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LONGEVITY OF POLISH TOP-CLASS ATHLETES COMPARED TO OTHER SOCIAL ELITES AND WELL-KNOWN PEOPLE IN THE YEARS 2001–2021

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Abstract
Objectives: The aim of this work is to initiate or revive a scientific discussion on the impact of professional life on the parameters of human lifespan. **Material and Methods:** Presented analysis is based on 8578 Polish elite or well-known person who died in 2001–2021. **Results:** The results of the conducted analysis indicate that in the case of men the highest values of the median age at death were characteristic of freelancers (median [Me] ± quartile deviation [QD] 85.5±8.5 years), followed by scientists and academic teachers of the biological and medical specialty (Me±QD 84.0±7.5 years) and officers of power structures (Me±QD 83.5±8.5 years). Subsequently, the highest value of the median age at death was

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recorded for social activists (Me±QD 83.0±9.5 years), clergy (Me±QD 82.0±7.5 years) and scientists and academic teachers of specialties other than biological and medical (Me±QD 82.0±8.0 years). Significantly, at the very end of this list are athletes (Me±QD 77.0±9.0 years). Nevertheless, the results of the analysis confirm that professional athletes are characterized by higher median age at death compared to the general population. Analysis made only within athletes group demonstrated that the parameters of lifespan of athletes of endurance disciplines (Me±QD 78.0±8.0 years) are the most favorable compared to athletes of other disciplines, in particular in compare to team sports athletes (Me±QD 75.0±10.0 years) or combat sports athletes (Me±QD 75.0±7.1 years). **Conclusions:** What is new and innovative in this paper is comparing the lifespan characteristics of athletes in comparison to widely represented group of other professions with higher socio-economic status. Unexpectedly, the lifespan of athletes occurred to be lower than for fast all other analyzed occupational groups, except mainly of entertainment musicians. Finally, the results presented in this paper emphasize the need to analyze the lifespan characteristics of athletes in a broader scope than only in relation to the general population.
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Key words:
Poland, lifespan, athletes, longevity, premature mortality, elites

INTRODUCTION

Numerous health benefits of regular physical activity have already been well documented, including the impact on longevity, total mortality, and the quality of life [1–4]. Nevertheless, the influence of competitive sports on human longevity remains controversial. Although large clinical studies and meta-analyses in elite athletes have demonstrated a longer lifespan in the investigated group [5–8], some authors have emphasized negative aspects of competitive sports which can be related to excessive training volume or intensity, a risk of serious injuries (especially head injuries), mental problems or potential illegal pharmacological support. Intense pressure from fans and the stress-inducing responsibility for the results of important competitions belong to the negative factors that can affect the athletes' health status and in consequence their lifespan [9,10]. Moreover, the elite athletes' lifestyle after their professional career termination is yet another relevant factor that has still been poorly investigated [11].

It is noteworthy that sports successes of top-class athletes often reinforce their image that includes among others: a higher social status, an above-average salary(at least as long as their sports career lasts), social recognition and easier access to professional health care. Consequently, from the socio-economic standpoint, the analyzed occupational group is more similar to social elites than the so-called "average citizens" and comparing them only to the general population , as was the case in most available studies on the athletes' lifespan, seems to be far from sufficient. Some researchers compared the lifespan parameters of athletes and representatives of other occupations, however, the choice of the professional groups was often made selectively without a clear explanation of the selection determinants [12,13], or the athletes were not included whatsoever [14]. The aim of this study was to fill this gap in the knowledge and initiate or revive a scientific discussion on the impact of professional life on the parameters of human lifespan, taking into consideration that the available literature has not yet reported any papers on the issue in a comprehensive manner, consistent with scientific methodology and based on a large sample size.

Finally, Poland seems to be an interesting location for this type of analysis as Polish athletes can boast numerous successes in the international arena, both today and in the past. Over the last century, Poland has won nearly 300 medals in the Summer Olympic Games only, most of them in athletics (66), followed by boxing (43), weightlifting (34), wrestling (27) and fencing and canoeing (22 in each) [15], not to mention the medals won at European and World athletics championships, team sports championships (mainly in volleyball), international competitions in winter sports (mainly in ski jumping) or at Grand Slam tennis tournaments.

MATERIAL AND METHODS

Record data of the analyzed people were obtained from the Wikipedia website, which annually publishes a list of well-known deceased people [16]. The data published by Wikipedia were also verified in other sources with a level of agreement >90% (92.7%). The choice of the data source was determined by the fact that the data on deceased Polish persons by Wikipedia proved to be the most complete as well as being based on the same or similar data acquisition methodology every year.

The structure analysis of the obtained data confirmed that the persons in the analyzed database met the criterion of belonging to broadly understood social elites or well-known persons and these consisted of scientists and academic teachers (27.4%), people of cultural recognition/artists (20.4%), athletes (12.9%), publicists (9.3%), politicians (8.9%), power structures officers and war veterans (5.7%), high church dignitaries, clergy (4.7%), social activists (4.2%), representatives of freelancers, i.e., doctors, lawyers, architects, business people, etc. (3.2%), senior civil servants (1.8%) and coaches, instructors, referees and sports activists (1.6%) (Table 1).

The values of the median age at death relevant to Polish population (limited to people who reached the age of ≥50 years) as well as other statistical parameters were calculated based on complete data published by Polish Central Statistical Office (Główny Urząd Statystyczny – GUS), i.e., the calculation was based on the data of all Polish citizens who died in Poland after reaching the age of ≥50 in the analyzed time period.

To sum up, the initial step of this analysis included all the well-know people of Polish origin who possessed their personalized websites on Wikipedia platform and died in the period 2001–2021. The further analysis included everyone who met the baseline criteria and died aged ≥50 years.

