, the prevalence of real facial features (here the average category prevailed), with a few exceptions, coincided with the prevalence of most attractive features (both for males and females). There was a statistically reliable association between real and most attractive features in women, with women with larger eyes and thicker lips, smaller cheekbones and a shorter nose, and an average chin more often rated as most attractive. Also in men, the real and most attractive traits were statistically significantly interrelated, except for the distance between eyes, cheekbone protrusion, and chin height (more expressed traits were rated as more attractive). It is important to note that modern young women no longer attach as much importance to extremely androgenized male faces, while men still mostly prefer female faces with distinctly feminine features. Social, cultural and even fashion factors undoubtedly influence the evaluation of faces.

Yehuda Limony discussed the relation between parental heights and age at onset of the pubertal growth spurt. His study was an extension of a previous investigation (Limony et al., 2015) which demonstrated an association between ”height gap” and the timing of the pubertal growth spurt (PGS). The association was more significant in the Israeli group (R^2=0.69 in Israeli

girls vs. R^2=0.25 in Polish girls and R^2=0.50 in Israeli boys vs. R^2=0.13 in Polish boys). The present study included data from 557 children from the Cracow growth study (297 females), 226 children from the 1st Zurich growth study (109 females), and new data added to the Israeli group (in total 403 children of whom 241 females). Children were observed from age 7–8 to 18–19 years. Unlike the other groups, the Israeli data were obtained from clinical records of children who were referred to a pediatric endocrinology clinic for evaluation of their growth or timing of puberty. They were defined as normal and healthy after a diagnostic workup. The associations between height gap and timing of the PGS as measured by R^2, were 0.15, 0.16, 0.13, and 0.56 for females from Zurich, Wroclaw, Cracow, and Beer-Sheva, and 0.09, 0.12, 0.12, 0.30 for males from Zurich, Wroclaw, Cracow, and Beer-Sheva respectively. The values of R^2 did not differ significantly between females and males except for the group of Beer-Sheva. To explain the differences in correlations, (1) differences in the timing of the PGS, (2) differences in height SDS at the onset of the PGS, and (3) differences in the height gap were examined. The differences in PGS timing, height-SDS, and height gap between the groups were not-significant (two-sided t-test $p<0.01$). Limony concluded that the differences among the Polish, the Zurich and the Israeli children in the correlations between the timing of the PGS and the height gap cannot be explained by the three parameters examined. Yet, as the children from Beer-Sheva were a selected population, and in this aspect different from the Wroclaw, Krakow, and Zurich children who were considered representative of the respective populations, a selection bias might explain the differences.

Sylvia Kirchengast reported on twins. Twins have fascinated scientists and the general public for thousands of years. The attractiveness of twins may be due to their rarity. Less than 2% of all human births are multiple births. From a biomedical viewpoint, multiple pregnancies and births are a special challenge. Twins have a high risk of being born prematurely, they are smaller and lighter at birth, and cesarean delivery is more often required. In this medical record-based study newborn size, pregnancy outcome, and delivery mode of 848 twin births which took place in Vienna, Austria between 2005 and 2019, were analyzed. Nearly 75% of the twin pairs have been conceived spontaneously, 80% were dichorial-diamniotic. All monochorial-monoamniotic twins were delivered by cesarean section; this was only true for about 60% of monochorial-diamniotic and dichorial-diamnyotic twins. Monochorial-monoamnioctic twins were born earlier, they were the lightest and shortest newborns, and showed the lowest APGAR scores. First and second-born twins differed in size, APGAR score, and presentation. Among dichorial-diamniotic twins, opposite-sex twins were significantly heavier and larger than their counterparts of same-sex twin pairs. This was true of males and females. After correction for gestational age and maternal parameters, it was shown that the sex constellation of the twins was independently associated with birth weight and birth length, but not with head circumference. Of special interest is the impact of sex constellation. Male-female pairs were larger than same-sex pairs. Opposite sex constellation enhanced intrauterine growth among females as well as males. Female fetuses may benefit from higher testosterone levels provided by their brothers, while it is not clear why male twins of opposite-sex pairs are larger than male newborns of a male-male constellation. However, it can be concluded that the sex constellation of twin pairs has an

impact on intrauterine growth patterns.

