

# ARE 80-YEAR-OLD SWIMMERS FASTER THAN 25-YEAR-OLD MASTER SWIMMERS?

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## ABSTRACT

*Competitive sport is one of the stimulants in making people practice exercise on the regular basis. Many of the handicap systems have been tried in different sports to match younger or older competitors to the young male adults, and it seems that the result indexing system according to age, which is in operation in track-and-field at the moment, is functional enough to help motivating veteran athletes to continue to participate in sports actively. The question raised by the authors of the present study was: “How can we create and implement coefficients and equations, which may be used to compare the results achieved by the master swimmers of different age groups?”. The aim of this study was to compile a point score system for the masters’ swimming results.*

*Objectives: 1) to determine the changes in master swimmers’ (men and women) race times depending on age; 2) to calculate the coefficients for the conversion of the master swimmers’ (men and women) race time; 3) to offer the system of recalculation of converted master swimmers’ results in time into points, and to test the new ranking system in a Master swim meet.*

*The data were taken from World Top-10 Masters Swimming Tabulation. Both male and female athletes were divided into 5-year age groups, starting from 25 years and going up to 94 years of age. We analysed the results (times) of the 1992–2005 year period in a cross-sectional study design. We calculated the differences in percentages of the averages of the results in different age group in comparison to the results achieved by the participants of the 25–29 year age group. Then we calculated the age coefficients, which could be used in indexing the competitive results, and finally we applied the International Swimming Federation (FINA) tables for point score to rank the master swimmers in actual competition.*

*The research findings suggested that:*

- 1. Among the women swimmers, a quicker deterioration of the results starts above the age of 75 years and older, and this decline is most obvious in breaststroke, butterfly, and individual medley, while it is less pronounced in long freestyle events.*
- 2. For males, swimming performance also abruptly decreases after the age of 75 years. Differently from women, males degrade their freestyle sprinting abilities less than the results in long-distance freestyle swimming. The results in butterfly deteriorate the most in both genders, with the greatest decline seen again after the age of 75 years.*
- 3. Here we have introduced a system for the recalculation of master swimmers’ results by using the age coefficients, with a subsequent conversion of the result into point score. The system can be successfully applied in determining the master swimmers’ rank among swimmers of different age groups.*

**Keywords:** results of master athletes, result indexing, swimming styles.

## INTRODUCTION

Swimming is an athletic activity in which many people of all ages participate and compete. Governed by International Swimming Federation (FINA) rules, World Swimming Championships are held for youths, adults and for veterans / masters, too. Competitions for people of those age groups are also organized in Europe. Both the long-course and short-course World championships are held biannually. Apart from physical development, psychological, technical and tactical preparations, the age of the participants is of no doubt of primary importance for

the results achieved in these competitions. Whilst 25-year-old gymnasts or swimmers are frequently called veterans, 40-year-old yachtsmen, golfers or equestrians remain in the thick of competition and frequently win world championships or similar high-calibre events.

After the termination of athletic career, high-performance athletes frequently take a period of relative abstention from regular exercise, but later they resume their activity in sport, which is often of the same or similar kind, and which they have practiced for many years at the professional level. Many

do this to maintain their previous physical condition; others desire to participate in competitions as veterans / masters. Competitions for veterans / masters are popular in track-and-field, basketball, cycling, and particularly in swimming. Swimming is a desirable physical activity for people of all ages because being in water they are not burdened with their weight (Organ et al., 1994). M. Goldstein and D. Tanner (1999) view swimming as advantageous over other modes of exercise and an ideal physical fitness activity for middle-aged and elderly people in respect to the quality of life. Swimming is as good and much safer than jogging provided the regimen entails at least 30 minutes three to four times per week (Ward, 1994). Swimming up to a very old age is popular in such countries as the USA, Germany, Great Britain, Canada, Japan, Italy, Sweden, and the Netherlands.

