

Prevalence of Allergy and Asthma Symptoms in Recreational Roadrunners

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ABSTRACT

RANDOLPH, C. C., D. DREYFUS, K. W. RUNDELL, D. BANGLADORE, and B. FRASER. Prevalence of Allergy and Asthma Symptoms in Recreational Roadrunners. *Med. Sci. Sports Exerc.*, Vol. 38, No. 12, pp. 2053–2057, 2006. **Purpose:** The prevalence of allergy and asthma symptoms and asthma medication use, which has been extensively studied in elite athletes, has received little attention in recreational roadrunners. **Methods:** A validated questionnaire was used to determine the prevalence of allergy and asthma symptoms, the use of medication, and allergy specialty attention among recreational roadrunners. Comparison with the published prevalence of allergy and asthma symptoms in Olympic athletes was made. **Results:** The prevalence of allergy and asthma symptoms were similar in two consecutive yearly surveys (2003, 2004). The response from 2004 was 11% (484 of 4398 runners). The study population was 60% male, 56% Caucasian, 10% non-Caucasian, and 34% undesignated. Subjects competed for 13.2 ± 10.5 yr. Prevalence was 44% for symptoms of allergy, 31% for asthma, and 21% for both. Of those reporting allergy symptoms alone, 0.5% had prescription medications or medication before the race. Those with asthma and allergy or asthma alone were more likely to have prescription medication (allergy and asthma, 32%, $P = 0.0001$; asthma, 6%, $P = 0.001$), to take medication before the race (asthma and allergy, 27%, $P = 0.0001$; asthma, 5%, $P = 0.007$), or to seek specialty attention and medication (asthma and allergy, 39%, $P = 0.0001$; asthma, 7%, $P = 0.004$) than those with allergy symptoms alone. The comparison with results from a survey of Olympic athletes indicates that symptoms of allergy and asthma were more prevalent in recreational athletes ($P = 0.0001$ to 0.007), but roadrunners were less likely to be taking prescription medication ($P = 0.025$). **Conclusion:** These results suggest that the recreational roadrunner is more likely to report symptoms of allergy and/or asthma but less likely to have prescription medication than the Olympic athlete. **Key Words:** EXERCISE-INDUCED ASTHMA, BRONCHOCONSTRICTION QUESTIONNAIRE, RUNNING, SURVEY

The prevalence of exercise-induced asthma (EIA) and asthma-like symptoms in elite athletes has been well documented in winter sport athletes (21,27,28) and Olympic athletes (21,26–28). Spirometry-determined prevalence of EIA among 1998 United States Winter Olympic athletes (28) was remarkably similar to the estimated symptoms-based prevalence obtained by Weiler and Ryan (27) using a questionnaire among Olympic athletes (23 vs 22%, respectively). Interestingly, in a study analyzing objective spirometry and asthma symptom questionnaires on Olympic winter athletes, Rundell et al. (21,22) reported that questionnaires provide acceptable estimates of prevalence that are similar to what is obtained using objective spirometry. However, the match between athletes reporting symptoms and those presenting postchallenge falls in FEV₁ who were positive for EIA was similar to a coin toss. The

1998 United States Winter Olympic Team Members demonstrated a 26% prevalence of EIA by spirometry (27) and a 27% prevalence by questionnaire (27). The questionnaire-estimated prevalence of EIA for 1996 Summer Olympians was 20% (26).

Elite and high-level recreational endurance athletes often train and race at minute ventilations (V_E) equal to or greater than 85% V_{Emax} (7,8,17). This high training V_E results in increased inhalation of aeroallergens, air pollutants, and cold/dry air compared with the nonexercising population (7,8). At these high ventilatory rates, mouth breathing becomes obligatory, bypassing normal air conditioning by the nose and often causing cold/dry air to dehydrate the airways, creating a hyperosmolar environment that can result in mast-cell degranulation and inflammatory mediator release, leading to bronchoconstriction (7,8).

Elite athletes demonstrate enhanced prevalence of asthma and allergy by previous survey (7–11,17,23,26,27,30). Whether this relates to irritants such as chlorine in elite swimmers, cold/dry air in cross-country skiers, or a combination of pollutants and aeroallergens leading to increased bronchial responsiveness with symptoms is unclear, but atopy clearly enhances asthma risk. Physician-diagnosed asthma has been reported in up to 22% of 1998 U.S. Winter Olympic athletes, with 18.4% having used medication for asthma and 17.4% currently taking medication

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TABLE 1. Questionnaire on respiratory conditions.

