

Factors that influence the health of mathematicians, physicists, and chemists: Data obtained from China

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Abstract: Given the practical implications of looking into the health of scholars, it is of great priority to figure out the factors that are generally agreed to be the contributors to sustained health, to which end, this paper sets out to collect the mainstream insight into all possible influencing factors. Three research scheme are proposed in this paper under which basic personal information are collected first from 520 scholars in mathematics, physics, and chemistry for an analysis of their longevity performance via a comparison with common values under the demographic perspective to derive the raw longevity information of the scholars. Also, the ways they manage to maintain health are ascertained, on the basis of which the reasons for their sustained health are provided.

1. Literature Review

This section will first address the commonly agreed factors contributing to a long and healthy life. Factors that maintain a long and healthy life are widely agreed upon. Qiufen Sun et al. (2022) justified five factors for maintaining longevity through 451,233 valid samples, namely, non-smoking, no excessive alcohol consumption, physical exercise, healthy eating habits, and a BMI between 18.5 and 27.9 kg/m². [1] Cui Degang et al. (2021), selected 34 out of 2292 Chinese and English literature to analyze the rehabilitation effects and recovery impact of subjects in each literature using physical activity as the study object, and concluded that physical health was one of the five beneficiaries of doing physical exercise. [2] Magdalena Zadworna (2021) summarized four factors associated with healthy aging, (1) access to undertakings that people value, (2) solid physical and mental capacity, (3) surrounding factors; and (4) happiness, security, and contentment, and concluded that the most important health-related factor in this regard appears to be personal economic status. [3]

Then it comes to region-specific factors for health and longevity. Wang Wuyi et al. (2015) suggested that the distribution of elderly longevity is closely related to the natural and cultural surroundings, with the occurrence of centenarians predominating in the south, the delta, low and medium hills with impact and flood plains, and areas with few or no epidemics. [4] Michael Y Ni et al. (2021) attributed one of the reasons for a high lifespan of SAR in Hong Kong to the well-developed transportation system due to the high population density there. [5] Diddahally Govindaraju et al. (2015) concluded

that the longevity of centenarians is “abnormal health and longevity” in terms of both genetics and lifestyle, and that longevity is under the influence of potential, measurable or congenital, and genetic factors. [6] Tomás Vega et al. (2022) also referred to the study of abnormal longevity, which was categorized by age, place of birth, place of residence, marital status, presence of caregivers, Basel index and presence of cognitive impairment in individuals with longevity. [7] Svetlana Ukraintseva et al. (2021) defined two properties characterizing health: (1) robustness, the nature of resistance to disease to avoid deviation from normal physiological state, to protect oneself and to avoid damages on the body, and (2) resilience, the ability to recover after deviation from normal physiological state. [8]

To summarize, the existing literature has been well researched and specific on the commonly agreed factors for health, but there is still a scarcity of research into of health and longevity of scientific workers mainly engaged in mathematics, physics, and chemistry and the comparison of life span of the above three types of scholars. As a result, this paper takes into account both the life span of mathematicians and the reasons for their generally health and long life span.

2. Normality test

Since both parametric tests, t-tests and ANOVA, have to meet the premise of normal distribution, the normality tests are performed on the life spans of 177 mathematicians, 153 physicists, and 190 chemists by using Spss26.0. [9]

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Table 1.Table of normality test results for scholar

	Kolmogorov-Smirnov(V) ^a			Shapiro-Wilk		
	Statistics	Degree of freedom	Significance	Statistics	Degree of freedom	Significance
mathematicians	0.116	168	0.000	0.958	168	<0.001
physicists	0.095	147	0.003	0.945	147	<0.001
chemists	0.107	186	0.000	0.949	186	<0.001

a. Riley's Significance Correction

According to the above results, where the normality test p-values are less than 0.05, indicating that the lifespan of scholars in all three disciplines does not obey a normal distribution, so the hypothesis test adopted in this paper should be non-parametric.

3. Non-parametric tests that do not presuppose a normal distribution of the data

In this paper, the median of independent samples test and Kruskal-Wallis test are used to test whether there is a

significant difference in median lifespan among all the 501 mathematicians, physicists and chemists, and the overall median is 84.0, where

Median test:
 $\chi^2 = 1.737, p = 0.419 (> 0.01)$

Kruskal-Wallis test:
 $H = 5.116, p = 0.077 (> 0.01)$

The p-values for both tests are greater than 0.01. The results indicate that there is no significant difference in the lifespan among mathematicians, physicists, and chemists.

Table 2.Median Lifespan Hypothesis Test for scholars of three disciplines investigated.

Test	Total N	statistics	Degrees of freedom	Significance
Independent sample median test	501	1.737	2	0.419
Independent sample Kruskal-Wallis test	501	5.116	2	0.077

Note: The null hypothesis is lifespan median of scholars is identical for all three disciplines. Significance level is 0.01.

Is there a significant difference between the median lifespan of scholars of the three disciplines (i.e., mathematicians, physicists, and chemists) and the median lifespan of the nation as a whole? In this paper, a total of 501 scholars from the three disciplines and a total of 10,001 ordinary people from the public are selected for hypothesis testing of median lifespan (Mann-Whitney test is required because neither sample group meets normal distribution).

Median test: $\chi^2 = 63.612, p < 0.001$

Mann-Whitney test:
 $U = 316602865.000, p < 0.001$

The p-values for both tests are less than 0.001, indicating that there is a significant difference between the median lifespan of scholars of the three disciplines and the nation as a whole.

Table 3.Median lifespan hypothesis test for scholars and the nation as a whole.