Peter Buston reviewed strategic growth in social vertebrates (Buston and Clutton-Brock, 2022). Individual differences in growth and size of vertebrates often represent adaptive, plastic responses to contrasts in ecological conditions. Social vertebrates can also modify their growth and size in an adaptive fashion in response to fine-grain changes in social conditions (strategic growth). Buston reviewed experimental evidence for strategic growth in social vertebrates and described conditions under which strategic growth commonly occurs. He highlighted potential examples of convergent evolution of strategic growth across the tree of life. This synthesis has implications for the way one thinks about organismal growth and size, because it underscores that the size of individuals can often be fine-tuned to their social environment.

Christiane Scheffler discussed the impact of social interactions on human growth in the light of the evolution of endocrine regulations (Hermanussen et al., 2022a). Strategic growth among mammals and humans has been well documented (Buston and Clutton-Brock, 2022). Greater body size and, in humans, demonstrative manners, clothing, insignia, and many other signs of prestige signal social status and dominance. The balance between social acceptance and an individual's self-perception is reflected and may be compensated by a wide spectrum of behavioral attitudes ranging from aggressive attempts targeting upward social movements to depression and social withdrawal. Aggressive behavior has been shown to be associated with hypothalamic neuropeptide activity (Stagkourakis et al., 2018) which, in turn, regulates the endocrine pathways responsible for developing various physical features such as sexual attributes and somatic growth. The eminent role of these pathways is emphasized by their evolutionary conservation. The Gonadotropin Releasing Hormone (GnRH) pathway has been conserved at least since the evolution of protostomes and deuterostomes some 700 million years ago. Authentic GnRH receptors have been conserved at least since the Cephalochordata, Urochordata, and Vertebrata some 530 million years ago (Sakai et al., 2017). The Growth Hormone Releasing Hormone (GHRH) pathway regulating Growth Hormone, Insulin-like-Growth-Factor 1 and skeletal growth has been conserved for some 400 million years and is found in all vertebrates. Thus, it is not so much a question of whether there is a bilateral link between social position and physical growth, but a question of what this link means in modern Western societies. Details of the socio-endocrine pathway still need to be further investigated.

Michael Hermanussen, Christiane Scheffler, and Detlef Groth discussed aspects of efficiency of social networks. Networks consist of distinct elements or actors (the individuals) represented by nodes and connections between nodes called edges. Networks differ by size, they may cluster. Centrality indices produce rankings for identifying important nodes. Average shortest path lengths and clustering coefficients refer to network efficiency. The global efficiency is defined as the average shortest path length over all pairs of nodes (Vragović et al., 2005). Efficiency means efficiency of information transport and determines network functionality. Centralizing networks raises efficiency and can improve the interaction with the environment. The authors presented Monte-Carlo-simulations of the evolvement of "network efficiency" based on network structure. They simulated dyadic agonistic contests between members of groups of homogeneous individuals and groups that were

dominated by one "keystone individual". When allowing for state dependent feedback (winner-loser effects), strongly centralized 'star' networks evolved. The same was observed in the presence of keystone individuals. The simulations suggested that state dependent feedback in competitive social interactions yields dominance hierarchies, simply for statistical reasons.