1. Age:	☐ < 10	☐ 10–20	☐ 21–30	☐ 31–40	☐ 41–50	☐ 51–60	☐ 61–70	☐ > 70
2. Gender:							☐ Male	☐ Female
3. Race (optional):								
4. Number of years running:								
5. Do you have chest tightness?							☐ Yes	☐ No
6. Have you ever been told you have asthma or exercise-induced asthma?							☐ Yes	☐ No
7. Do you ever have wheezing?							☐ Yes	☐ No
8. Do you have itching eyes?							☐ Yes	☐ No
9. Do you ever have itching of the nose or throat, or sneezing?							☐ Yes	☐ No
10. Does running ever cause chest tightness, cough, wheezing, or prolonged shortness of breath?							☐ Yes	☐ No
11. Have you ever had chest tightness, cough, wheezing, asthma, or other lung problems that made it difficult for you to perform in sports?							☐ Yes	☐ No
12. Have you ever missed school or work because of chest tightness, cough, wheezing, or prolonged shortness of breath?							☐ Yes	☐ No
13. Do you take prescription medication for asthma and/or allergy particularly before sports (i.e., the race)?					☐ Yes, allergy alone	☐ Yes, asthma alone	☐ Yes, both allergy and asthma	☐ No
14. Have you seen an allergy specialist for allergens or asthma?					☐ Yes, allergy alone	☐ Yes, asthma alone	☐ Yes, both allergy and asthma	☐ No
15. Did you take any medications for asthma or allergy before running this race?					☐ Yes, allergy alone	☐ Yes, asthma alone	☐ Yes, both allergy and asthma	☐ No

(27). Recently, allergies were reported in up to 56% of Australian Olympic athletes (15), representing a fivefold increase in diagnosed asthma and a 2.5-fold increase in the use of asthma medication compared with 1984 Olympians. Whether this is related to increased awareness, increased reporting, increased training volume, diagnostic approaches to asthma, or training environment is not clear (7). The estimated number of Olympic athletes in the 2004 Athens Olympics was 16,000, of which an estimated 20% had allergy or asthma symptoms (29). Similar data are not available on recreational athletes, who are estimated to number 182 million in the United States (3).

This study compared allergy and asthma symptom survey results from recreational roadrunners with those of their Olympic counterparts. In 2003 and 2004, we surveyed a total of 962 athletes who participated in an annual road race, using a previously validated questionnaire used for Olympic athletes (26,27). Queries for use of medications and contact with an allergy specialist were added to the survey.

METHODS

In 2004, roadrunners were surveyed at an annual Labor Day road race (20-, 5-, or 3-km event) with 15 questions regarding respiratory symptoms with exercise or sports. Inquiries concerning cough, wheezing, chest tightness, impact on work or school, allergy symptoms of itching nose or eyes, and use of medications before or during the running race and contact with an allergy specialist were made.

Previously, we (18) had administered a more abbreviated form of the questionnaire at the Labor Day 2003 race. The 2003 questionnaire did not include medication use or specialty attention. In the 2004 questionnaire (19), two questions addressed inhalant allergy (questions 8 and 9), six addressed asthma (questions 5–7 and 10–12), four addressed demographics and running experience (questions 1–4), two addressed the use of medications for asthma (questions 13 and 15), and one addressed allergy specialty attention (question 14) (Table 1).

Statistical analysis was done using chi-square to determine differences in responses between the two populations (recreational roadrunners and Olympic athletes). A confidence interval of 95% was employed (SPSS, version 13.0, Chicago, IL).

RESULTS

Eleven percent (484) of 4398 road race competitors completed the survey. Participation according to race distance was 2100 (48%) in the 20 km, 2000 (45%) in the 5 km, and 298 (7%) in the 3 km. Population demographics indicated 64% males, 34% females, and 1% undesignated (Table 2). Of those who responded to the race questions, 85% (319) were Caucasian. The responders included 56% Caucasians and 1% non-Caucasians, and 165 (34%) were undesignated. The 2003 survey respondents were similar, with 61% males and 89% Caucasian. In the 2004 survey, ages ranged from less than 10 yr to more than 70 yr, with

TABLE 2. Runner demographics.

Total Screened	Age (yr)	Sex			Race			Amount of Time Running	
		M	F	ND	C	NC	ND		
484(11%)	Range	10–70	292	163	29	272	47	165	Range
	Median	30–40	(60%)	(34%)	(6%)	56%	1%	34%	Median
									3 months to 50 yr
									13.2 ± 10.5 yr

ND, not designated.

TABLE 3. Recreational vs Olympic athlete: asthma or allergy symptoms.

