

Cardiac rehabilitation in elderly athletes.

Analysis of elderly participation in Wizz Air Cluj-Napoca Marathon

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Abstract

Cardiac rehabilitation remains an indispensable tool of the cardiologist's arsenal for improving cardiovascular health in his patients. The range of applications of cardiac rehabilitation has increased over time. In recent years outstanding athletic performances of elderly people have been reported. In this article we present the benefits of cardiac rehabilitation for elderly population and for elderly athletes. We also make an analysis of the elderly participation in WizzAir Cluj-Napoca Marathon: number of finishers, best running time, evolution of running time over years, male-to-female ratio participation and results.

Key words: *cardiac rehabilitation, elderly, marathon, semimarathon, Wizz Air,*

Introduction

Cardiac rehabilitation (CR) remains an indispensable tool in the modern cardiologist's array of improving cardiovascular health (1,2). As the population ages, the number of elderly eligible for secondary prevention by cardiac rehabilitation increases. The term elderly refers to adults over 65 years of age.

There are elderly patients that participated in athletics during their lives and continued training over the years. Patients of any age that enjoy participation in sports can have a high level of athletic performance. Studies have shown that quitting sport for athletes might have negative repercussions on their lives: decreased self-confidence, emotional problems and depression (3). For the elderly patient, return to athletic activity may be the most important benefit of cardiac rehabilitation.

Cardiac rehabilitation not only lays the foundation for more holistic treatment of cardiac problems, but it also incorporates multiple important facets of care that are oftentimes overlooked. These includes: training, physical activity, smoking cessation, medication compliance and dietary advice (4). As CR becomes increasingly utilized in cardiac patients as part of the standard of care, we note that elderly patients, who commonly present with numerous comorbidities and health care needs, are often referred to CR programs with hesitation even in case of

athletes (5). The source of this hesitation isn't completely unfounded, especially given the paucity of data for this particularly group. Furthermore, there also exist numerous health problems exclusive to this population that may potentially complicate fundamental steps in the program (6). Nonetheless, as CR continues to become more accepted in older age groups, it is essential that current data on elderly patients be presented in order to encourage the performance of more studies in this particularly vulnerable population.

1. Current Evidence for CR in Elderly Population and Elderly Athletes

Cardiac rehabilitation is possible both in elderly and elderly athletes. Schmid et al. reported the case of a 77-year-old athlete that received a drug-eluting stent for coronary artery disease. He started phase II cardiac rehabilitation with 2 sessions training /week during 1 year, each including 40 minutes jogging and running on treadmill. For the first 10 minutes the speed was 3.5 miles/hour with a 3% tilt. He increased the speed over time until he reached 5.0 miles/hour. During exercise the patient's heart rate was monitored maintaining a rate pressure product of less than 36.000 (7).

Studies on CR in the elderly have demonstrated outstanding and robust results – improvements in exercise capacity, quality of life, psychological well-being and frailty have all been well documented and elegantly summarized in a recent article by Schopfer

el al. (8). In Asia, a recent study demonstrated high percentages of compliance among such elderly patients, particularly within a hospital based program in the Philippines (9). However, an analysis of most of these studies high-lighted center patient ages roughly around 70-75 years of age. As advances in health care have continued to pave the way for increased longevity, the expected lifespan for most individuals in advanced nation has slowly reached a mean age of 90 years. An article by Thinggard et al. in 2016 exploring the totality of this overall global health care summation has outlined the realization that a majority of health care interventions shall soon be and will, inevitably, be offered to very elderly individuals by default (10). This brings to mind CR, with its overall approach to optimizing cardiovascular health, it is very likely that it may be one of the earliest intervention programs offered to these individuals first. But what evidence do we have on CR in elderly in addition to case reports?

1.1. Mortality

Cardiac rehabilitation has effects not only on exercise capacity or cardiac morbidity but also on mortality. Suaya et al. demonstrated on a big number of patients that mortality decreases by 21 to 33 % at 5 years after beginning cardiac rehabilitation. Hammil et al. found even more important results: a 47% reduction of death risk at 5-years follow-up (11).