Antonia Rösler discussed the detectability of mini growth spurts in daily measurements of body height. Child growth is a dynamic process. When measured at short intervals, children's growth shows characteristic patterns that can be of great importance for clinical purposes. It was studied whether daily measurements of height using an APP was practicable and user friendly. Families were recruited via Snowball Sampling. Thirteen out of 14 contacted families signed up for a study period of twelve weeks, with altogether 22 healthy children aged 3 to 13 years (response rate 93%). The study started with a visit at the family's homes for the set-up of the measurement site, conventional height measurement, and initial training of the measurement process. Follow-up appointments were made at four, eight, and twelve weeks. Height of the children was measured at daily intervals at home by the parents over a period of three months. The parents altogether recorded 1704 height measurements and meticulously documented practicability and problems when using the devices. A 93% response rate in recruitment was achieved by maintaining a high motivation within the families. Contact with the principal investigator was permanently available, including open communication, personal training and attendance during the appointments at the family homes. Measuring height by photographic display is interesting for children and parents and can be used for height measurements at home. Though the quality of the measurements was too poor to detect any mini growth spurts, the quantity could make them detectable with the right statistical analysis. A positive response rate of 13 out of 14 families with altogether 22 children highlights the high convenience and user friendliness of daily APP-supported height measurements. This appears to be a promising new tool for longitudinal growth studies.

Nikolaos Gasparatos discussed how to navigate through the statistical noise in growth data. Assessing short term growth in humans is still fraught with difficulties. Especially, when looking for small variations and increments such as mini growth spurts, high precision instruments or frequent measurements are necessary. Daily measurements however require a lot of effort, both for anthropologists and for the subjects. Therefore, new sophisticated approaches are needed that reduce fluctuations and reveal underlying patterns. He presented change point analysis as a possible solution. Change points are abrupt variations in the properties of time series data. In the context of growth, such variations can be variation in mean height. To investigate the applicability of change point analysis on growth data, he performed change point analysis on simulated datasets varying in growth patterns and standard deviation. First results show that change point analysis can detect mini growth spurts. However, performance is heavily dependent on standard deviation. Further optimization and performance analysis could help quantify those results

Sergei Erofeev presented sociological considerations on human values between position assertion and progress. If human height is considered a sociobiological sign of status, then the social sciences can be used to help explain how the social and the biological status interact. In this regard, im-

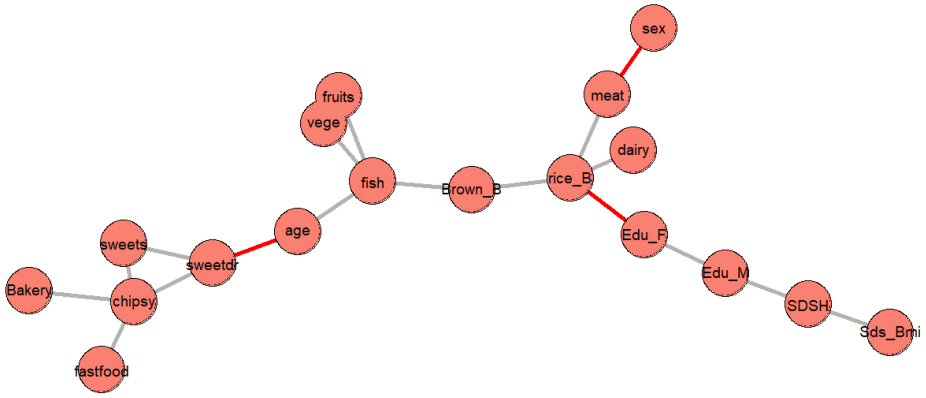

Figure 3 St. Nicolas House graph of anthropometric and nutritional variables of 442 Polish school boys and girls aged 7–18 years living in the Bystrzyca Kłodzka town and the surrounding rural areas. Grey lines indicate positive, red lines indicate negative associations (abbreviations: SdsBM: BMI_SDS; SDSH: height SDS; EduM: mother's education; EduF: father's education; riceB: consumption of rice; dairy: dairy products; fruts: fruits; vege: vegetables; chpsy: chips; swtdr: sweet drinks; swets: sweets; Bakry: bakery products; fast: fastfood; BrwnB: brown bread).

mediate social conceptions with explanatory power are those of Abraham Maslow's hierarchy of needs (Maslow, 1943) and Ronald Inglehart's theory of cultural values (Inglehart, 2018). Of special interest here was the level of values above those of survival, security and belonging where social competition supports the development of symbolic markers of status which are in fact clearly physical. The other sociological theory which may have serious implications for the discussion was that of modernization touching upon the phenomenon of universalization of competitive features and values in western societies from the onset of the industrial revolution. Erofeev elaborated on all three conceptions but especially on the latter as it points at the remarkable historical shift in human growth over the last two centuries