Eleven Master Swimming World Championships have been held already, and the 12th will take place in Perth (Australia) in April, 2008. Master Swimming World Championships are held in even-numbered years, while the European Swimming Championships take place on odd-numbered years. National Swimming Championships in different countries are held annually. The Master Swimming World Championships attract from 7000 to 8000 participants anywhere, approximately half of that number participate in the European Swimming Championships, and the entrants compete in 34 individual and 6 relay events (Cametti, 2004). Since the person's age has its inevitable effects, according to FINA rules, athletes are assigned to the age groups of five years, and master swimmers are those of at least 25 years of age. Thus age groups in swimming for both genders are 25—29 years, 30—34 years, and so on.

Nessel (2004) discussed the role of age in sports performance, as well as respiratory, cardiovascular fitness; strength and body composition changes with aging; trainability of older athletes and how training can delay the decline in exercise performance. Further the author suggests that though we cannot halt "Father Time" and his inexorable march toward our decline with aging, we can fightback it to a large extent by taking up regular exercise and observing proper nutrition.

The general agreement exists that older adults can also continue or take up competitive sports provided simple precautions are taken to ensure cardiovascular health and to minimise risk of injury (Ward, 1994). There is no scientific evidence that competitive sports, swimming in particular, are detrimental

to one's health, which is also true for healthy elderly people. On the contrary, it seems that greater than moderate intensity of exercise has its own additional benefits not to tell of the psychological advantages of sports activity (Trappe, 2001).

As regular participation in organised physical activity is beyond a doubt important though not easily implemented part of modern human's life, different strategies are used to persuade people to become or remain physically active. One of the stimulants is obviously competitive element of sports, which, when applied properly, may indeed be helpful in making people practice sports on the regular basis in order to be prepared for the recurrently impending competitions. Many of the handicap systems have been tried in different sports, and it seems that the point score system which is in operation in track-and-field at the moment is functional enough to help motivating veteran athletes to continue participating in sports actively. The question which the authors of the present study raised was "How can we create and implement mathematical formulas and coefficients, which may be used to compare the results achieved by Master swimmers in different age groups?" and the main (practical) **aim of this study** was to compile a point score system for the masters' swimming results.

#### **Objectives:**

1. To determine the changes in master swimmers' (men and women) race times depending on age.
2. To calculate the coefficients for the conversion of the master swimmers' (men and women) race time.
3. To offer the system of recalculation of converted master swimmers' results in time into points, and to test the new ranking system in a Master swim meet.

## **ORGANIZATION OF THE STUDY**

According to FINA, master swimmers are those who are 25 years of age or older. All our studied master athletes were divided into 5-year-age groups, and thus age groups in swimming for both genders were 25—29 years, 30—34 years, and so on, up to the 90—94 year-old group athletes. The data on the results of the masters were taken from FINA's World Top-10 Master Swimming Tabulation. The results (times) of 1992—2005 year period were analysed in a cross-sectional study design. We calculated the averages, standard deviations, and the differences between the averages of the results of different age groups. The results in all age

Table 1. Master swimmers' (women) race time increase (%)

Event		Age group, years													
		25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94
50 m	Freestyle	0	0	1	4	8	12	16	21	26	36	53	81	123	185
100 m	Freestyle	0	–2	0	5	10	15	20	26	34	45	64	94	138	200
200 m	Freestyle	0	–3	–1	4	10	15	20	27	35	48	66	94	134	190
400 m	Freestyle	0	–4	–2	4	10	16	22	28	36	48	66	94	135	194
800 m	Freestyle	0	–2	–1	2	7	12	19	27	37	50	68	92	123	164
1500 m	Freestyle	0	–2	–1	2	7	14	21	31	42	55	69	87	108	132
50 m	Breaststroke	0	1	2	3	6	12	19	25	30	37	53	91	176	338
100 m	Breaststroke	0	1	4	10	12	18	26	33	39	46	65	109	206	393
200 m	Breaststroke	0	1	3	5	7	13	20	26	32	41	59	98	182	337
50 m	Butterfly	0	1	2	3	7	12	18	24	37	61	103	171	273	421
100 m	Butterfly	0	1	2	6	11	19	26	38	56	85	130	198	294	428
200 m	Butterfly	0	1	4	11	16	25	34	46	67	98	149	226	338	494
50 m	Backstroke	0	1	2	5	11	15	21	26	34	45	62	86	122	171
100 m	Backstroke	0	1	2	5	12	17	23	30	39	52	69	95	132	180
200 m	Backstroke	0	0	2	4	11	16	23	30	39	51	69	92	125	170
200 m	Individual medley	0	1	2	4	10	17	25	32	42	55	82	140	249	442
400 m	Individual medley	0	2	4	6	10	17	26	34	48	67	100	151	234	363

groups above 30 were calculated as the average percentage decline in the performance (race time) in comparison to the average result of the 25–29 year age group swimmers. The coefficients for the conversion of the result of the master swimmer into point score were obtained using approximation (best fitted curve method) from average changes (mean drops) in swimming results.