1.2. Quality of Life

In the study of Lavie et al.(12) improvement of quality of life was significant after cardiac rehabilitation in patients over 65 years compared to younger patients.

A study by Conner et al sought to analyze the differences in outcomes of rehabilitation for multiple health problems common in the elderly, one of which includes heart failure. The retrospective study analyzed rehabilitation characteristics and noted benefits similar to their younger counterparts, but were noted to have increased utilization of a greater amount of health care resources (13). Another article by Furukawa et a.l analyzed very elderly patients (ranged from 85 to 90 years of age) who underwent cardiac rehabilitation after one of several types of cardiac surgeries. All patients received early cardiac rehabilitation as early as 1.7 days post operation. All patients were noted to have safely completed their cardiac rehabilitation with improvements in NYHA score and quality of life (14).

1.3. Exercise capacity

In patients over 65 years exercise capacity declines as part of the aging process. In the study of Lavie et al. (15) old patients that started cardiac rehabilitation showed increased exercise capacity, increased peak VO2 max and anaerobic threshold. Athletes that stopped training because of a cardiac disease have lower exercise capacity. After starting cardiac training, their capacity increases to a level that permits resuming the participation in competitions (16). Cardiologists can use the internet to track elderly patients ‘activity and make recommendations in function of the speed, pace and heart rate recorded during training (17) (fig 1,2,3).

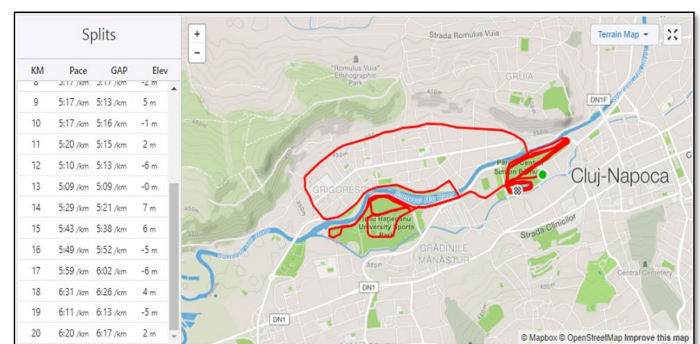


Fig. 1. Map with the distance during a 20 km training. Please note the pace of the patient which is between 5:09 and 6:31/km. (from <https://www.strava.com/activities/2493267900>)

1.4. Frailty

Older patients with cardiovascular disease are susceptible to frailty, and hospitalizations. Cardiac rehabilitations programs can help individuals gain mobility and balance. Frail patients with cardiovascular disease were included in the study of Molino-Lova (18) and Pulignano (19) which showed increased exercise capacity and improved physical performance in patients over 65 years after 3 to 32 months.

1.5. Psychological effects

The change from athletic physical activity to end of carrier might bring psychological problems such as depression anxiety and self-disrespect (20). In patients with cardiovascular disease the occurrence of depression is associated with increased morbidity and mortality (21,22). In the study of Milani et al. (23) patients aged 65 and older with depression had lower exercise capacity and depressed quality of life. Furthermore after beginning cardiac rehabilitation, patients were less likely to be depressed.

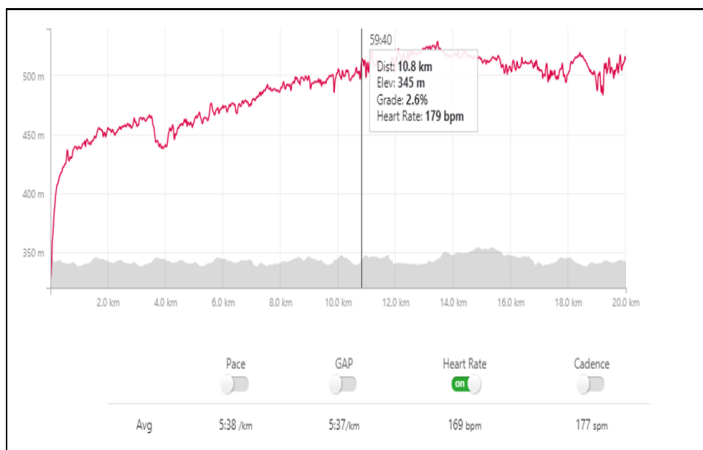


Fig. 2. Chart with the heart rate during 20 km training. Please note mean heart rate which is 169bpm (from <https://www.strava.com/activities/2493267900>)