Detailed characteristics of persons coded in each professional category

Although, as already mentioned, all the included persons certainly belonged to social elites or a category of well-known people, the authors are aware that the list cannot be considered as a complete one, i.e., some people who met the indicated criteria, were omitted by Wikipedia authors as the ones arousing slightly weaker public interest.

Athletes

People professionally practicing sports as part of their professional career. Athletes were divided into team sports players (soccer, handball, volleyball, basketball, hockey and rugby players), the athletes of endurance sports (runners, cyclists), combat sports (boxing, judo, karate or other combat sports), winter sports (alpine skiers, cross-country skiers, ski jumpers, tobogganers, skaters), water sports (swimmers, canoeists, rowers) motor or air sports (sport pilots, rally drivers), individual sports players (tennis, table tennis, badminton players), competitors of intellectual sports (chess, bridge players) and competitors of other Olympic disciplines unmentioned above.

Sports activists

Coaches, sports referees and sports activists or national sports associations members (unless they had achieved significant successes in their own sports career in which case they were classified as athletes).

Scientists and academic teachers

People dealing with science, with at least a degree of Ph.D. with habilitation and employed in universities or other scientific institutions. The category was additionally divided into scientists and academic teachers representing medical and other fields. Other academics were further classified into the representatives of technical sciences (engineers), exact sciences (mathematicians, physicists, economists, computer scientists), biological and chemical sciences, social sciences (sociologists, philosophers, philologists, psychologists, historians, anthropologists), earth sciences (geographers, geologists, astrologers) and law.

Table 1. The structure of the analysed representatives of the Polish elite and well-known people who died in the period of 2001–2021 according to individual professional groups and gender (based on [16])

Professional group	Patricipants (N = 8578)		
	men [n]	women [n]	total [n (%)]
Athletes	992	113	1105 (100)
team sports players	406	35	441 (39.9)
endurance athletes	109	16	125 (11.3)
competitors of motor and air sports	110	6	116 (10.5)
competitors of other Olympic[a] disciplines	86	23	109 (9.9)
martial arts athletes	80	1	81 (7.3)
winter sports athletes	66	15	81 (7.3)
water sports players	66	11	77 (7.0)
bridge players and chess players	31	3	34 (3.1)
strength athletes	21	1	22 (2.0)
athletes in individual sports	17	2	19 (1.7)
Coaches and sports activists	129	6	135 (100)
Academic teachers	1871	478	2349 (100)
representatives of social sciences	531	209	740 (31.5)
physicists, mathematicians	315	33	348 (14.8)
biologists, chemists	225	103	328 (14.0)
representatives of medical sciences	233	77	310 (13.2)
engineers	255	11	266 (11.3)
geographers, geodesists	149	24	173 (7.4)
lawyers	120	14	134 (5.7)
architects	43	7	50 (2.1)
People of cultural recognition/artists	1338	410	1748 (100)
actors	333	168	501 (28.7)
artists	298	76	374 (21.4)
other film, theatre or music industry staff	237	63	300 (17.2)
classical music artists	201	50	251 (14.4)
pop musicians	165	30	195 (11.2)
photographers	68	5	73 (4.2)
museologists	27	6	33 (1.9)
dancers	5	8	13 (0.7)
librarians	4	4	8 (0.5)
Publicists	615	184	799 (100)
writers	298	110	408 (51.1)
journalists	317	74	391 (48.9)

Table 1. The structure of the analysed representatives of the Polish elite and well-known people who died in the period of 2001–2021 according to individual professional groups and gender (based on [16]) – cont.

Professional group	Patricipants (N = 8578)		
	men [n]	women [n]	total [n (%)]
Politicians	700	61	761
central level politicians	304	42	346 (45.5)
top government officials	204	13	217 (28.5)
regional level politicians	192	6	198 (26.0)
Officers of the power structures	474	17	491
World War II veterans	337	14	351 (71.5)
military officers	104	1	105 (21.4)
police officers	25	2	27 (5.5)
firefighters officers	8	0	8 (1.6)
Clergy	385	18	403
theologians[b]	113	0	113 (28.0)
priests	94	0	94 (23.3)
cardinals, bishops and archbishops	73	0	73 (18.1)
monks and nuns	61	17	78 (19.4)
minority (non-catholic) clergy	44	1	45 (11.2)
Social activists	229	134	363
Freelancers	232	39	271
architects	70	6	76 (28.0)
physicians	33	19	52 (19.2)
engineers	43	1	44 (16.2)
entrepreneurs	39	2	41 (15.1)
lawyers	16	4	20 (7.4)
others	31	7	38 (14.0)
Senior civil servants	133	20	153

[a] Athletes represent such disciplines as: shot put, javelin throw, fencing, pole vault, triple jump, pentathlon, decathlon, etc.
[b] Theologists or clergy with at least a doctoral degree.

People of cultural recognition/artists

Employed in the music, film or theater industry, arts or other people professionally related to cultural institutions. Musicians were divided into classical music artists and entertainment industry musicians, while representatives of the film and theater industry were divided into actors and other employees of the film or theater industry (directors, screenwriters, choreographers, etc.). The representatives of the art industry included artists of various fields and photographers, while the remaining people associated with cultural institutions included mainly the management staff of leading national libraries and museums.

Publicists

The professional category was composed of writers, including poets and translators of foreign literature, and journalists, including press, radio or television reporters.