## RESULTS

**Swimming race results in women.** The data in Table 1 show that up to 40 years of age no decline in the freestyle race performance in all the distances occurred in women. We can also observe the slight improvement in the results in middle and long distance freestyle races as the second and third (30 to 39 year-aged) group female swimmers with compared to younger counterparts (aged 25 to 29).

Up to the age group of 65–69 years the results in the 50 m freestyle decreased by 4 to 5% every 5 years on the average, but in the 75–79 year age group the race time in the events of all distances and strokes of swimming were more than 50% lower than those of the 25–29 year age group. Even more dramatic decline occurred after the age of 80 years. An interesting tendency emerged that the oldest master swimmers were doing relatively better in long dis-

tance (freestyle) than in sprint when compared to the 25–29 year age group swimmers (Table 1).

There are interesting data in butterfly, a stroke which particularly requires great strength and good joint flexibility. Comparing the 85–89 year age group results with those of the 25–29 year old group we detected more than 200% decrease in the race time, while the 90–94 age group masters swam butterfly on the average more than four times slower than 25–29 year old athletes. When compared with the youngest masters, fairly steep decrease in average swimming speed was obvious in the 90–94 year old age group swimmers in individual medley, which includes the butterfly.

**Swimming race results in men.** The results of male swimmers started to decline gradually after the age of approximately 35 years on the average, and only after the age of 45 years in long distance swimming (Table 2). However, the quick decline in male performance was evident when analysing the butterfly: the race time in the group of 75–84 year old men more than twice outreached the results of the 25–29 year old swimmers (Table 2).

**Age group coefficients.** Using approximation (best fitted curve method) from average changes (mean drops) in swimming results, we obtained coefficients that were utilized for the conversion of the master swimmers' result into point score

Table 2. Master swimmers' (men) race time increase (%)

Event		Age group, years													
		25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94
50 m	Freestyle	0	1	3	4	6	8	11	16	22	29	40	54	70	89
100 m	Freestyle	0	1	2	4	7	10	14	19	26	35	48	66	88	120
200 m	Freestyle	0	0	1	3	6	10	15	21	28	39	53	74	102	139
400 m	Freestyle	0	0	1	4	8	12	16	22	29	40	56	82	120	172
800 m	Freestyle	0	0	0	1	6	11	16	21	29	40	56	81	122	179
1500 m	Freestyle	0	0	0	1	5	9	14	19	27	39	57	86	130	191
50 m	Breaststroke	0	0	3	6	10	14	17	21	26	35	47	67	95	136
100 m	Breaststroke	0	0	1	6	10	14	18	22	28	37	52	76	114	170
200 m	Breaststroke	0	0	1	5	8	13	17	21	28	39	56	83	124	182
50 m	Butterfly	0	0	2	6	9	12	15	20	28	44	70	113	177	269
100 m	Butterfly	0	1	3	5	9	13	22	33	50	73	105	146	199	265
200 m	Butterfly	0	1	3	6	10	17	25	38	54	76	106	143	189	245
50 m	Backstroke	0	1	3	6	9	12	17	23	30	40	51	66	83	105
100 m	Backstroke	0	0	4	8	13	18	23	28	35	46	62	86	120	168
200 m	Backstroke	0	0	2	5	9	14	20	26	34	45	60	78	103	136
200 m	Individual medley	0	0	1	4	7	11	17	24	34	48	66	92	127	175
400 m	Individual medley	0	0	0	2	5	10	16	24	35	48	68	95	132	182

Table 3. Coefficients for indexing masters' swimming times (women)