Test	Total N	statistics	Degrees of freedom	Significance
Independent sample median test	1000502	63.612 ^a	1	<0.001
Independent sample Mann-Whitney test	1000502	316602865.000	—	<0.001

a. Yates continuum correction.

Note: Null hypothesis is the lifespan median of scholars is identical to that of the nation as a whole. Significance level is 0.01.

Given the generally superior medical treatment, working conditions, and living standards of academicians

compared with the general public of the nation, it is further investigated whether there is any significant

difference between the median lifespan of scholars who are not academicians of the three disciplines and the nation as a whole. A total of 270 scholars (231 academicians were removed) from the three disciplines and a total of 10,001 ordinaries from the public are selected for the hypothesis test of median lifespan.

Median test:
 $\chi^2 = 14.955, p = 0.000110 (< 0.01)$
 Mann-Whitney test:

$$U = 155638940.500, p = 0.000031 (< 0.01)$$

The p-values for both tests are less than 0.01, indicating that the median lifespan of scholars of the three disciplines (excluding academicians) is also significantly different from that of the nation as a whole. This result suggests that, even discounting academicians, scholars of the three disciplines also live longer than the national population as a whole.

Table 4. Median life hypothesis test for Non-academician scholars and the nation as a whole

Test	Total N	statistics	Degrees of freedom	Significance
Independent sample median test	1000271	14.955	1	0.000110 ^a
Independent sample Mann-Whitney test	1000271	155638940.500	—	0.000013

a.Asymptotic significance after Yates continuum correction.

Note: Null hypothesis is the lifespan median of Non-academician scholars is identical to that of the nation as a whole .Significance level is 0.01.

Table 5. Table of the total life span of scholars in the three disciplines

Age	Effective sample size	Death toll	Death probability	Survival probability	Probability density function	Risk function
38	501	1	0.002	0.998	0.001	0.001
40	500	0	0.000	0.998	0.000	0.000
42	500	1	0.002	0.996	0.001	0.001
44	499	1	0.002	0.994	0.001	0.001
46	498	3	0.006	0.988	0.003	0.003
48	495	1	0.002	0.986	0.001	0.001
50	494	3	0.006	0.980	0.003	0.003
52	491	2	0.004	0.976	0.002	0.002
54	489	6	0.012	0.964	0.006	0.006
56	483	6	0.012	0.952	0.006	0.006
58	477	6	0.013	0.940	0.006	0.006
60	471	12	0.025	0.916	0.012	0.013
62	459	9	0.020	0.898	0.009	0.010
64	450	7	0.016	0.884	0.007	0.008
66	443	5	0.011	0.874	0.005	0.006
68	438	15	0.034	0.844	0.015	0.017
70	423	16	0.038	0.812	0.016	0.019
72	407	15	0.037	0.782	0.015	0.019
74	392	18	0.046	0.747	0.018	0.023
76	374	21	0.056	0.705	0.021	0.029
78	353	30	0.085	0.645	0.030	0.044
80	323	32	0.099	0.581	0.032	0.052
82	291	32	0.110	0.517	0.032	0.058
84	259	36	0.139	0.445	0.036	0.075
86	223	41	0.184	0.363	0.041	0.101
88	182	40	0.220	0.283	0.040	0.123
90	142	37	0.261	0.210	0.037	0.150
92	105	29	0.276	0.152	0.029	0.160
94	76	23	0.303	0.106	0.023	0.178
96	53	22	0.415	0.062	0.022	0.262
98	31	18	0.581	0.026	0.018	0.409
100	13	10	0.769	0.006	0.010	0.625
102	3	1	0.333	0.004	0.001	0.200
104	2	1	0.500	0.002	0.001	0.333
106	1	0	0.000	0.002	0.000	0.000
108	1	1	1.000	0.000	0.001	1.000

Notes: The median of survival analysis is 84.47.

4. Questionnaire analysis

The questionnaire “Health Survey for the general public based on mathematicians, physicists and chemists” received a total of 210 valid responses from 27 provinces and autonomous regions, with 20 items divided into 4 sections, namely the Social Contribution and Health Scale for Mathematicians, Physicists and Chemists and the “Health Factor Scale” based on the respondents themselves.”, which is distributed in the form of a 5-point Likert scale. All three categories of scholars score more than 4.2 on a five-point scale, which shows the public's concern for the health of all the three kinds of scholars and their expectation for the future development of basic science, with 4.28 points for mathematicians, 4.27 points for physicists, and 4.25 points for chemists. The analysis of this questionnaire was conducted using SPSSPRO (2021). The overall Cronbach's alpha coefficient of the questionnaire was $0.869 > 0.800$, and the half-measure reliability was 0.798 and 0.732 respectively, indicating a good overall reliability of the questionnaire. [10]

5. Conclusion

This paper highlights the current literature on factors of health and longevity and divides them into four categories: commonly agreed factors contributing to health and longevity, region-specific factors for health and longevity, education-related contributors to health and longevity, and attitude-related contributors to health and longevity. Information from scholars in mathematics, physics and chemistry is compiled for data analysis, yielding a higher than average lifespan for all three kinds of scholars, while there finds no significant difference in lifespan between the three kinds of scholars. It is revealed by the interview results that more brain activities and more reflections is an important reason for mathematicians to achieve longevity, more exercise and healthy diet are the factors commonly agreed by professors as contributors to health, while willingness to study and read along with playing less mobile games are the requirements of professors for students to become healthy learners. The analysis of the questionnaire shows that the public is concerned about the health of all the three kinds of scholars in the hope that they can live a longer and healthy life to make more contributions to the development of basic science.

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Appendices

The following supporting information can be downloaded at
<https://data.mendeley.com/datasets/t35xz3ntj6/1>

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