

GASTROINTESTINAL DISTURBANCES IN MARATHON RUNNERS

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ABSTRACT

The purpose of this survey was to investigate the prevalence of running-induced gastrointestinal (GI) disturbances in marathon runners. A questionnaire was completed by 471 of the estimated 1,750 competitors in the 1986 Belfast City Marathon. Eighty-three per cent of respondents indicated that they occasionally or frequently suffered one or more GI disturbances during or immediately after running. The urge to have a bowel movement (53%) and diarrhoea (38%) were the most common symptoms, especially among female runners (74% and 68% respectively). Upper GI tract symptoms were experienced more by women than men ($p < 0.05$) and more by younger runners than older runners ($p < 0.01$). Women also suffered more lower GI tract symptoms than men ($p < 0.05$) with younger runners showing a similar trend. Both upper and lower tract symptoms were more common during a "hard" run than an "easy" run ($p < 0.01$) and were equally as common both during and after running. Of those runners who suffered GI disturbances, 72% thought that running was the cause and 29% believed their performance to be adversely affected. There was no consensus among sufferers as to the causes of symptoms and a wide variety of "remedies" were suggested. GI disturbances are common amongst long-distance runners and their aetiology is unknown. Medical practitioners should be aware of this when dealing with patients who run.

Key words: Gastrointestinal disturbances, Running, Marathon.

INTRODUCTION

Gastrointestinal (GI) disturbances are commonly experienced by people who run, "Runner's Trots" being a well-known phrase amongst the running fraternity. It refers to the watery diarrhoea that can afflict runners during, or immediately after, running (Fogoros, 1980). Recent surveys (Sullivan, 1981; Keeffe et al, 1984; Priebe and Priebe, 1984; Worobetz and Gerrard, 1985; Sullivan, 1987) have documented the prevalence of this and other symptoms amongst endurance athletes in several different populations (Table I).

Sullivan (1981), in a study of Canadian runners ($n = 57$), reported a high incidence of heartburn, nausea, abdominal pain, the urge to have a bowel movement, fluctuations in appetite and diarrhoea. Keeffe and co-workers studied American marathon runners ($n = 707$) and discovered a similar range of symptoms (Keeffe et al, 1984). In addition

they found that lower GI tract problems were more common than upper GI tract problems, that females and younger runners had a higher frequency of symptoms, and that symptoms were more likely to occur during or after a "hard" run, than during or after an "easy" run. Worobetz and co-workers discovered a similar range of disturbances among participants in a New Zealand endurance event ($n = 70$) which included swimming, cycling, canoeing and running (Worobetz and Gerrard, 1985). In a recent survey of triathletes ($n = 110$), Sullivan (1987) noted a greater prevalence of GI symptoms while running than while cycling or swimming.

The sports medicine and sports science literature contains little information concerning the adverse GI symptoms of running. That which exists, while recognising that runners can suffer GI problems, is highly speculative in terms of causes and remedies, and, while the metabolic, renal, cardiovascular and pulmonary responses to exercise have been thoroughly researched (Åstrand and Rodahl, 1986), we have limited knowledge of the effects of exercise on GI function. The purpose of this survey was to investigate the prevalence of adverse GI symptoms in a population of marathon runners.

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TABLE I

Frequency of gastrointestinal symptoms in five studies. Results are expressed as a percentage of respondents who suffer each symptom

Population Studied	n	Loss of Appetite	Heartburn	Nausea	Vomiting	Abdominal Cramps	Urge for Bowel Movement	Diarrhoea	
Sullivan (1981)	Recreational and competitive runners	57	50	10	6	6	25	30	25
Keeffe et al (1984)	Marathon runners	707		9.5	11.6	1.8	19.3	36.7	19.2
Worobetz et al (1985)	Quadrathletes (swim/cycle/canoe paddle/run)	70	30	11	20	6	39	24	14
Sullivan (1987)	Triathletes	110		24*		24†	35		49‡
Present study (1986)	Marathon runners	471	28	13	20	4	31	42	27

* described as gastroesophageal reflux

† nausea or vomiting

‡ urge for bowel movement or diarrhoea

MATERIALS AND METHODS

The study surveyed participants in the 1986 Belfast City marathon. All entrants were sent a questionnaire in their final information pack together with a covering letter outlining the purposes of the survey. It was explained to the runners that the survey was designed to investigate the effects of long-distance running on the gastrointestinal system. Participants were encouraged to complete the questionnaire and return it at the race venue prior to the run. On the day of the race as many runners as possible who had failed to complete the questionnaire were handed an extra copy as they entered the changing area and asked to complete it.

The questionnaire addressed two main areas. Firstly, a personal profile was sought in respect of age, sex, running experience, weekly training mileage, best marathon time and dietary habits. Secondly, the frequency of a range of GI symptoms was sought relating to three running situations, i.e. during an "easy" run, during a "hard" run and after a run. Symptoms investigated were loss of appetite, nausea, vomiting, heartburn, abdominal cramps, darkened urine, the urge to have a bowel movement and diarrhoea. Darkened urine is a renal tract problem but it is included here for completeness, as many runners do experience the symptom. The information sought was an estimate, by the athletes, of the frequency of occurrence of each symptom in the three running situations by answering "never", "rarely", "occasionally" or "frequently". It was made clear to runners that questions referred to running in general and not just to competitive racing. Asking for the percentage of runs during which symptoms occurred, or specifying a time period for occurrence, were rejected as many runners report that symptoms occur in phases, making such fine detail difficult to quantify.