Politicians

People holding the highest state offices and those holding the mandate of an MP, senator or councilor of local governments. Politicians were divided into so-called the most important politicians in the country (i.e. persons holding the office of president, prime minister or deputy prime minister, speaker of the Parliament or Senate together with deputy marshals, members of the Council of Ministers or Polish ambassadors in foreign missions), politicians of the central level (deputies and senators) and representatives of local authorities (presidents of cities, mayors, marshals of provincial assemblies and councilors of provincial assemblies, city councils or district councils).

Officers of the power structures

Officers of the power structures included mainly high-ranking military officers and officers of the state security service, police or fire brigade officers. The World War II veterans and combatants were distinguished as a subcategory therein.

Clergy

Mainly high-ranking church dignitaries, i.e., cardinals, archbishops and bishops of the Roman Catholic Church, priors of male and female orders, dignitaries of the Orthodox Church, the Evangelical-Augsburg Church, as well as rabbis and Muslim clergy.

Social activists

Mainly activists of the democratic opposition during the communist period, activists for the socially excluded, leading activists of charitable foundations, as well as people awarded the Righteous Among the Nations title for their support to Jewish people during the World War II.

Freelancers

Mainly doctors, lawyers and entrepreneurs, unless they proved their scientific work (then they were included in the category of people of science and academic teachers).

Senior civil servants

People holding the positions of secretaries or undersecretaries of state and directors or other management staff in state institutions and offices.

Statistical analysis

Since the lifespan distribution differed statistically significantly from a normal distribution (which was confirmed by the Shapiro-Wilk test), the lifespan parameters were described as median (Me), quartile 1 (Q1), quartile 3 (Q3) and the maximum value. The Kruskal-Wallis test was applied to make comparisons between occupational groups. The comparison of lifespan parameters (within 1 occupational group) by time period was also made by the Kruskal-Wallis test. The statistical significance level was set at 0.05. All calculations were made using the Statistica software, v. 13 (Statsoft Poland).

RESULTS

To compare the median age at death by occupational groups a given person was assumed to have reached the age of ≥50 years. This condition was determined by the fact that the achievement of an outstanding position in some occupational groups usually occurs at a relatively young age (e.g. the athletes who essentially end their sports career at the age of 30–35 years and gain high social recognition from around the age of 20–25 years or even younger, as is the case with actors and pop musicians). Comparable achievements

Table 2. Frequency of reaching the age of ≥50 years among the analysed representatives of the elite and well-known people by occupational group and gender (group size)

Group	Participants reaching ≥50 years [n (%[a])]		
	men	women	total
Athletes	992 (89.7)	113 (92.9)	1105 (90.0)
Coaches and sports activists	129 (97.7)	6 (100.0)[b]	135 (97.8)
Academic teachers	1871 (99.4)	478 (99.4)	2349 (99.4)
People of cultural recognition/artists	1338 (93.3)	410 (96.6)	1748 (94.1)
Publicists	615 (95.8)	184 (97.8)	799 (96.2)
Politicians	700 (98.9)	61 (98.4)[b]	761 (98.8)
Officers of the power structures	474 (97.5)	17 (94.1)[b]	491 (97.4)
Clergy	385 (99.0)	18 (100.0)[b]	403 (99.0)
Social activists	229 (95.6)	134 (100.0)	363 (97.2)
Freelancers	232 (96.6)	39 (100.0)[b]	271 (97.0)
Senior civil servants	133 (95.5)	20 (95.0)[b]	153 (95.4)
Total	7098 (96.1)	1480 (97.8)	8578 (96.4)

[a] Percentage of representatives of a given occupational category who have reached the age of ≥50 years.
[b] The values published only due to informative purposes (the group size <100).

in other professions are usually recorded at a later age (e.g., a promotion in science, in power structures or higher church dignitaries). Consequently, without the aforementioned assumption, an obvious advantage of higher lifespan parameters would be given to people who usually achieve thier higher social position at a later age (thus they had to reach this age first). Table 2 shows the frequency of reaching the age limit of 50 years in particular occupational groups. In total, 8266 out of 8578 individuals (96.4%) reached the age of ≥50 years. The lowest frequency of achieving the set age limit by athletes (90.0%) and by artists (94.1%) is potentially connected to them becoming recognized at a younger age than the rest of the elite individuals.

Among the 12 occupational groups examined, only in a half of them the number of females was ≥100 individuals, whereas ≥100 males were recorded in all the analyzed groups. Consequently, the decision was made to restrict the analysis of lifespan parameters within each occupational group solely to males. For informative reasons, the parameters of the analyzed lifespan in women were determined only for occupational groups of ≥100 females (Table 3).

The results of this analysis demonstrated that in males the highest values of the median age at death were recorded for freelancers (Me ± quartile deviation [QD] 85.5±8.5), followed by scientists and academic teachers of the biological and medical specialty (Me±QD 84.0±7.5 years) and, surprisingly, for officers of power structures (Me±QD 83.5± 8.5 years). It is worthy of note that physicians constituted a significant part of the first 2 aforementioned occupational groups, i.e., freelancers (14.7%) and scientists and academic teachers of biological/medical specialties (63.2%). Next, the highest value of the median age at death was recorded for social activists (Me±QD 83.0±9.5 years), clergy (Me±QD 82.0±7.5 years) and scientists and academic

Table 3. Age at death of the analysed representatives of Polish elites and well-known people died in 2001–2021 by gender and occupational groups (assuming reaching the age of ≥50 years) (based on [16])