Event		Age group, years													
		25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94
50 m	Freestyle	1.00	1.00	1.01	1.04	1.08	1.12	1.16	1.21	1.26	1.36	1.53	1.81	2.23	2.85
100 m	Freestyle	1.00	0.98	1.00	1.05	1.10	1.15	1.20	1.26	1.34	1.45	1.64	1.94	2.38	3.00
200 m	Freestyle	1.00	0.97	0.99	1.04	1.10	1.15	1.20	1.27	1.35	1.48	1.66	1.94	2.34	2.90
400 m	Freestyle	1.00	0.96	0.98	1.04	1.10	1.16	1.22	1.28	1.36	1.48	1.66	1.94	2.35	2.94
800 m	Freestyle	1.00	0.98	0.99	1.02	1.07	1.12	1.19	1.27	1.37	1.50	1.68	1.92	2.23	2.64
1500 m	Freestyle	1.00	0.98	0.99	1.02	1.07	1.14	1.21	1.31	1.42	1.55	1.69	1.87	2.08	2.32
50 m	Breaststroke	1.00	1.01	1.02	1.03	1.06	1.12	1.19	1.25	1.30	1.37	1.53	1.91	2.76	4.38
100 m	Breaststroke	1.00	1.01	1.04	1.10	1.12	1.18	1.26	1.33	1.39	1.46	1.65	2.09	3.06	4.93
200 m	Breaststroke	1.00	1.01	1.03	1.05	1.07	1.13	1.20	1.26	1.32	1.41	1.59	1.98	2.82	4.37
50 m	Butterfly	1.00	1.01	1.02	1.03	1.07	1.12	1.18	1.24	1.37	1.61	2.03	2.71	3.73	5.21
100 m	Butterfly	1.00	1.01	1.02	1.06	1.11	1.19	1.26	1.38	1.56	1.85	2.30	2.98	3.94	5.28
200 m	Butterfly	1.00	1.01	1.03	1.06	1.15	1.25	1.40	1.53	1.68	1.94	2.52	3.28	4.19	6.43
50 m	Backstroke	1.00	1.01	1.02	1.05	1.11	1.15	1.21	1.26	1.34	1.45	1.62	1.86	2.22	2.71
100 m	Backstroke	1.00	1.01	1.02	1.05	1.12	1.17	1.23	1.30	1.39	1.52	1.69	1.95	2.32	2.80
200 m	Backstroke	1.00	1.00	1.02	1.04	1.11	1.16	1.23	1.30	1.39	1.51	1.69	1.92	2.25	2.70
200 m	Individual medley	1.00	1.01	1.02	1.04	1.10	1.17	1.25	1.32	1.42	1.55	1.82	2.40	3.49	5.42
400 m	Individual medley	1.00	1.02	1.04	1.06	1.10	1.17	1.26	1.34	1.48	1.67	2.00	2.51	3.34	4.63

(Fig. 1). We present all the coefficients for indexing women's results (Table 3) and all the coefficients for indexing men's results (Table 4) in swimming in all race strokes and all distances.

**How to count FINA Point Score.** After the recalculation of the result, the FINA Point Scoring Formula, which uses the base time for 1000 points (*Swimming Top-10 Tabulation, FINA 1992–2005*),

can be successfully applied. The score in points (P) is calculated knowing the swim time (T, in seconds) and the base time (B, in seconds) by applying the following equation:

$$P = 1000 \times (B / T)^3,$$

i.e. the equation is used to convert time into score. Then the result is rounded to the next integer number using normal rounding (932.499... -> 932.50... -> 933).

Table 4. Coefficients for indexing masters' swimming times (men)