Questions 4–12	2003	2004	Olympic	P Value
Chest tightness	71 (14.7%)	71 (15.2%)	18 (9.2%)	0.077
Diagnosed asthma	75 (16%)	84 (17.4%)	43 (21.9%)	0.224
Wheezing	98 (20.9%)	97 (20.1%)	23 (11.7%)	0.012
Itchy eyes	157 (33.5%)	176 (36.4%)	29 (14.8%)	<0.0001
Itchy nose, throat sneezing	159 (34%)	171 (35.4%)	26 (13.3%)	<0.0001
Running causes chest tightness, wheezing, and/or sob	86 (18.4%)	84 (17.4%)	18 (9.2%)	0.007
Wheezing or asthma symptoms in sports	76 (16.2%)	71 (14.7%)	24 (12.2%)	0.369
Missed work or school	26 (5.6%)	26 (5.6%)	3 (1.5%)	0.061

median of 30–40 yr. The range for running experience was 3 months to 50 yr, with a mean of 13.2 ± 10.5 SD yr.

Table 3 indicates similar responses between 2003 and 2004 roadrunners, indicating reproducibility of the survey. Figure 1 compares questionnaire responses from recreational roadrunners and Olympians. Chest tightness was reported by 14.7% of the 2003 roadrunner respondents, 15.2% of the 2004 roadrunner respondents, and 9.2% of Olympic athletes (27) ($P = 0.077$). Reports of diagnosed asthma were similar between roadrunners and Olympians: 17.4% of 2003 roadrunner respondents, 16% of 2004 respondents, and 22% of Olympic athletes (27) reported diagnosed asthma ($P = 0.224$). Wheezing was reported in 20% of both 2003 and 2004 respondents but in only 11.7% of Olympic athletes ($P = 0.012$). Allergy symptoms of itching eyes, nose, and throat and sneezing were reported by 33–36% of the roadrunners but only 13.3–14.8% of Olympic athletes in the Weiler studies ($P = <0.0001$; 27,28).

Running caused chest tightness, wheezing, or shortness of breath in 18.4, 17.4, and 9.2% of 2003 and 2004 roadrunners and Olympic athletes (26,27), respectively ($P = 0.007$). Wheezing or asthma symptoms made it difficult to perform in sports in 16.2, 14.7, and 12.2% of 2003 and 2004 roadrunners and Olympic athletes (26,27),

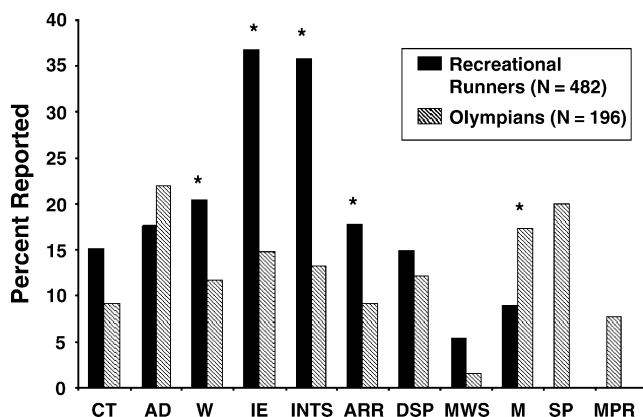


FIGURE 1—Comparison of positive responses from the respiratory conditions questionnaire between recreational roadrunners and Olympic runners. CT, chest tightness; AD, asthma diagnosis; W, wheezing complaints; IE, itchy eyes; INTS, itchy nose and throat and sneezing spells; ARR, asthma symptoms related to running; DSP, difficulty in performing sports; MWS, missed work/school; M, taking prescription medication; SP, seeing an asthma/allergy specialist; MPR, took medications before the race.

TABLE 4. Cumulative results: asthma/allergy symptoms, 2004 (questions 4–12).

Asthma or Allergy	Allergy Only	Asthma Only	Asthma and Allergy
264 (55%)	214 (44%)	150 (31%)	100 (21%)

respectively ($P = 0.369$). Missed school or work attributable to asthma symptoms was reported by 5.4, 5.6, and 1.5% of 2003 and 2004 roadrunners and Olympic athletes, respectively ($P = 0.061$). Fifty-five percent (264) of the roadrunners reported a positive response to at least one question related to asthma or allergy (Table 4). Thirty-six percent of roadrunners who admitted to allergy or asthma symptoms or history had seen an allergist, and 16% used prescription medication for asthma (Table 5); 17.4% (84 of 484) had been told they had asthma, and 45% (38) of those had prescription medications. Of all roadrunners, 23% had prescribed medications, 21% had seen an allergy specialist, and four roadrunners with negative questionnaire responses (0.8%) had seen an allergist specialist. Among those with allergy symptoms by questionnaire, only 0.5% had prescription medication before the race, whereas 6% of those reporting asthma had prescription or medication before the race (Table 6, $P = 0.0007$).

