



Post-reproductive life span of spouses correlates higher than of full siblings in a genetically homogeneous top status group

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Introduction:

While many genes with slight to moderate effects on the life span have been identified, socio-economic and life-style factors are considered of even greater importance, especially for the post-reproductive life span. In a genetically identical population, all individual differences must be caused by environmental differences. In an identical environment, however, all individual differences are caused by genetic differences. In a genetically fairly homogeneous top status group with similar life styles and many potential confounders controlled, a higher correlation in lifespan should be expected for fully siblings than for half-siblings, and for the latter higher than for spouses.



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Data:

These are the 1,672 legitimate births occurring in the Royal Houses of Europe to George I, King of Great Britain, France, and Ireland and Elector of Hannover (1660–1727), and his wife, Sophie Dorothea of Celle (1666–1726), and their direct descendants, between 1 January 1683 and 31 December 1939. Deaths until 31st December 2014 were recorded. To this top status group and their children belong all present reigning monarchs in Europe, save Reigning Princes Hans-Adam II of Liechtenstein and Albert II of Monaco. The latter are not considered as peers by the former.



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George I King of Great Britain (1660–1727)



Sophie Dorothea of Celle (1666–1726)



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The proportion of direct descendants of this couple within members of the royal dynasties of Europe increased throughout the observation span:

- among the births 1790-1799 it was 71%,
- among the births 1840-1849 it was 3%,
- 1890-1899 it was 97%,
- from the turn of the 19th to the 20th century onwards, 100%

of all crowned heads in Europe have been direct descendants of this couple.

In the era of Britain world dominance, a British Royal Princess was the ultimate prize in dynastic marriage politics, like a Byzantine born-to-the-purple princess a millennium earlier. Since there are also catholic lineages among the descendants of George and Sophie Dorothea, and since marriage candidates always could convert, the catholic dynasties of Europe were in the market, too.



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The basic source was McNaughton monumental three volume “Book of Kings” (1973); the information contained there on the direct, legitimate descendants of George and Sophie Dorothea born until 31st December 1939, was checked and updated by the rich genealogical sources freely available in printed form and in the internet.

Deaths until 31st December 2014 (closure of the data base) were taken into account.



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Of these subjects, only ever married subjects surviving to at least 45 years of age, and only married couples and sibling couples with both partners dead by closure of the data base were analysed.

In this population is little evidence for mating assortative for longevity. Sex and cohort were statistically controlled.



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The puzzling question:

How great was the variation in longevity relevant

- Genes?
- Environment?
- Individual Lifestyle Factors?



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Genes?

Intermarrying was proverbial in this very special population.

An example: „King George V (1865 - 1936) of England was first cousin to the German Emperor, Wilhelm II; first cousin to the Tsar, Nicholas II and the Tsarina, Alexandra (Nicholas through his mother's sister, Alexandra through his father's sister); first cousin to Christian X of Denmark; to Haakon VII of Norway (who was married to George V's sister, Princess Maud, and was therefore his brother-in-law as well); to King Constantine I and Queen Sophia of Greece (the former through his maternal uncle, the latter through his paternal aunt); to Queen Marie of Romania; to Queen Victoria of Spain; and to the first wife of King Gustav VI Adolf of Sweden.

George V was also closely related to all reigning Princes, Dukes, Grand Dukes in the German Empire in 1914, and he was distantly related to the Emperor Karl I of Austria, himself a direct descendant of George I“.

(McNaughton 1973: IX)



King George V
(right) and his
physically
similar cousin
Tsar Nicholas II
of Russia in
German military
uniforms in
Berlin before the
First World War





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Genes?

Intermarrying was common in this special population.

Almost 50 percent of females and males had married another member of the study population; for very many of the other cases, who did not intermarry (but in most cases had married an aristocrat), we have the vital data for spouses, too.



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Genes?

But even in this population:

Full siblings had higher genetic co-variation than half-siblings, and those a higher than spouses.



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Genes?

Quite important for the interpretation of findings is:

Because of the relative genetic homogeneity of the population of potential mates, the genetic distance between spouses at least within one generation can be considered as relatively constant.

An important factor of uncertainty, here, can be considered as non-existent.



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Environment ?

All individuals in the study population were extremely well shielded against the vicissitudes of business cycles, demographic waves, sex imbalances in the marriage market, nutrition supply, epidemics, and the risks associated with war (some secondary male members of the study population were killed in action in wars, but all before age 45, and thus were not included in the sample) and political unrest (except for some very few assassinations in 1870–1918).



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Environment ?

All members of the study population also belonged to the most affluent stratum of their societies.

According to press reports, Charles Prince of Wales, the heir to the British throne, in Clarence House, his home just for himself and his wife Camilla Parker-Bowles, enjoys the services of 17 valets, 3 cooks, 2 private secretaries, 2 butlers, 2 chauffeurs and 8 gardeners.

Within the observation time, probably no Heir to the British throne before him had lived so modestly.



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Environment ?

At last from 1800 onwards, the European Aristocracy also enjoyed the fruits of medical progress earlier than normal people.

For example, variolation even before Jenner's vaccination was practiced widely among the European aristocracy in the second half of the 18th century. (Weiss & Esparza 2015)

Infant mortality in this population was relatively low: 80 per thousand live births in 1700-99, 70 per thousand in 1800-49, 50 in 1850-99, and 8 in 1900-39. Also low was child mortality (death before age 5 years), which dropped from 150 per thousand in 1700-99 to 120 per thousand in 1800-49, 80 in 1850-99, and 8 after 1900.

In 1912 infant mortality in Berlin-Tiergarten, the most affluent of the 20 districts of Greater Berlin, was 50 per thousand. In Berlin-Wedding, the poorest district, infant mortality was 400 per thousand.



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Individual life style factors?

These – like nutrition, exercise, personal hygiene, sanitation, addictions, overweight, exercise - are the least observable influence factors in this study population.

Only one assumption may be justified for married people beyond age 45:

the co-variation in individual life style factors probably is higher for cohabiting spouses than for full siblings who in most cases live apart from each other.



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Methods:

Cohort and sex were statistically controlled (the latter by standardizing life span by sex and by cohort).

Simple correlations are reported here.



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Results:

255 pairs of full brothers and 209 pairs of full sisters, of which all had been married at some time and had survived to at least age 45, could be identified.

A person's life span was predicted by first spouse's life span, with $r=.251$, $p=.026$ for women and $r=.227$, $p=.032$ for men. On the other hand, no correlation was found in the life span of full brothers with $r=.118$ ($p=.270$) or full sisters ($r=-.033$, $p=.763$), nor in the life span of half brothers or half sisters.



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Conclusion:

In this population with a similar high standard of living and the best medical care of the time, life style factors - like nutrition, exercise, personal hygiene, sanitation, addictions – that are more shared between spouses than between adult full siblings - may have mattered more than genes for longevity in this population.

The finding is important since for most of the birth cohorts in the dataset no such general population data are available at all.