Event		Age groups, years													
		25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94
50 m	Freestyle	1.00	1.01	1.03	1.04	1.06	1.08	1.11	1.16	1.22	1.29	1.40	1.54	1.70	1.89
100 m	Freestyle	1.00	1.01	1.02	1.04	1.07	1.10	1.14	1.19	1.26	1.35	1.48	1.66	1.88	2.20
200 m	Freestyle	1.00	1.00	1.01	1.03	1.06	1.10	1.15	1.21	1.28	1.39	1.53	1.74	2.02	2.39
400 m	Freestyle	1.00	1.00	1.01	1.04	1.08	1.12	1.16	1.22	1.29	1.40	1.56	1.82	2.20	2.72
800 m	Freestyle	1.00	1.00	1.00	1.01	1.06	1.11	1.16	1.21	1.29	1.40	1.56	1.81	2.22	2.79
1500 m	Freestyle	1.00	1.00	1.00	1.01	1.05	1.09	1.14	1.19	1.27	1.39	1.57	1.86	2.30	2.91
50 m	Breaststroke	1.00	1.00	1.03	1.06	1.10	1.14	1.17	1.21	1.26	1.35	1.47	1.67	1.95	2.36
100 m	Breaststroke	1.00	1.00	1.01	1.06	1.10	1.14	1.18	1.22	1.28	1.37	1.52	1.76	2.14	2.70
200 m	Breaststroke	1.00	1.00	1.01	1.05	1.08	1.13	1.17	1.21	1.28	1.39	1.56	1.83	2.24	2.82
50 m	Butterfly	1.00	1.00	1.02	1.06	1.09	1.12	1.15	1.20	1.28	1.44	1.70	2.13	2.77	3.69
100 m	Butterfly	1.00	1.01	1.03	1.05	1.09	1.13	1.22	1.33	1.50	1.73	2.05	2.46	2.99	3.65
200 m	Butterfly	1.00	1.01	1.03	1.06	1.10	1.17	1.25	1.38	1.54	1.76	2.06	2.43	2.89	3.45
50 m	Backstroke	1.00	1.01	1.03	1.06	1.09	1.12	1.17	1.23	1.30	1.40	1.51	1.66	1.83	2.05
100 m	Backstroke	1.00	1.00	1.04	1.08	1.13	1.18	1.23	1.28	1.35	1.46	1.62	1.86	2.20	2.68
200 m	Backstroke	1.00	1.00	1.02	1.05	1.09	1.14	1.20	1.26	1.34	1.45	1.60	1.78	2.03	2.36
200 m	Individual medley	1.00	1.00	1.01	1.04	1.07	1.11	1.17	1.24	1.34	1.48	1.66	1.92	2.27	2.75
400 m	Individual medley	1.00	1.00	1.00	1.02	1.05	1.10	1.16	1.24	1.35	1.48	1.68	1.95	2.32	2.82

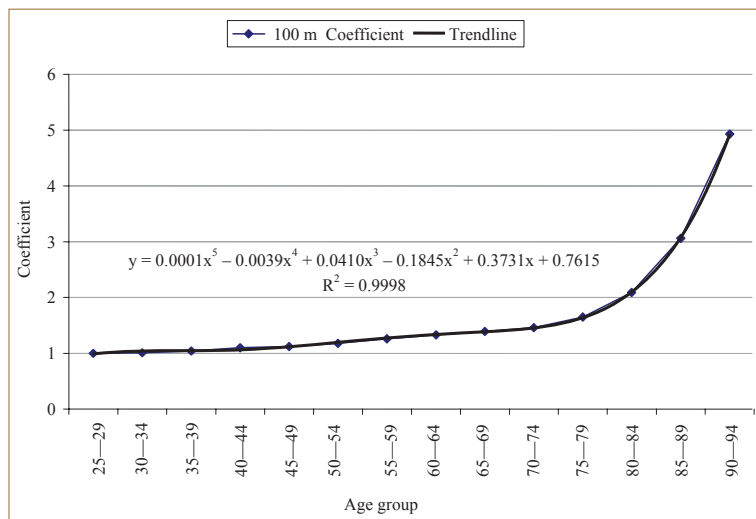


Fig. Calculated coefficients for the age groups in women's 100 m breaststroke

When the time (T, in seconds) needed for a certain score (P) has to be calculated, the same formula is reconstructed for the reverse calculation to yield  $T = 10B \times P^{-3}$ . Calculated time should be rounded to one hundredth of a second.

**Base times for 1000 points as presented by FINA.** The base times are set by FINA for all individual events and relays, separately for men and women as well as for the long course (Table 5) and the short course. The base times are recalculated after every Olympic Games, based on the average of the Top-10 of the All Time World Rankings. The base times are published on the FINA website within one month after the Olympics.