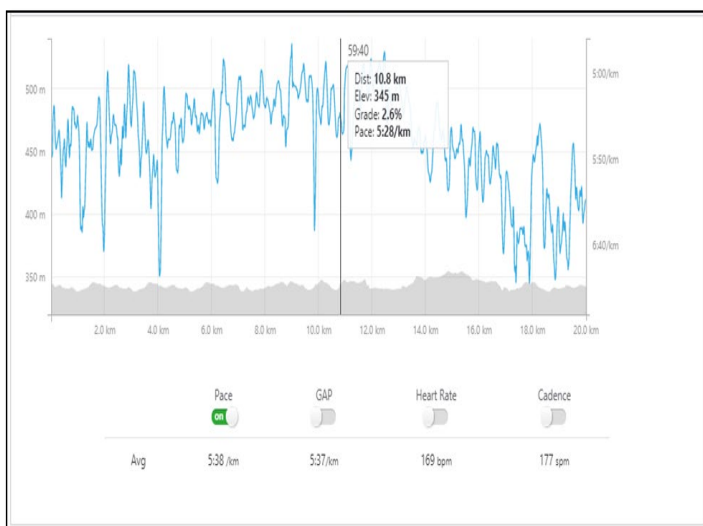


Fig. 3. Chart with the pace during 20 km training. Please note mean pace which was 5:38/km (from <https://www.strava.com/activities/2493267900>)

2. Analysis of elderly participation in Wizz Air Cluj-Napoca Marathon

The best age to obtain marathon records is 31-32 years (24,25). Nonetheless marathon races are not exclusive to elite, the vast majority of participants being non-elites of all ages. The number of elderly runners over 65 years had constantly increased over time (26).

Between 2012 and 2019 the number of finishers aged > 65 years remained low for women and men both in marathon and semimarathon in Wizz-Air Cluj-Napoca. An increase by more than 200 % in semimarathon male finishers was found in 2019 (fig 4,5).

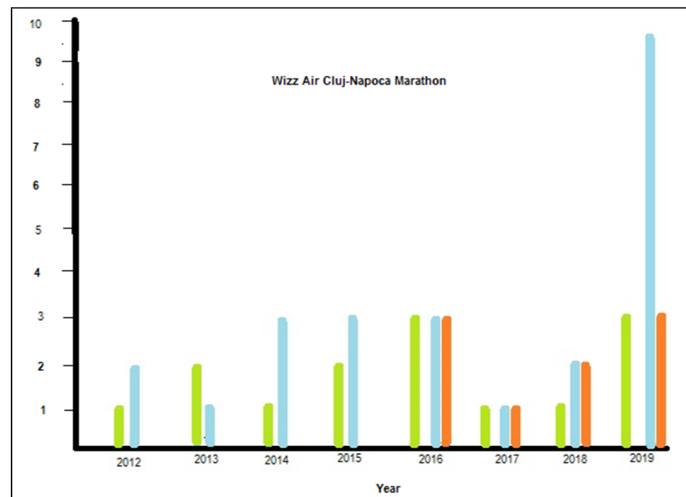


Fig. 4. Number of elderly (over 65 years-old) male and female finishers of Wizz Air Cluj-Napoca International Marathon (green line males marathon, blue line males semimarathon, red line females semimarathon).