Group	Participants (N = 7929)							
	men (N = 6481)				women (N = 1448)			
	n	age at death [years]			n	age at death [years]		
		Me	Q1–Q3	max		Me	Q1–Q3	max
Freelancers	224	85.5	75.0–92.0	104	39	–	–	–
Academic teachers of biology/medical sciences	367	84.0	75.0–90.0	102	153	87.0	78.0–92.0	103
Officers of the power structures	125	83.0	73.0–90.0	104	2	–	–	–
Social activists	219	83.0	71.0–90.0	106	134	90.0	85.0–95.0	106
Clergy	381	82.0	74.0–89.0	105	18	–	–	–
Other academic teachers	1492	82.0	73.0–89.0	106	322	83.0	75.0–89.0	104
Publicists	589	80.0	71.0–87.0	103	180	85.0	73.8–90.0	103
People of cultural recognition/artists	1249	79.0	69.0–87.0	110	396	84.0	72.0–90.0	107
Coaches and sport activists	126	79.0	68.0–86.0	99	6	–	–	–
Senior civil servants	127	79.0	67.0–89.0	108	19	–	–	–
Politicians	692	78.0	69.0–86.3	107	60	–	–	–
Athletes	890	77.0	66.0–84.0	98	105	80.0	71.0–85.0	100
Elites and well-known persons (total)	6481	80.0	71.0–88.0	110	1448	85.0	75.0–91.0	112
Polish population aged ≥50[a]		72.0	63.0–81.0	112		81.0	72.0–86.0	112

[a] Polish citizens who died in age of ≥50 years old in 2001–2021.

teachers of other specialties than biological and medical ones (Me±QD 82.0±8.0 years). Significantly, athletes were found at the very end of this list (Me±QD 77.0±9.0 years). Moreover, their median age at death differed in a statistically significant way (to their disadvantage) from the majority of the analyzed professional groups, i.e., it did not differ only from the values recorded in senior civil servants and sports activists (statistical differences between the compared occupational groups are shown in Table 4). Concluding, the median age at death observed for athletes was lower than for the majority of the other elite occupational groups, but the value was higher than for the general population (77.0 vs. 72.0). As noted previously, the analysis of the female category was distinctly limited, nevertheless the median age at death for athletes was also observed to be lower than for other analyzed occupational groups and similar to the value reported for the general population.

The analyzed period covered a relatively long timespan amounting to approx. 20 years. Considering the fact that over the last 100 years almost a linear growth has been recorded in the average lifespan of people in most societies [17], it is also important to present the values recorded in shorter subperiods of time. It is of particular significance here to distinguish the initial years of the COVID-19 pandemic, i.e., 2020–2021 [17]. The indicated data are presented in Table 5. In the first years of 20th century the number of people included in the analyzed Wikipe-

Table 4. Significance of differences between men's life expectancy parameters in relation to belonging to occupational groups (provided they are ≥50 years of age)

Variable	Correlation											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Other academic teachers		**0.000**	1.000	0.667	**0.000**	1.000	1.000	**0.000**	**0.007**	1.000	1.000	0.109
2. Athletes	**0.000**		**0.000**	0.447	**0.000**	**0.000**	**0.000**	**0.004**	**0.000**	**0.000**	**0.000**	1.000
3. Academic teachers of biol./medical sciences	1.000	**0.000**		**0.030**	**0.000**	1.000	1.000	**0.000**	**0.000**	1.000	1.000	**0.004**
4. Senior civil servants	0.667	0.447	**0.030**		1.000	1.000	**0.012**	1.000	1.000	1.000	1.000	1.000
5. People of cultural recognition/artists	**0.000**	**0.000**	**0.000**	1.000		**0.008**	**0.000**	1.000	1.000	0.111	0.070	1.000
6. Clergy	1.000	**0.000**	1.000	1.000	**0.008**		1.000	**0.001**	0.976	1.000	1.000	0.683
7. Freelancers	1.000	**0.000**	1.000	**0.012**	**0.000**	1.000		**0.000**	**0.000**	1.000	1.000	**0.002**
8. Politicians	**0.000**	**0.004**	**0.000**	1.000	1.000	**0.001**	**0.000**		1.000	**0.024**	**0.018**	1.000
9. Publicists	**0.007**	**0.000**	**0.000**	1.000	1.000	0.976	**0.000**	1.000		1.000	0.926	1.000
10. Social activists	1.000	**0.000**	1.000	1.000	0.111	1.000	1.000	**0.024**	1.000		1.000	1.000
11. Officers of the power structures	1.000	**0.000**	1.000	1.000	0.070	1.000	1.000	**0.018**	0.926	1.000		0.404
12. Coaches and sport activists	0.109	1.000	**0.004**	1.000	1.000	0.683	**0.002**	1.000	1.000	1.000	0.404	

Kruskal-Wallis ANOVA test.
Bolded are statistically significant values.

dia list was smaller than in the following years so the first separated time period is longer than others as a result.

The results presented in Table 5 indicate that the median age at death in subsequent subperiods (excluding the pandemic period) was on the increase for most occupational groups. In over a half of the investigated occupational groups (i.e., with the exception of social activists, clergy, publicists, coaches and sport activists, senior civil servants and politicians), the differences in the median age at death in the analyzed periods increased statistically significantly. Comparing the values of the median age at death in the periods of 2015–2019 and 2001–2009, the most considerable increase was recorded for athletes (8.3%) and academic teachers of biological or medical sciences (8.2%), followed by other academic teachers (7.7%) and freelancers (7.4%). It is also worth emphasizing that in all analyzed subperiods, the median age at death in the majority of the occupational categories was higher than that observed for the general male population (in the first subperiod of time the median age at death for athletes was the same as for the general population and slightly lower than for coaches and sports activist).

With regard to the athletes as the authors' focus group, it should be underlined that in subsequent time subperiods, the difference between the median age at death for athletes and for the general male population was more substantial to the athletes' advantage (2001–2009: no difference, 2010–2014: 4.5 years, 2015–2019: 6 years).

