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Relevance of Body Size and Growth Type for Sports

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ABSTRACT:
High level exercising during adolescence alone enhance peak bone mineral density and reduce osteoporosis risk. It's a well-known fact that body weight influences menarche age. Intensive sports activity and thinness appear to have a synergetic effect in delaying menarche. It will be a big task during future to study relationship of physical structure to high level performance because discouraging results have shown some important high lights. It appears that with high level of sports, anatomical, biological and biomechanical modelling of physique changes. The performance may be more appropriate if the next future training may attempt to match the model better than before.

Key Words: Somatotype, Sport, Growth and Development, Menarche.

In the field of Sports Anthropology, Talent identification and selection is connected with "Models of special norms" (Herm 1988, 1993, 2012).The biological characteristics of the growing child in sport are quite different to those of non sportsmen of the same age. At present the variation in Somatotype in different adult sports are very great.During the twenties of the last century Kohlrausch (1922/23) wrote and described "Sports types". Conrad (1963) performed somatotypological estimation and found more mesomorphic middle distance runner than sprinter. Tittel and Wutscherk (1972) have given in "Sportanthropometrie" the different possibilities for somatic types and sports development. Carter and Heath (1990) described in "Somatotyping" about sport and physical performance. Today have the high specialized training, the super nutrition, the supporting drugs and excellent technical equipment a quite higher influence at somatic development than before.

Notwithstanding, we may have to see for somatic type the relation between genetical (heredity) and environment influences (sports training) on an average of 80 to 20 percent.

According to Kovar (1977), Chovanova et al. (1982) and Carter and Heath (1990) heredity plays a greater part in ectomorphy and mesomorphy than in endomorphy. It's not astonishing that there is a good correlation between Somatotype and sports performance. Somatotyping is also useful in helping to guide both children and adults to sports appropriate for their present and potential somatotypes. Accordingly, Carter judging somatotypes by photographs of athletes in the 1928 summer Olympics published earlier by Kohlrausch (1930), and judging by Somatotype photographs of Olympic athletes between 1948 and 1976, found that the somatotypes of successful Olympic athletes have changed.

In this period, male swimmers were less endomorphic; body builders, shot and discus throwers were more mesomorphic; high jumpers and 400 m runners were less mesomorphic and ectomorphic. He attributed the change in high jumpers to changes in technique from straddle technique to "flop" technique.

Today we can recognize a high optimization of somatic structure in all areas of sports. For example, today the long distance runner **Haile Gebraselassie** has a size of 164 cm, body weight of 53 kg and BMI as 19.7! Can we say small and spindly? Olympic Marathon runners during the sixties have had the following data (Table 1):

Table 1. Body size data of Olympic marathon runners

1960			1964			1968		
Ht-cm	Wt-kg	BMI	Ht-cm	Wt-kg	BMI	Ht-cm	Wt-kg	BMI
170.5	60.9	21.1	170.7	60.6	20.9	170.0	59.7	20.8

Sprinter **Usain Bolt** with 195 cm height and 95 kg body mass has a BMI 25.0. If you look at his calf down to hamstring then you recognize his muscles in finest and gracility form directly under his skin like an anatomical preparation. You will find this result of sprint training in a high level of characteristics of the body built.

Ski down hill sports lady **Lindsay Vonn** has Size 178 cm and weight 75 kg with BMI 23.7.That means that there is besides high muscle mass also a relative body mass usefully.

Matthias Steiner (Weightlifting) has weight greater than 105 kg, size 183 cm and BMI of 31.4. In this heavy weight sports kind we have characteristics of very high body weight with superior muscle mass and substandard average of fat mass.

Madam **Ulrike Sennewald** in rowing has 194 cm height and 84 kg weight; BMI 22.3. There is a sign that move and throw the lever with specialty power relation are successfully.

Characteristic for sports is that not more than 1 % of selected young talents in all sports kinds will reach the World and Olympic level. And so it is no wonder that sometimes it is difficult to determine for everybody the right sports according to Somatotype analysis.

Sometimes the Somatotype is a result of typical selection and individual specialised skills. Sports high level training has a direct influence at somatic development.