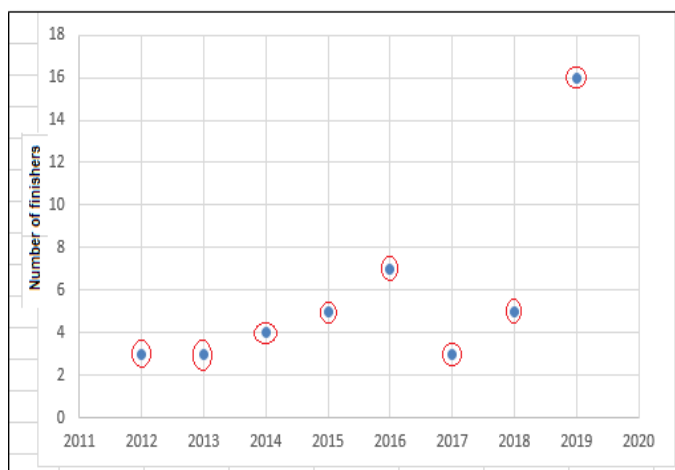


Fig. 5. Participation of finishers aged > 65 years in marathon and semimarathon races from 2012 to 2019

Marathon race times of the fastest runner over 65 years remained constant over years (fig 6) but decreased in semimarathon both in females and males (fig 7). The evolution over time for the same runner over 4 years showed a non-significant variation of the running time both for males and females (fig 8).

The fastest running time for males over 65 years during 2012 to 2019 in marathon races were: 4:56:06; 3:54:58; 3:51:18; 3:44:49; 4:00:34; 3:57:38; 4:12:31 and 4:22:26. Race times were 1:52;0:50;0:47;0:56;0:53;1:08 and 1:18 hours slower than the age group world record (Ed Whitlock 3:04:54)

The fastest running time for males over 65 years in semimarathon races during 2012 and 2019 were: 1:54:38; 2:37:26; 1:51:45; 1:48:17; 1:47:41; 1:45:02; 1:37:39; and 1:29:44

The fastest running time for females over 65 years in semimarathon races during 2016 and 2019 were: 2:41:35; 2:39:11; 2:20:03 and 2:03:20.

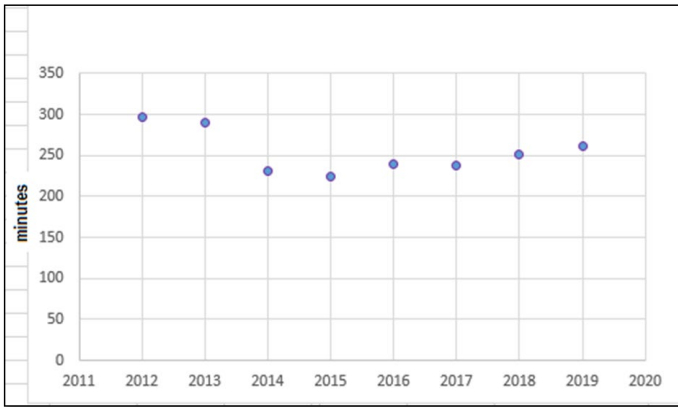


Fig. 6. Marathon race times of the fastest male (blue dot) in age group > 65 years.

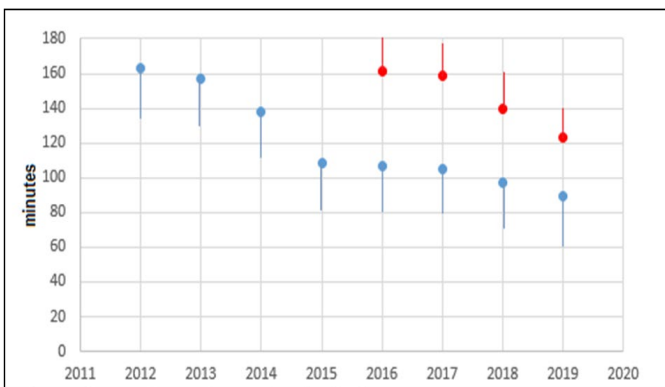


Fig. 7. Semimarathon race times of the fastest female (red dot) and male (blue dot) in age group > 65 years.