Seven percent of those with allergy symptoms alone sought specialty attention, 11% of those with asthma alone sought specialty attention, and 7% of those with medications prescribed or taken before the race sought specialty attention. Of those with positive responses to both allergy and asthma symptoms, 32% had been prescribed medication and 27% had used medications before the race. The number of roadrunners with asthma symptoms who were using medications and seeing specialists was significantly higher than the number of people with allergy taking medications and seeing a specialist ($P = 0.004$).

Of those with both allergy and asthma symptoms, 60% sought specialty attention, and 38% of roadrunners who had been prescribed or who had taking medication before the race sought specialty attention. Overall, 16% of those with positive questionnaires had been prescribed medication, and 13% had taken medication before the race; 36% had sought specialty attention (or 20% of those taking prescribed medications). Of runners with positive questionnaires, 20% were taking prescribed medications and seeing a specialist (Table 6). Of those with both allergy and asthma symptoms, a significantly higher number were taking prescriptions compared with the number of runners with allergy or asthma alone ($P < 0.0001$). Similarly, the runners with both allergy and asthma symptoms were more likely to take medications before the race ($P < 0.0001$), to visit a specialist ($P < 0.0001$), or to take medications and see a specialist ($P < 0.0001$).

TABLE 5. Use of allergy services and prescription frequency for recreational roadrunners with and without allergy and/or asthma symptoms by questionnaire.

Asthma Medications (+/- Q)	Asthma Medications (+ Q)	Allergy Specialist (+/- Q)	Allergy Specialist (+ Q)
110 (23%)	42 (16%)	100 (21%)	96 (36%)

Q, questionnaire; +, positive; -, negative.

TABLE 6. Use of specialist/prescription medication by symptomatic roadrunners.

(+) Question	Prescription Medication	Medication Before Race	Specialist Contact	Medication and Specialist Contact
Allergy: 214	1 (0.5%)	1 (0.5%)	16 (7%)	3 (1.5%)
Asthma: 150	9 (6%)*	7 (5%)*	16 (11%)*	11 (7%)*
Both: 100	32 (32%)*	27 (27%)*	60 (60%)*	39 (39%)*
Total: 264	42 (16%)	35 (13%)	96 (36%)	53 (20%)

* $P = 0.001$; ** $P < 0.0001$; *** $P = 0.004$; **** $P < 0.0001$; + $P = 0.007$; ++ $P < 0.0001$; *** $P < 0.29$; **** $P < 0.0001$.

DISCUSSION

Fifty-five percent of roadrunners reported a history or symptoms of allergy and asthma. Of these, 21% had seen an allergist, and 23% had prescribed medication. In contrast, 6% of those with only asthma symptoms had prescribed medications. Only 0.5% of runners with just allergy symptoms had been prescribed medications, and 7% had seen a specialist. Runners with allergy and asthma symptoms were significantly more likely to have been prescribed medications, take medication before the race, and consulted an allergy specialist than those with allergy symptoms alone. In comparison with Olympic athletes (4,5), the recreational runners were significantly more likely to report symptoms of wheezing ($P = 0.012$), itchy eyes, nose, and throat and sneezing spells ($P < 0.0001$), and asthma related to running ($P = 0.007$), but the recreational runners took significantly less prescription medication ($P = 0.025$) than their Olympic counterparts (Fig. 1). Recreational roadrunners were significantly more likely to be symptomatic of asthma related to running or to have wheezing and allergy-related symptoms than their Olympic counterparts ($P = 0.007$). In contrast, recreational roadrunners were less likely to have been prescribed medication than the Olympic athletes. This may represent a greater likelihood that Olympic athletes receive more attention to their symptoms than recreational roadrunners. The results of this survey strongly suggest the need for increased allergy specialty attention to recreational athletes, who number 182 million, with 87 million (31%) of those participating in sports or physical activity for up to 30 min, five times per week (3) (Mike May Sporting Goods Manufacturers Association, personal communication, 2005), as opposed to the estimated 16,000 Olympic athletes in the 2004 Athens competition (30).