Finally, as regards the first years of the COVID-19 pandemic, it should be noted that even though life expectancy in Poland for men was found to decrease, an increase was recorded in the median age at death. It is related to the fact that in the first years of the pandemic a strong excess mortality of elderly people was observed in Poland, hence the increase in the analyzed value [17]. Thus, it is difficult to interpret the observed changes because it seems to be a positive change, i.e., the increased value of median age could be connected to the excess, premature mortality of elderly people.

Table 5. Age at death parameters of the analysed representatives of Polish male elites and well-known people who died in the period of 2001–2021 by occupational groups and period of death (assuming reaching the age of ≥50 years) (based on [16])

Group	2001–2009		2010–2014		2015–2019		2020–2021		p
	age at death [years] (Me (IQR))	participants [n]	age at death [years] (Me (IQR))	participants [n]	age at death [years] (Me (IQR))	participants [n]	age at death [years] (Me (IQR))	participants [n]	
Elites and well-known persons	77.0 (8.5)	1410	80.0 (8.5)	1167	82.0 (8.5)	2485	82.0 (8.5)	1419	<0.001
freelancers	81.0 (10.6)	56	84.0 (4.3)	39	87.0 (8.3)	102	[b]	27	0.002
academic teachers of biology/ medical sciences	79.0 (7.5)	61	83.0 (8.5)	57	85.5 (6.4)	146	86.0 (8.0)	103	0.004
officers of the power structures[a]					85.0 (6.0)	57	[b]	29	<0.001
social activists[a]					83.0 (10.0)	101	86.0 (8.5)	33	0.091
clergy	82.5 (8.9)	86	79.5 (7.5)	68	83.0 (6.5)	139	83.0 (5.0)	88	0.564
other academic teachers	78.0 (7.9)	294	81.0 (7.6)	228	84.0 (7.5)	593	83.0 (7.5)	377	<0.001
publicists	78.0 (7.4)	146	82.0 (7.8)	146	80.0 (8.5)	197	79.0 (9.5)	100	0.777
people of cultural recognition/ artists	77.0 (8.5)	296	79.0 (9.5)	240	81.0 (8.0)	463	81.0 (9.5)	250	<0.001
coaches and sports activists[a]					81.5 (6.4)	52	[b]	17	0.083
senior civil servants[a]					73.0 (11.0)	49	80.0 (10.0)	39	0.514
politicians	75.0 (8.0)	151	79.0 (9.5)	133	78.5 (8.6)	236	78.0 (9.0)	172	0.013
athletes	72.0 (8.6)	176	76.5 (8.6)	180	78.0 (9.0)	350	79.0 (7.6)	184	<0.001
Polish male population aged ≥50	72.0 (8.5)		72.0 (9.5)		72.0 (9.0)		73.0 (9.0)		–

[a] The age at death and number of participants were calculated for period 2001–2014 – for officers of the power structures age at death: Me (IQR) 76.0 (5.8), participants N = 39; for social activists: 80.0 (11.0) and 85, respectively; for coaches and sports activists 71.0 (10.5) and 57, respectively; for senior civil servants 80.0 (9.3) and 39, respectively.
[b] Insufficient subgroup size to present the obtained statistics in reliable way.

Lifespan parameters for individual, selected, detailed occupational groups are presented in Table 6. The results have been aggregated for the entire analyzed period of time in order to ensure the adequate sample size. The highest values of the median age at death were detected for architects (Me±QD 87.0±6.1 years) and physicians (Me±QD 86.0±6.0 years), followed by clergy (monks: Me±QD 84.5±7.6 years; senior hierarchy of the Catholic Church: Me±QD 84.0±5.5 years), most important politicians (Me±QD 84.0±6.6 years) and academic teachers of earth (Me±QD 84.0±8.0 years) or biological or chemical sciences (Me±QD 84.0±7.5 years). Clearly, the highest lifespan values were recorded for the representatives of medical, biological, and chemical sciences, and the representatives of exact sciences (including architects and engineers), the representatives of the highest state authorities and clergy. Athletes, who are of particular interest in this study, were ranked lower on the discussed list with the highest values of the median age at death observed in endurance sport athletes (mainly runners and cyclists) (Me±QD 78.0±8.0 years), followed by athletes of other Olympic disciplines (Me±QD 78.0±7.1 years), water sports athletes (mainly swimmers, canoeists and rowers) (Me±QD 77.5±7.5 years), winter sports athletes (mainly ski jumpers and skaters) (Me±QD 77.0±7.0 years) and the lowest values observed in team sports athletes (Me±QD 75.0±10.0 years) or combat sports athletes (Me±QD 75.0±7.1 years). Moreover, among the representatives of social elites and well-known people (by in-detail

Table 6. Age at death of the analysed representatives of Polish male elites and well-known people who died in 2001–2021 by detailed occupational groups (assuming reaching the age of ≥50 years)

