

## P27-Age-related changes in marathon running performances

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The aim of the study was to analyze the changes in participation and performance trends of master marathon runners (> 40 yrs) between 1980 and 2009. Running times of the best male and female runners between 20 and 79 yrs of age who competed in the New-York City marathon were analyzed. The participation of master runners increased during the 1980-2009 period, to a greater extent for females compared to males. During that period, running times of master runners significantly ( $P < 0.01$ ) decreased for males older than 64 yrs and for females older than 44 yrs, respectively. These data suggest that male ( $\geq 65$  yrs) and female ( $\geq 45$  yrs) master runners have probably not yet reached their limits in marathon performance.

**Key words:** Running; Aging ; Master athletes ; Endurance exercise ; Gender difference

### INTRODUCTION

Older (or masters) endurance athletes are a positive example of exceptional aging and are a rich source of insight into a person's ability to maintain peak physical performance and physiological function with advancing age (Tanaka and Seals 2008, Lepers et al. 2010, Lepers & Maffiuletti 2011). Few studies have focused on the participation and performance trends of masters athletes at the marathon running distance since the early 1980's (Jokl et al. 2004). To date, it is not known whether masters athletes still improve their marathon performance or whether they have reached their limits. Accordingly, the purpose of this study was to examine the changes in participation and performance of masters athletes at the New-York City (NYC) marathon over the last 30 years (from 1980 to 2009).

### METHODS

Age and time performance data for all runners completing the NYC marathon from 1980 to 2009 were obtained through the NYC marathon web site: <http://www.ingnycmarathon.org/>. Averaged running time performances of the top 10 finishers of each age group for both females and males were analyzed from 1980 to 2009. In order to simplify the analysis over the 30 years studied period (1980-2009), we pooled data into three decades: 1980-89, 1990-99 and 2000-09. Two-way ANOVAs (age group x decade) with repeated measures on decade were used to compare percent of finishers and running times between the decades across ages, for both males and females. Tukey's post hoc analyses were used to test differences within the ANOVAs when appropriate. A significance level of  $P < 0.05$  was used to identify statistical significance.

### RESULTS

The number of total finishers increased by 65% between decade 1980-89 (Male: 142.753 finishers; Female: 27.770 finishers) and decade 1990-99 (Male: 213.123 finishers; Female: 67.986 finishers) and by only 25% between decade 1990-99 and decade 2000-09 (Male: 236.405 finishers; Female: 114.514 finishers). Over the three decades 1980-89, 1990-99 and 2000-09, the percent of finishers younger than 40 yrs significantly decreased ( $P < 0.05$ ), while the percent of masters finishers significantly increased ( $P < 0.05$ ), for both males and females. Over the 3 decades, male masters athletes represented 36%, 45% and 53% of total male finishers, respectively; while female masters athletes represented 24%, 34% and 40% of total female finishers, respectively.

For males, ANOVA revealed that mean finish times did not change over the three decades for age groups < 60-64 yrs. In contrast, running times significantly decreased ( $P < 0.01$ ) over the three decades for age groups  $\geq 60$ -64 yr. Average running time of males within the 70-74 yrs age range significantly decreased ( $P < 0.01$ ) by ~13 min (4.9%) between 1980-89 and 1990-99, and by ~4 min (1.6%) between 1990-99 and 2000-09. For females, mean finish times did not change over the three decades for age groups < 45-49 yrs, except the time of the 30-39 yrs

group that was lower in 2000-09 decade compared to previous decades. Female running times significantly decreased ( $P < 0.01$ ) over the three decades for age groups  $\geq 45$ -49 yr. Average running times of females within the 60-64 yrs age range significantly decreased ( $P < 0.01$ ) by ~16 min (6.8%) between 1990-99 and 2000-09.

## DISCUSSION

Several reasons may explain the improved performance of males older than 65 yrs over these 20 years, such as a greater participation of the older age groups, which would increase the probability of finding better runners in these age groups, increase training facilities for older people, and increase the competitive spirit in these older groups. In addition, if masters athletes performed at such a high-level for so long, it is reasonable to expect that those destined to maintain that intensity could do so because they remained largely injury-free.

Improvements of masters running performance have been much greater for females than for males as it has already been observed by Jokl et al. (2004). These data suggest that older females should still improve their marathon performance in the future as the new generation of well-trained young female athletes will move into the older age group competitions (Lepers & Maffiuletti 2011). In addition to better performances for older female athletes, an increase of density such the top 10 spreads of each age group may also be expected in the future.

The participation of masters runners at the NYC Marathon increased over the last 30 yrs and it will probably still grow in the future in the New-York and other marathons worldwide. Interestingly, the last two decades the master runner's performances have plateaued within the 40-64 yrs age range for males, but only within the 40-44 yrs range for females. The present data suggest that male ( $\geq 65$  yrs) and female ( $\geq 45$  yrs) master runners have probably not yet reached their limits in marathon performances. Literature on the masters athletes improvements in performance has already and, should still stimulate further research on the understanding of age related physiological changes and the potential slowing of some of the aging processes through athletic training.

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