Although a number of published studies use questionnaires (6,8,9,15,26,27) for elicitation of allergy and asthma symptom prevalence, Rundell et al. (3,21) caution that self-reported symptoms allow reasonable estimates of EIA prevalence but produce high levels of false-positive and false-negative outcomes for individual diagnoses. In a study of elite athletes (21), there was no difference in pulmonary function—positive and normal athletes in terms of positive questionnaire responses. Sixty-one percent of athletes with a positive field exercise challenge reported symptoms, and 48% with negative exercise challenge spirometry reported symptoms. Holzer et al. (12) reported similar findings using eucapnic voluntary hyperventilation. Likewise, among intercollegiate athletes, only 46% of those with positive history had a positive challenge (20). In

contrast to Rundell et al. (3,21) and Holzer et al. (12), Verges et al. (25) reported a significant correlation between questionnaire symptoms and bronchial hyperresponsiveness, as well as ventilatory limitation in elite athletes. However, Rundell et al. (3,21) concluded that diagnosis demands an appropriate challenge in combination with the symptomatic history of the athlete.

Elite athletes often underestimate or overestimate symptoms, which jeopardizes the sensitivity and specificity of questionnaires (6,3,21). Turcotte et al. (24) documented false-negative questionnaires and underestimation of airway hyperresponsiveness to methacholine in swimmers, triathletes, and sedentary controls; there was 84% sensitivity to detect airway responsiveness $PC_{20} < 8 \text{ mg}\cdot\text{mL}^{-1}$, with specificity varying from 64 to 83%, with questions regarding postnasal drip, chest symptoms of cough or wheezing and nociceptive sensations associated with respiratory symptoms. Hallstrand et al. (4) similarly reported that screening by physical exam and history did not aid in the diagnosis of exercise-induced bronchoconstriction (EIB) in adolescents. The individuals who screened negative for all questions regarding symptoms or history of asthma, EIB, and allergic rhinitis composed 45.8% of adolescents with EIB. Hammerman et al. (5) concluded that in high school athletes, questionnaires were useful when negative, but a free running test was more reliable for identifying and assessing EIA. Clearly, an exercise challenge with spirometry in conjunction with questionnaire history is optimal to document EIB or EIA. As with our study, Katelaris et al. (15) identified a 56% prevalence of allergic rhinoconjunctivitis in Australian Olympic athletes (15), and Hopper et al. (13) reported a doubling of allergic rhinoconjunctivitis from 20% in 1968 to 40% in 1988 in the Australian population (13). Heibling et al. (6) found by questionnaire that of 2961 elite Swiss athletes, 16.8% had hay fever, and 59% of those required medication.

The limitations of this study are apparent in that the allergy and asthma prevalence and use of medications as well as allergy specialist are based on personal surveys. The recreational athlete has a propensity for self-diagnosis, whereas elite athletes tend to perceive themselves as invulnerable and fear doping, and thus they may under-report symptoms and medications and avoid diagnosis and therapy. This difference in perspective may account for differences in therapy between the groups. The questionnaire only asked for medications taken or prescribed, which may also contribute to treatment difference (6,3,21). Nonetheless, our survey has been validated previously (26,27). Clearly objective parameters including pulmonary function testing, pre- and postbronchodilator, as well as an appropriate challenge test and skin-prick testing to inhalants are needed to confirm the diagnosis. In evaluating athletes, whenever possible, a boarded allergy specialist should be part of the team for interpretation of pulmonary functions and allergy skin testing and management. However, when an allergy specialist is not available a primary care provider with a specialty in sports medicine allergy and asthma diagnosis and management should provide appropriate

evaluation and management. Training in sports medicine allergy and asthma diagnosis and management should be accomplished at annual meetings.

In conclusion, athletes often fail to recognize symptoms of allergy, including upper respiratory illness (15,16), and are poor historians. Our preliminary questionnaire data indicate that recreational roadrunners have a higher prevalence of symptoms of asthma and inhalant allergy but use prescribed medication to a lesser extent than their Olympic counterparts. Further objective studies including spirometry and skin test for inhalants are needed to confirm these findings. It is apparent that allergy specialty attention is needed for recreational athletes. Katelaris (15) has docu-

mented decreases in quality of life in allergic rhinoconjunctivitis, and asthma clearly impairs athletic performance. Because symptoms of allergic rhinoconjunctivitis and asthma peak at ages 10–25 yr, when elite athletes reach maximal performance, it is critical that allergy specialists address these conditions. Likewise, more recreational athletes require allergy specialty attention to the same conditions for comfort and encouragement of healthy sports activity. Asthma and allergic rhinoconjunctivitis should never interfere with healthy sports activity.

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