Group	Participants (N = 6264)			
	n	age at death [years]		
		Me	Q1–Q3	max
Occupation				
architects	112	87.0	80.0–92.3	103
physicians	265	86.0	79.0–91.0	104
monks	60	84.5	75.8–91.0	103
senior hierarchs of the catholic church	73	84.0	78.0–89.0	98
high government officials	204	84.0	76.8–90.0	100
earth sciences lecturers	148	84.0	74.0–90.0	106
lecturers of the biological and chemical specialization	223	84.0	74.0–89.0	104
Polish army officers	94	83.5	74.0–90.0	97
engineers	297	83.0	76.0–90.0	106
catholic priests	92	83.0	74.0–89.0	105
social activists	219	83.0	71.0–90.0	106
science lecturers	318	82.5	74.0–89.0	105
writers	289	82.0	74.0–88.0	103
artists	291	82.0	72.5–88.0	110
classical musicians	191	82.0	72.0–89.0	103
social sciences lecturers	524	81.0	72.0–88.0	104
lawyers	160	80.5	70.8–89.0	103
photographers	66	80.0	73.0–88.0	100
theologians and scholars of the clerical state	112	80.0	71.0–87.0	97
actors	321	80.0	70.0–86.0	104
workers in the music, theatre or film industry	224	79.0	71.0–86.0	98
sports coaches and activists	126	79.0	68.0–86.0	99
journalists	300	79.0	67.8–87.0	102
government officials	98	79.0	67.0–89.0	108
athletes of endurance disciplines	101	78.0	70.0–86.0	96
athletes of other Olympic disciplines	100	78.0	69.8–84.0	98
water sports athletes	60	77.5	69.0–84.0	97
winter sports athletes	62	77.0	69.0–83.0	98
members of parliament, members of senate	300	77.0	68.0–84.3	102
athletes of motor and air sports	94	77.0	64.3–84.0	94
team sports athletes	362	75.0	64.0–84.0	98

Table 6. Age at death of the analysed representatives of Polish male elites and well-known people who died in 2001–2021 by detailed occupational groups (assuming reaching the age of ≥50 years) – cont.

Group	Participants (N = 6264)			
	n	age at death [years]		
		Me	Q1–Q3	max
Occupation – cont.				
combat sports athletes	68	75.0	63.8–80.0	90
regional level politicians	188	72.5	65.0–80.0	107
entertainment musicians	122	64.0	57.3–75.0	102
Men (Polish population)	–	72.0	63.0–81.0	112

classification), a lower value of the median age at death (than recorded for team or mortal sport athletes) was recorded only for politicians of a regional level (Me±QD 72.5±7.5 years) and entertainment musicians (Me±QD 64.0±8.9).

DISCUSSION

The analysis revealed that the median lifespan of well-known male athletes was higher than that of the Polish male population, but lower than the lifespan of most other members of country elites. Most male athletes were outlived by the majority of other elite groups with a striking exception of entertainment musicians who, in general, live shorter than the population Me. The decreased lifespan of entertainment musicians in comparison to the Polish male population could potentially be caused by their lifestyle and a greater temptation to engage in anti-health behaviors [18].

However, how can a significantly reduced lifespan of elite male athletes be explained in relation to the most important politicians, writers or classical musicians who often lead a sedentary lifestyle? Can it indicate that physical activity is not a significant factor that favorably affects the duration of life or that the benefits of physical activity are less substantial than expected, and they are not ascertained for a lifetime and/or are diminished by the presence of other negative risk factors in elite athletes? The elite athletes group was mainly composed of top athletes with a very successful national or international career including Olympic athletes and medalists. The authors' previous study on Polish male Olympic medalists born between 1888–1965 showed that their lifespan was longer by over 8 years in comparison to the general population [7]. Consistently, studies on Olympic medalists from other countries also demonstrated a longer life than in the general population [19]. Other studies on elite athletes demonstrated their lower mortality risk from virtually all causes but external factors. This finding could possibly be attributed to a higher percentage of hazardous behaviors and suicides [5]. Based on these results, it cannot be stated univocally that professional sport is harmful as the elite athletes' mean lifespan is significantly longer than the general population mean value. It is simply not as long as it would be expected. Surprisingly, however, a recent German study demonstrated that currently, the survival rate of German Olympians is lower compared to the general population [20]. If confirmed by other studies, this may be an alarming signal, potentially suggesting that modern, extremely demanding training regimes undertaken to beat exorbitant world records may lead to chronic exhaustion, overtraining, depression, and

injuries and altogether could cause more harm than produce benefits in the course of an individual lifetime.

In this analysis, the longest lifespan was attributed to endurance and mixed or skill athletes and not to the power sport athletes. These results are consistent with a larger analysis of the Olympic medalists which demonstrated higher survival rate recorded in endurance sports than mixed and power disciplines [19] and with this analysis of Polish Olympic medalists where the longest life duration was observed for mixed and skill discipline athletes [7].

In another interesting study, researchers examined the longevity of the top 20 athletes from 14 countries who were credited with running a mile in <4 min in the years 1954–1960 [21]. The obtained findings revealed that a vast majority of them (90%) featured a considerable longevity with a lifespan of 80–88 years and exceeded the average life expectancy by several years. Such examples show that endurance elite runners might live longer than an average individual and highlight the potential benefits of intensive regular exercises. The least significant increase in power sports-related lifespan can be explained by a different lifestyle, presumably a higher frequency of doping use and repetitive head injuries in combat sports [4,19].

The health benefits of physical activity cannot be taken for granted for a lifetime if the physical activity is not regularly practiced. In fact, well-known athletes refrain from regular engagement in sports activities after the end of their careers, which [22] may result from a lack of motivation, the presence of chronic injuries, engagement in other activities, or depression, alcohol and/or drug abuse. An unhealthy lifestyle after the end of the career may lead to an outburst of acquired cardiovascular risk factors in this group of athletes and therefore diminish the positive influences of physical activity [23].