If sports performance in high level sport is an individual result then we can not recognize any principles if we have also a changing of the somatotypes during puberty, according to Conrad (1963) from **hypo plastic** to **hyper plastic** type. There is an increasing athletic aspect also during childhood of young sportsmen. But it's shown that there is during growth period especially the same level of leptomorphy or pycnomorphy between 11 and 18 years. Who is leptomorph during childhood will be also leptomorph in adulthood.

The same you can find for pycnomorphy (Fröhner and Wagner 2011). So you can say that the leptomorphy and pycnomorphy is especially genetically and respectively constitutionally determined and can be used in different kind of sports for talent selection and identification.

Somatoplots from studies of athletes have established the most common somatotypes distributions for individual sports. The elaborations of immature somatotypes of athletes are reasonably predictable if the distributions of young athletes who are still growing are similar to those of older athletes. So you can describe **growth types** in different sports kinds to see if they are growing more dynamically or less changing and more stable in growth velocity (Herm 1987, 2007, 2012).

Alongside of stable physique of some children over some periods the individual instability of somatotypes in children shows the significant changes during childhood and adolescence in their growth. There you can find that in general, the somatotypes of children between two and six years of age progress from endo-mesomorphy toward balanced mesomorphy for boys and toward central somatotypes for girls. Thereafter, the boys tend to decrease in mesomorphy and increase slightly in ectomorphy into mid-adolescence, when there is a dramatic reversal toward ecto-mesomorphy, balanced mesomorphy or endo-mesomorphy (Carter and Heath 1990).

So it's not astonishing that also a typical changing in somatotypes for girls is possible.

For sports it is the hardest question in somatotypological estimation to recognize very early the general or specific tendency of growth.

Carter found that in the somatotypes distribution of athletes for all sports in the 1968 and 1976 Olympics show that the male somatotypes are concentrated around 2-5-2 1/2 and the females around 3-4-3. That means the majority of the males are dominantly mesomorphic and

more mesomorphic and less ectomorphic than the females. The athletes of both sexes were more mesomorphic and less endomorphic. That means that the Olympic participants in sport are more athletic than non sportsmen. That's no surprise.

Mean somatotypes for selected male and females show that there are high somatic differences e.g. between weightlifting, gymnastics, swimming, rowing, volleyball, basketball, canoeing, soccer, handball and so sports sciences came to the conclusion that training will develop mostly the athletic type but also the lean and skinny type. The high endomorph or pycnomorphy type you will not find in top level.

In some of sports kinds the body height assumes a big role to reach the level of performance like Gymnastics, Volleyball, Basketball, Weightlifting and some others. Fact is that sport is every time connected with Somatotype. You must follow the age of the biological body development which is mostly determined genetically and influenced through environment see above. There is a typical hormonal disorder also in relation to sports and somatotypes.

There are also big differences in sports if you investigate the somatotypes of different ethnic groups. As one example shall be deemed fit, the large range of means and distribution of different national level volleyball players during the seventies of last century range from endo-mesomorphy (Europe) to meso-ectomorphy (India). That's why prescriptive limits for every sports kinds like special norms are useful.

In case of sports girls, the big question is related to the relation of menarche age in different kinds of sports. Like researchers noted the trend some 140 years ago that in year 1860 the average menarche happened at 16.6 years, in 1920 at 14.6 years, in 1950 at 13.1 years, in 1989 at 12.5 years, in 1992 at 12.2 and during 2010 it is between 10 and 11 years. Different countries and different areas have different menarche age and so we can find in sports typically specific too. We can find some influences at gynaecological age in sports. High exercising during adolescence alone enhance peak bone mineral density and reduce osteoporosis risk, there is also in different kind of sports a high influence during which age girls reach menarche. It's well known that body weight influences menarche age. Intensive sports activity and thinness appear to have a synergetic effect in delaying menarche. It is typical for Gymnastics.

It therefore seems likely in different kinds of sports that menarche age is later than 15 years in Gymnastics, endurance sport, figure skating, ballet dancing. Every year intensive sports training introduced before reaching menarche age delayed the beginning of periods for more months.

It will be a big task during future to study relationship of physical structure to high level performance because discouraging results have shown some important high lights. It appears that with high level of sports, anatomical, biological and biomechanical modelling of physique changes. The performance may be more appropriate if the next future training may attempt to match the model better than before.

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