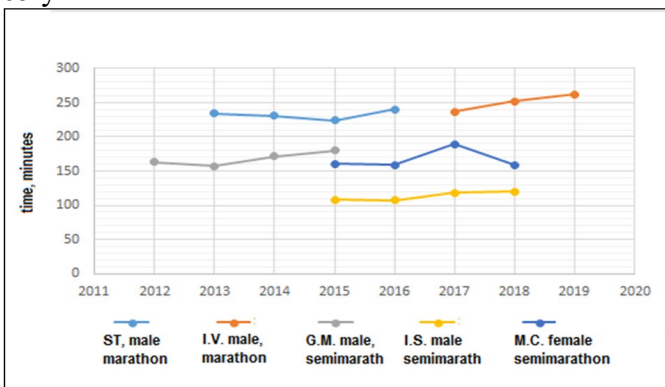


Fig. 8. Evolution of race time during 4 consecutive years in 5 finishers: 2 males in marathon, 2 males and 1 female in semimarathon.

An important finding was that semimarathon race times decreased across years both in males and females. This finding is in agreement with the observation of an improvement in performance over time. Recent studies confirmed improved marathon race times in the last 30 to 40 years (27,28).

3. CONCLUSION

Benefits of cardiac rehabilitation on elderly population and elderly athletes include reduced morbidity and mortality, decreased depression and other psychological symptoms, increased exercise capacity and quality of life. The participation of elderly marathoners and semimarathoners > 65 years increased in the last year of WizzAir Cluj-Napoca Competition, with decreased race times which denotes an improved performance over time.

References

1. Pop D, Caloian B et al. Secondary prevention-an essential component of the comprehensive rehabilitation of patients with heart failure. *Balneo Research Journal*.2017;8:217-219.
2. Gurzau D, Caloian B, Fringu F et al. The role of cardiovascular rehabilitaton in women with ischemic heart disease and rhythm disorders. *Balneo Research Journal*.2018;9:50-53.
3. Stephan Y, Bilard J, Ninot J et al. Repercussions of transition out of elite sport on subjective well-being: a one-year study. *Journal of Applied Sport Psychology*. 2003;15:354-371.
4. Schopfer DW; Forman Daniel E. Benefits of Cardiac Rehabilitation in Older Adults. *American College of Cardiology* 2019. Available at: <https://www.acc.org/latest-in-cardiology/articles/2016/10/19/09/22/benefits-of-cardiac-rehabilitation-in-older-adults>.
5. Al Quait, A., & Doherty, P. Does cardiac rehabilitation favour the young over the old? *Open Heart*.2016;3(2), e000450. doi:10.1136/openhrt-2016-000450.
6. Chan KA, Gallardo EL, Trani MR, Buaya CA, Alcazar JA, Cabatania LA ."Adherence and Functional Outcomes of Elderly Cardiac Rehabilitation Patients: A 5-year Philippine Regional Referral Center Review" *Journal of the Hong Kong College of Cardiology*.2018: 26(2):A30.
7. Schmidt J, Adams J et al. Cardiac rehabilitation of a 77-year-old male runner: consideration of the athlete, not the age. *Proc (Bayl Univ Med Cent)*. 2009;22:16-18.