As an example, European Master Championship women's 50 m freestyle results in master age groups and their recalculation are presented in Ta-

ble 6. The data indicate that the quickest swimmer in the 25—29 age group was relatively slower than the 35—39 year age group champion. Recalculated results using our suggested system with the coefficients for the age groups and the corrected ratings are also presented in this example in Table 6. According to our suggested system, the 80—84 year age group swimmer would achieve the best result in the 50 m freestyle event in the 2007 European Master Swimming Championships, and the result was obviously very high (Table 6). The second place would go to the winner of the 70—74 year age group contest, the third — to that of the 55—59 year age group, and so on (Table 6).

**Application of the system in practice.** Presented point score recalculation system was applied for ranking the Top-10 swimmers at the 2006

Table 5. Base times used in FINA points calculation for long course (2004)

Distance, m	Stroke	Men's time, s	Women's time, s
50	Freestyle	21.88	24.61
100	Freestyle	48.30	54.01
200	Freestyle	1:45.94	1:57.31
400	Freestyle	3:44.30	4:05.64
800	Freestyle	7:48.51	8:21.84
1500	Freestyle	14:48.88	16:04.14
50	Backstroke	25.14	28.50
100	Backstroke	53.93	1:00.29
200	Backstroke	1:56.69	2:08.40
50	Breaststroke	27.51	31.06
100	Breaststroke	1:00.16	1:07.02
200	Breaststroke	2:10.24	2:23.85
50	Butterfly	23.54	26.23
100	Butterfly	51.73	57.65
200	Butterfly	1:55.14	2:06.61
200	Individual medley	1:58.75	2:11.44
400	Individual medley	4:12.18	4:35.82

Table 6. European Masters Swimming Championship 50 m freestyle champions' (women) results (2007) before and after indexing

Age groups, year interval	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89
Official time, s	27.99	27.49	27.81	28.45	28.89	30.40	30.58	33.40	33.23	35.52	41.79	43.53	64.40
Rank according time	<b>III</b>	<b>I</b>	<b>II</b>	<b>IV</b>	<b>V</b>	<b>VI</b>	<b>VII</b>	<b>IX</b>	<b>VIII</b>	<b>X</b>	<b>XI</b>	<b>XII</b>	<b>XIII</b>
Coefficient	<b>1.00</b>	<b>1.00</b>	<b>1.01</b>	<b>1.04</b>	<b>1.08</b>	<b>1.12</b>	<b>1.16</b>	<b>1.21</b>	<b>1.26</b>	<b>1.36</b>	<b>1.53</b>	<b>1.81</b>	<b>2.23</b>
Indexed time, s	27.99	27.49	27.53	27.36	26.75	27.14	26.36	27.60	26.37	26.12	27.31	24.05	28.88
Places after indexing	<b>XII</b>	<b>IX</b>	<b>X</b>	<b>VIII</b>	<b>V</b>	<b>VI</b>	<b>III</b>	<b>XI</b>	<b>IV</b>	<b>II</b>	<b>VII</b>	<b>I</b>	<b>XIII</b>

Table 7. Lithuanian Master Swimming Championship Top-10 swimmers (2006)

Place	Gender	Stroke	Distance	Time, s	Age group, year interval	Country represented	Points
1	Male	Breaststroke	50 m	<b>34.70</b>	60–64	Poland	<b>1164</b>
2	Male	Backstroke	50 m	<b>27.52</b>	30–34	Lithuania	<b>1058</b>
3	Male	Backstroke	100 m	<b>1:15.05</b>	55–59	Russia	<b>986</b>
4	Male	Breaststroke	50 m	<b>34.92</b>	50–54	Estonia	<b>955</b>
5	Female	Breaststroke	50 m	<b>37.36</b>	35–39	Australia	<b>936</b>
6	Male	Freestyle	50 m	<b>24.90</b>	25–29	Lithuania	<b>919</b>
7	Female	Backstroke	100 m	<b>1:23.86</b>	50–54	Lithuania	<b>918</b>
8	Female	Breaststroke	50 m	<b>37.46</b>	35–39	Lithuania	<b>896</b>
9	Male	Breaststroke	50 m	<b>34.55</b>	45–49	Lithuania	<b>886</b>
10	Male	Freestyle	50 m	<b>25.52</b>	30–34	Lithuania	<b>879</b>

Lithuanian National Open Masters Swimming Championships. According to our system, the best swimmer was the winner of the 50 m breaststroke in 60–64 year age group, the second best was the 30–34 year group swimmer of 50 m backstroke, and so on (Table 7).