The longer lifespan of country elites other than elite athletes may be affected by several factors. First of all, it has been demonstrated that higher literacy and education levels strongly affect longevity [24]. This may explain the longer life of many described elite groups over athletes (especially academic teachers). Physicians or specialist of biological sciences may also have a better knowledge of disturbing signs or symptoms and an easier access to healthcare. Another important longevity-affecting factor is the income status [25]. In Poland, the public admiration of elite athletes is not always connected to high economic status, or even if it is, in many cases it may last only for the duration of the athletic career. Consistently, a recent analysis of German Olympic Athletes demonstrated that a significantly reduced survival rate was observed for athletes from the Federal Republic of Germany than from the German Democratic Republic [20]. In other elites, unlike in athletes, the age is not a risk factor for lower income and is often related to the constant increase of income with increasing skills, proficiency and public recognition.

In short, the lifespan of athletes is related to differences in career development by age in comparison to other professionals [26]. Typically, career stages develop and change slowly from the stage of the so-called "uprooting", when a young person strives for self-reliance and independence from parents, until stabilization and flourishing when one analyses one's own skills and successes, derives satisfaction with the chosen profession, and relishes stabilization and fulfillment. In most professions of high social status (physicians, lawyers, academic teachers, politicians, officers of power structures, senior civil servants or clergymen), the career develops slowly at the beginning of studies and the last phase of stabilization and satisfaction comes between the ages of 43–50 years and lasts until retirement [27]. A professional career of the athlete looks completely different as it starts very early, lasts mostly for a relatively short time, and the greatest successes and stabilization appear around the age of 25–35 years. The specificity of athletes' life involves the end of their career and professional retirement at a very young age,

with potentially many years ahead of them when they may experience the need for self-realization as well as the need to support themselves and often their own families [28]. Despite their young biological age, athletes realize that from the competitive standpoint they are too old and their chances to measure up with younger players are slim.

The unavoidable end to a sports career, for which athletes have sacrificed a lot, could lead to a difficult turning point in their lives. This often entails a loss of prestige, the inability to maintain a high financial and social status, a change in the current luxurious lifestyle, and above all, very often cutting off from what was the meaning of life for the competitor i.e., sport. Furthermore, it is often combined with a lack of stability and perspectives, which is a consequence of the need for total life reorganization. Some athletes manage to stay in well-known sports areas, e.g., as sports commentators, coaches, sports teachers/instructors or sports activists. However, this is dependent on external opportunities, individual capabilities and is often associated with a significantly reduced incomes. The necessary change means a return to the starting point, a modification to one's own identity and a start of a professional career from the very beginning [29].

A change in life is a very strong stressor which in extreme cases could lead to nervous breakdowns, depression and unhealthy behaviors when a long-term stress is drowned out by various types of stimulants (such as tobacco, alcohol, drugs), tranquilizers and sleeping pills, or leads to harmful behaviors such as explosive outbursts of anger and/or violence, compulsive overeating, or netoholizm. It should also be mentioned that stress is not only an inseparable element at the time of retirement from sports. Being a competitive athlete is associated with permanent competition-related stress, the need to prove the best and cross self-imposed barriers or the experience of failures and social criticism. Exposure to long-term stress, both during and after a professional career, has a negative impact on both mental and physical health of an athlete [30].

If other results also confirmed a reduced lifespan of athletes when compared to other professions in elite groups, it should evoke a lively debate on the impact of competitive sports on the health and lifespan of (former) athletes.

CONCLUSIONS

The results of this analysis confirmed higher lifespan parameters recorded in professional athletes in comparison with the general population, which is consistent with other available studies. The results also confirmed that the lifespan parameters of athletes of endurance disciplines were the most favorable when compared to athletes of mixed disciplines, and to team or combat sports in particular, which is also commonly reported by other authors. is the novelty and innovation of this study involves the comparison of the lifespan characteristics of athletes to a widely represented group of other professions with higher socio-economic status. Unexpectedly, the lifespan of athletes was found to be shorter than for all other analyzed occupational groups, with the most notable exception of entertainment musicians. Finally, the results presented in this paper emphasize the need to investigate the athlete's lifespan characteristics in a more comprehensive analysis than only in relation to the general population.