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Masiar Novine presented first approaches towards a digital health screening for children below age 6 years. The increase in processing power and the availability of easy-to-use software (i.e., mobile apps) have led to the widespread use of smartphones. Novine presented a prototype of a mobile app to be used by parents for health screening of their children. The prototype was developed for Android OS and allowed for processing and visualization of biometrical data given by the parents (i.e., height and weight) and evaluating interactive questionnaires consisting of standardized developmental questions. The app generates plots for height, weight and BMI as raw scores and z-scores. The current functionalities were compared to already available mobile apps and further extensions were envisioned. Examples of use were described. The prototype app allows for interactive digital child health screening. Visualizations of height, weight and BMI with reference curves can reveal disorders of development including anomalies in developmental tempo. The data is saved in a local database on the user's device but can also be transferred remotely to an external database for further analytics. Novine con-

cluded that mobile apps can be useful in the context of digital child health screening when their scope of application is clearly defined and not overstretched: Due to the widespread availability of smartphones and the possibility of high speed data gathering, processing and transfer, mobile apps can be used as an efficient tool for decentralized digital child health screening.

Bárbara Navazo and Silvia Dahinten described trends in sexual dimorphism of mesobrachial composition in students from Puerto Madryn (Argentina) between 2001 and 2016. They presented data on the mesobrachial composition in two samples of males and females, aged between 6 to 14 years who resided in Puerto Madryn. Mesobrachial composition was estimated considering triceps skinfold thickness (mm) and arm circumference (cm), and calculated by three arm areas: total arm area (TAA), muscle area (AMA), and fat area (AFA). The authors analyzed changes in arm composition. Two samples (S) of students of both sexes who attended different schools in Puerto Madryn (Chubut, Argentina) were compared. The first sample (S1 n=3114) was measured between 2001 and 2006. The second sample (S2 n=2799) was studied between 2014 and 2016. LMS ChartMaker Pro software was applied to obtain centiles (5^{th}, 50^{th}, 85^{th}, and 95^{th}) by sex and age. Comparisons between the samples were analyzed using Wilcoxon test ($p<0.05$). Significant differences occurred in all centiles of arm areas analyzed in both sexes. While males showed higher values of TAA and AMA in both samples, females showed higher values of AFA. When analyzing the trends in mesobrachial composition, higher values of TAA, AMA, and AFA were found in S2. The biggest increments in AFA were found in the males, the biggest increments in AMA were found in the females. The authors concluded that the mesobrachial composition of students from Puerto Madryn showed sexual dimorphism and positive secular changes during the first decade of the 21^{st} century.

Sławomir Kozieł, Aleksandra Gomuła, and Natalia Nowak-Szczepańska explored nutritional data in school-age children. The aim of the study was to estimate a relationship between nutritional data, parental education and anthropometry. Nutritional, socio-economic and anthropometry data of 442 Polish school boys and girls aged 7–18 years living in the town of Bystrzyca Kłodzka and surrounding rural areas were collected between 2012 and 2013. The study was part of a project of the Polish-Czech transborder cooperation project supported by the EU. Height, weight and BMI were standardized for age using LMS parameters referred to the Polish general population. All children and their parents filled out a nutrition questionnaire about frequency and nutrition items consumption. As a large number of variables might constrain limitations in the statistical analysis, St. Nicolas House Analysis was applied (Hermanussen et al., 2021). The analysis revealed several association chains between the variables. The consumption frequency of items that are considered unhealthy, like sweets, sweet drinks and chips were interrelated and connected within one group, whereas healthy food items were also highly correlated and connected within another group (Figure 3). Sex and age were not associated with any of the items consumed. St. Nicolas House Analysis appears to be a method that allows for exploring large data sets with variables of different nature.

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