## DISCUSSION

Our suggested master swimmers' results indexing system is simple to apply, and it may be helpful in ranking master swimmers of all categories

(age, gender, and event), as well as it might be used in an identification of the best swimmers of the competition, of the year, etc., as well as in life-long activity following of the relative level of the master athlete. It may emerge as a really helpful tool in motivating the master athletes to continue their activity and maintain good health.

In their study Kolt et al. (2004) tried to identify the motivation of older people to participate in regular exercise and sports. The 815 participants (399 men) ranged in age from 55 to 93 years (mean age was 64 years) and were participating in their

activities of choice at least once per week. The most common exercise / sports activities the participants were involved in were walking, golf, lawn bowls, tennis, and swimming. The main motives for participation were health benefits, enjoyment of the activity, better fitness, and maintenance of joint mobility (Kolt et al., 2004). Master athletes at the age of 60 can perform considerably better than some sedentary men at the age of 30 (Ward, 1994). M. Goldstein and D. Tanner (1999) view swimming as advantageous activity compared to modes of exercise and an ideal physical fitness activity for middle-aged and elderly people in respect to quality of life.

Dummer et al. (1985) examined muscle performance among 73 female master swimmers aged 24 to 71 years. Although swimming training appeared to have resulted in higher strength values for these women, an age-related decline in muscular strength values was nevertheless apparent. Their results showed different age-related trend for muscular endurance, suggesting that swim training affects muscular endurance more favourably than muscular strength among adult women. However, it was shown that master athletes spend less time per week for training, and their training focus is on endurance, not strength gains as compared to younger swimmers who train for all the endurance, strength, speed, and power, and the authors suggest that these differences might be partly responsible for age-related performance decline (Weir et al., 2002). This could be seen in the tendency of the greater decline in butterfly results in both men and women (Tables 1 and 2) in comparison to the results in other swimming disciplines. On the other hand, swimming technique is of relatively bigger importance for the results in butterfly and individual medley (which includes butterfly) than it is for the front or back crawl as separate events. In such a way, when athletes become elderly, the quicker deterioration of the results in the butterfly and medley as compared to the results in other events suggests that the motor control might become inadequate for good results in these events, while the endurance and strength are still better preserved at this stage.

Koda et al. (1994) examined forty Japanese male and female master swimmers ranging from 40 to 69 years who were selected for a comparative study of maximal oxygen uptake ( $VO_2\max$ ). The age-related rate of decline in  $VO_2\max$  was similar between genders (8 to 9% per decade), and in fact comparable to the values for the sedentary

controls, though  $VO_2\max$  in swimmers was higher than that of the age-matched sedentaries. It was concluded that swimming training might maintain a higher level of aerobic capacity, but could not prevent the decline of it with aging. On the contrary to the results in women, males do not seem to better preserve the aerobic endurance, since the race time in long distances deteriorates even quicker than that in short freestyle distances (Table 2). We can therefore conclude that older women have relatively better aerobic endurance than males of the same age.

Very few data have been published on master swimmers physiology and biomechanics. In the 162 male athletes aged 50—90 years participating in the World Master Championships in the 200-m freestyle event, stroke length was found to decline less than stroke frequency (Gatta et al., 2006). Semi-longitudinal and cross-sectional studies indicate accelerated decline in performance starting at the age of around 60 years, and these data are further discussed by the authors in respect to the role that practice plays in performance changes due to ageing (Weir et al., 2002). In our master swimmers the most notable decline in the results was evident after the age of 75 years.