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REFERENCES

1. Lee IM, Paffenbarger RS, Hennekens CH. Physical activity, physical fitness and longevity. Aging Clin Exp Res. 1997;9:2-11. https://doi.org/10.1007/BF03340123.
2. Lee I-M, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. Lancet. 2012;380:219-229. https://doi.org/10.1016/S0140-6736(12)61031-9.
3. Kaleta D, Jegier A. Occupational Energy Expenditure and Leisure-Time Physical Activity. Int J Occup Med Environ Health. 2005;18(4):351-356.
4. Lemez S, Baker J. Do Elite Athletes Live Longer? A Systematic Review of Mortality and Longevity in Elite Athletes. Sports Med Open. 2015;1(1):16. https://doi.org/10.1186/s40798-015-0024-x.
5. Garatachea N, Santos-Lozano A, Sanchis-Gomar F, Fiuza-Luces C, Pareja-Galeano H, Emanuele E, et al. Elite athletes live longer than the general population: a meta-analysis. Mayo Clin Proc. 2014;89:1195-1200. https://doi.org/10.1016/j.mayocp.2014.06.004.
6. Śmigielski W, Gajda R, Małek Ł, Drygas W. Goalkeepers Live Longer than Field Players: A Retrospective Cohort Analysis Based on World-Class Football Players. Int J Environl Res Public Health. 2020;17(17):6297. https://doi.org/10.3390/ijerph17176297.
7. Małek Ł, Śmigielski W, Krysztofiak H, Marszałek M, Drygas W. Longevity of Polish male Olympic medalists born between 1888 and 1965, Biomed. Hum. Kinet. 2021;13:29-36. https://doi.org/10.2478/bhk-2021-0004.
8. Gajda J, Śmigielski W, Śmigielski J, Pakos E, Drygas W. Longevity and cardiovascular mortality of Polish elite football players. Kardiol Pol. 2018;76(12):1705-1711. https://doi.org/10.5603/KP.a2018.0173.
9. Manley G, Gardner AJ, Schneider KJ, Guskiewicz KM, Bailes J, Cantu RC. A systematic review of potential long-term effects of sport-related concussion. Br J Sports Med. 2017;51:969-977. https://doi.org/10.1136/bjsports-2017-097791.
10. Lindqvist AS, Moberg T, Eriksson BO, Ehrnborg C, Rosen T, Fahlke C. A retrospective 30-year follow-up study of former Swedish-elite male athletes in power sports with a past anabolic androgenic steroids use: a focus on mental health. Br J Sports Med. 2013;47:965-969. https://doi.org/10.1136/bjsports-2012-091340.
11. Mannes ZL, Waxenberg LB, Cottler LB, Perlstein WM, Burrell LE, Ferguson EG, et al. Prevalence and correlates of psychological distress among retired elite athletes: A systematic review. Int Rev Sport Exerc Psychol. 2019;12(1):265-294. https://doi.org/10.1080/1750984X.2018.1469162.
12. Gajewski AK, Poznańska A. Mortality of top athletes, actors and clergy in Poland: 1924–2000 follow-up study of the long term effect of physical activity. Eur J Epidemiol. 2008;23:335-340. https://doi.org/10.1007/s10654-008-9237-3.
13. Ofek N, Rokach L, Shmilovici A, Katz G. Do Famous People Live Longer? A Wikipedia Analysis. [cited 2023 Dec 23]. Available from: https://www.researchgate.net/publication/259920939_Do_Famous_People_Live_Longer_A_Wikipedia_Analysis.
14. Johnson NJ, Sorlie PD, Backlund E. The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study. Demography. 1999;36(3):355-367.
15. Olympic Results [Internet]. 2024 [cited 2023 Dec 23]. Available from: https://olympics.com/en/olympic-games/olympic-results.

16. Wikipedia [Internet]. 2022 [cited 2023 Dec 23] [Died in 2022]. Available from: https://pl.wikipedia.org/wiki/Zmarli_w_roku_2021 [and analogist websites relevant to years from 2001 to 2020]. Polish.
17. Śmigielski W. [Life expectancy of Poles and other inhabitants of Slavic countries. From prehistoric times to postmodernity]. Łodź: Wydawnictwo Uniwersytetu Lodzkiego, 2022. Polish.
18. Kenny DT, Asher A. Life Expectancy and Cause of Death in Popular Musicians. Is the Popular Musician Lifestyle the Road to Ruin? Med Probl Perform Art. 2016;31(1):37-44. https://doi.org/10.21091/mppa.2016.1007.
19. Clarke PM, Walter SJ, Hayen A, Mallon WJ, Heijmans J, Studdert DM. Survival of the fittest: retrospective cohort study of the longevity of Olympic medalists in the modern era. BMJ. 2015;49:898-902. https://doi.org/10.1136/bmj.e8308.
20. Thieme L, Fröhlich M. Do Former Elite Athletes Live Longer? New Evidence From German Olympic Athletes and a First Model Description. Front Sports Act Living. 2020;2:588204. https://doi.org/10.3389/fspor.2020.588204.
21. Maron BJ, Thompson PD. Longevity in elite athletes: the first 4-min milers. Lancet. 2018;392(10151):913. https://doi.org/10.1016/S0140-6736(18)31825-7.
22. Kettunen JA, Kujala UM, Kaprio J, Bäckmand H, Peltonen M, Eriksson JG, et al. All-cause and disease-specific mortality among male, former elite athletes: an average 50-year follow-up. Br J Sports Med. 2015;49:893-897. https://doi.org/10.1136/bjsports-2013-093347.
23. McHugh C, Hind K, Davey D, Wilson F. Cardiovascular Health of Retired Field-Based Athletes: A Systematic Review and Meta-analysis. Orthop J Sports Med. 2019;7:2325967119862750. https://doi.org/10.1177/2325967119862750.
24. Luy M, Zanella M, Wegner-Siegmundt C, Minagwa Y, Lutz W, Caselli G. The impact of increasing education levels on rising life expectancy: a decomposition analysis for Italy, Denmark, and the USA Genus. 2019;75:11. https://doi.org/10.1186/s41118-019-0055-0.
25. Chetty R, Stepner M, Abraham S, Lin S, Scuderi B, Turner N, et al. The Association Between Income and Life Expectancy in the United States, 2001-2014. JAMA. 2016;315:1750-1766. https://doi.org/10.1001/jama.2016.4226.
26. Wylleman P, Alfermann D, Lavallee D. Career transitions in sport: European perspectives. Psychol Sport Exerc. 2004;5(1):7–20. https://doi.org/10.1016/S1469-0292(02)00049-3.
27. Januszek H, Sikora J. [Sociology of work]. Poznań: Wydawnictwo Akademii Ekonomicznej w Poznaniu, 2000. Polish.
28. Lenartowicz M. [Sports career and its social conditions]. In: Dziubiński Z, Krawczyk Z, editors. [Sociology of Physical Culture]. Warszawa: Wydawnictwo Akademii Wychowania Fizycznego im. Józefa Piłsudskiego, 2011. Polish.
29. Brewer BW, Van Raalte JL. Linder DE. Athletic identity: Hercules' muscles or Achilles heel? Int. J Sport Psychol. 1993;24:237-254.
30. Alfermann D, Stambulova N. Career development and transitions of athletes. In: Papaioannou A, Hackfort D, editors. Routledge Companion to Sport and Exercise Psychology: Global Perspectives and Fundamental Concepts. London: Routledge, 2004.