8. Schopfer DW; Forman Daniel E. Benefits of Cardiac Rehabilitation in Older Adults. American College of Cardiology 2019. Available at: <https://www.acc.org/latest-in-cardiology/articles/2016/10/19/09/22/benefits-of-cardiac-rehabilitation-in-older-adults>.
9. Chan KA, Gallardo EL, Trani MR, Buaya CA, Alcazar JA, Cabatania LA "Adherence and Functional Outcomes of Elderly Cardiac Rehabilitation Patients: A 5-year Philippine Regional Referral Center Review". *Journal of the Hong Kong College of Cardiology* .2018;26(2):A30.
10. Thinggaard, M., McGue, M., Jeune, B., Osler, M., Vaupel, J. W., & Christensen, K. Survival Prognosis in Very Old Adults. *Journal of the American Geriatrics Society*. 2016;64(1): 81–88. doi:10.1111/jgs.13838.
11. Hammill BG, Curtis LH, Schulman KA et al. Relationship between cardiac rehabilitation and long-term risks of death and myocardial infarction among elderly Medicare beneficiaries. *Circulation* .2010; 121:63-70.
12. Lavie CJ, Thomas RJ, Squires RW et al. Exercise training and cardiac rehabilitation in primary and secondary prevention of coronary heart disease. *Mayo Clin Proc*. 2009; 84:373-383.
13. Conner, D., Barnes, C., Harrison-Felix, C., & Reznickova, N. Rehabilitation Outcomes in a Population of Nonagenarians and Younger Seniors With Hip Fracture, Heart Failure, or Cerebral Vascular Accident. *Archives of Physical Medicine and Rehabilitation*. 2010;91(10): 1505–1510.
14. Furukawa H, Kangai K, Minami K, Ohura K, Ochi Y, Ikumoto H, Fujimoto M, Aono H, Samukawa M. "Initial clinical experience of early cardiac rehabilitation for very elderly patients over 85 years old following open heart surgery" *Kyobu Geka*. 2012 ;Jun65(6):440-5.
15. Lavie CJ, Milani RV. Cardiac rehabilitation, exercise training, and psychosocial risk factors. *Journal of the American College of Cardiology*. 2006;47:212-212.
16. Schmidt J, Adams J et al. Cardiac rehabilitation of a 77-year-old male runner: consideration of the athlete, not the age. *Proc (Bayl Univ Med Cent)*. 2009;22:16-18.
17. Moldovan O, Deak B, Bian A et al. How do I track Cardiac Rehabilitation in my patient with ischemic heart disease using Strava. *Balneo Research Journal*.2019;10:114-117.
18. Molino-Lova R, Pasquini G, Vannetti F. et al. Effects of a structured physical activity intervention on measures of physical performance in frail elderly patients after cardiac rehabilitation: a pilot study with 1-year follow-up. *Intern Emerg Med*.2013;8:581-589.
19. Pulignano G, Tinti MD, Del Sindaco D et al. Barriers to cardiac rehabilitation access of older heart failure patients and strategies for better implementation. *Monaldi Arch Chest Dis*. 2016;84:732.
20. Stephan Y, Bilard J, Ninot G et al. Repercussion of transition out of elite sport on subjective well-being: a one-year study. *Journal of Applied Sport Psychology*. 2003;15:354-371.
21. Frasure-Smith N, Lesperance F et al. Cardiac Rehabilitation. *The Lancet*. 1997; 350:1401.
22. Schopfer DW, Krishnamurthi N, Shen H, Duvernoy CS, Forman DE, Whooley MA. Association of Veterans Health Administration home-based programs with access to and participation in cardiac rehabilitation. *JAMA Intern Med*. 2018;178:715–7.
23. Milani RV, Lavie CJ. Impact of cardiac rehabilitation on depression and its associated morphology. *Am J Med*. 2007; 120: 799-806.
24. Hunter SK, Stevens AA, Magennis K, Skelton KW et al. Is there a sex difference in the age of elite marathon runners ? *Med Sci Sports Excer*. 2011; 43: 656-664.
25. Berthelot G, Len S, Hellard P et al. Exponential growth combined with exponential decline explains lifetime performance evolution in individual and human species. *Age* .2012;34:1001-1009.
26. Lepers R, Cattagni T. Do older athletes reach limits in their performance during marathon running ? *Age* .2012;34:773-781.
27. Jokl P, Sethi PM, Cooper AJ. Masters's performance in the New York City marathon 1983-1999. *Br J Sports Med*. 2004;38:408-412.
28. Leyk D, Erley O, Rider D et al. Age-related changes in marathon and half-marathon performances. *Int J Sports Med*. 2007;28:513-517.