## CONCLUSIONS

1. Among the women swimmers, a quicker deterioration of the results starts above the age of 75 years and older, and this decline is most obvious in breaststroke, butterfly, and individual medley, while it is less pronounced in long freestyle events.
2. For males, similarly as for women, swimming performance abruptly decreases after the age of 75 years. Differently from women, males degrade their freestyle sprinting abilities less than endurance capacity as reflected by less marked drop of the results in long-distance freestyle swimming as compared to the performance in short distance crawl. The results in butterfly deteriorate the most in both genders, with the greatest decline seen again after the age of 75 years.
3. Here we have introduced a system for the recalculation master swimmers' results by using the age coefficients, with a subsequent conversion of the result into point score. The system can be successfully applied in determining the master swimmers' rank among swimmers of different age groups.

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## AR 80 METŲ AMŽIAUS PLAUKIMO VETERANAI YRA GREITESNI UŽ 25 METŲ PLAUKIMO VETERANUS?

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### SANTRAUKA

Rengimasis dalyvauti varžybose yra svarbi paskata reguliariai sportuoti. Nemažai išbandyta sistemų norint palyginti įvairaus amžiaus sportininkų pajėgumą. Viena iš tokių — šiuo metu lengvojoje atletikoje naudojama rezultatų indeksavimo pagal amžių sistema. Ją taikant galima išsamiau analizuoti rezultatų kaitą, juos palyginti Šio straipsnio autoriai iškėlė tokį probleminį klausimą: „Kaip sukurti ir įdiegti koeficientus, formules, pagal kurias būtų galima palyginti skirtingų amžiaus grupių plaukimo veteranų rezultatus?“. Tyrimo tikslas — sudaryti plaukimo veteranų varžybų rezultatų taškų skaičiavimo sistemą.

Uždaviniai: 1) nustatyti plaukimo veteranų (vyrų ir moterų) varžybų rezultatų kaitos priklausomumą nuo amžiaus; 2) sudaryti plaukimo veteranų (vyrų ir moterų) varžybų rezultatų perskaičiavimo koeficientų lenteles; 3) pasiūlyti plaukimo veteranų varžybų perskaičiuotų rezultatų pavertimo taškais sistemą ir išbandyti siūlomą reitingų sudarymo sistemą veteranų plaukimo varžybose.

Duomenys paimti iš Pasaulio plaukimo veteranų geriausių 10 rezultatų lentelių. Vyresni nei 25 metų vyrai ir moterys buvo suskirstyti į penkerių metų intervalo amžiaus grupes. Vyriausių plaukikų amžiaus grupė — 90—94 metai. Analizuojami 1992—2005 m. rezultatai. Analizė atlikta palyginant tik amžiaus grupes, o 1992—2005 m. rezultatų kaita neanalizuota. Apskaičiuotas skirtingų amžiaus grupių rezultatų vidurkio ir 25—29 metų amžiaus grupės rezultatų vidurkio procentų skirtumas, koeficientai, o perskaičiuoti rezultatai paversti taškais pagal Tarptautinės plaukimo federacijos taškų lenteles ir sistemą, taikomą veteranų plaukimo varžybose sportininkų reitingui nustatyti.

Atlikus tyrimą, galima padaryti tokias išvadas:

1. Plaukikų varžybų rezultatai sparčiau ima blogėti po 75 metų amžiaus. Šis blogėjimas labiausiai pastebimas plaukiant krūtine, peteliške ir kompleksiniu būdu, tačiau lėtesnis įveikiant ilguosius nuotolius laisvuju stiliumi.

2. Vyrų, vyresnių nei 75 metų amžiaus, sprinto rungčių rezultatai blogėja lėčiau nei moterų ilgųjų nuotolių plaukimo laisvuju stiliumi varžybose. Abiejų lyčių sporto veteranų plaukimo peteliške rezultatai blogėja greičiausiai, ypač po 75 metų amžiaus.

3. Šiame straipsnyje pateikėme plaukimo veteranų rezultatus, pritaikydami mūsų sukurtus koeficientus (indeksus), paverstus taškais. Indeksuotą rezultatą verčiant taškais, galima sėkmingai palyginti skirtingų amžiaus grupių sportininkų, plaukimo veteranų, meistriškumą.

**Raktažodžiai:** plaukimo veteranų rezultatai, rezultatų indeksavimas, sportiniai plaukimo būdai.

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