Runners' responses were considered to be negative ("never" and "rarely") or positive ("occasionally" and "frequently") for purposes of data analysis. The percentage of sufferers of each symptom was calculated by summation of the positive responses and division by the total number of responses to that question. Additional information was sought as to whether respondents felt that their performance was affected and the type of remedies, if any, that were employed to combat them.

Chi-square analysis was used to compare the frequency of each symptom in the various running situations and to compare differences between age and sex groups. Additionally, results were compared in terms of weekly training mileage, best marathon time and running experience with runners being placed in "high" and "low" groups either side of the mean value. Results were considered statistically significant at the five per cent level.

RESULTS

Questionnaires were received from 536 of the estimated 1,750 runners. Sixty-five were rejected as being incomplete, leaving a total of 471, a response rate of 27%. Four hundred and thirty-three respondents (92%) were male, 38 (8%) were female. The demographic and athletic profile of the sample is given in Table II. Figs. 1 and 2 give the prevalence of upper and lower GI tract symptoms experienced during "easy" and "hard" runs, and after running. Overall, the urge to have a bowel movement was the most common symptom experienced (53%), with diarrhoea being experienced by 38%. The urge to have a bowel movement or diarrhoea was experienced by 58% of respondents

during or after running. Symptoms were more frequently experienced during a hard run than an easy run ($p < 0.01$) and were as frequent after running as during running.

TABLE II
Demographic and athletic profile of 471 marathon runners

	Mean Age n	Mean Age Yrs. (\pm S.D.)	Mean Running Experience Yrs. (\pm S.D.)	Mean Weekly Training Mileage Miles (\pm S.D.)	Mean Best Marathon time Mins. (\pm S.D.)
Males	433	35 (\pm 10)	5.7 (\pm 5.4)	37 (\pm 16)	211 (\pm 31)
Females	38	31 (\pm 7)	3.4 (\pm 2.5)	35 (\pm 12)	244 (\pm 37)
All	471	34 (\pm 10)	5.5 (\pm 5.3)	36 (\pm 15)	214 (\pm 33)

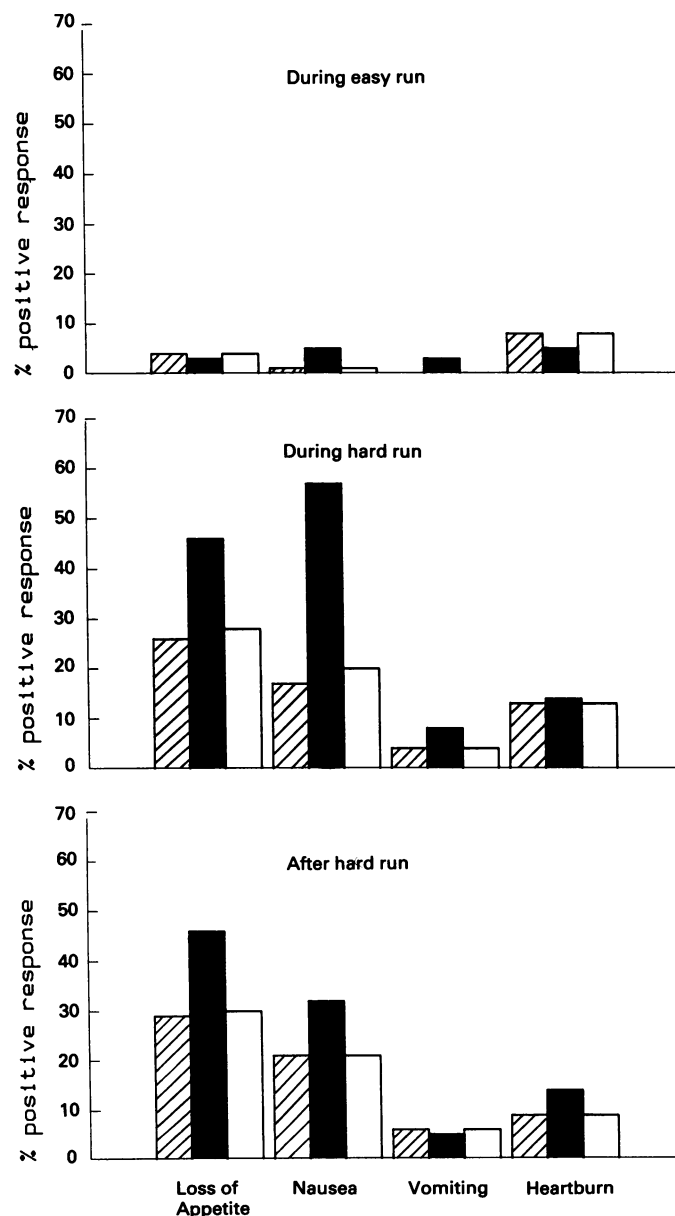


Fig. 1: Frequency of upper gastrointestinal tract symptoms in 471 marathon runners (433 male, 38 female). Bars represent the percentage of respondents answering positively for each symptom.

▨ Male ■ Female □ All runners

Lower GI tract symptoms (abdominal cramps, dark urine, diarrhoea, the urge to have a bowel movement) were more common than upper tract symptoms (nausea, loss of

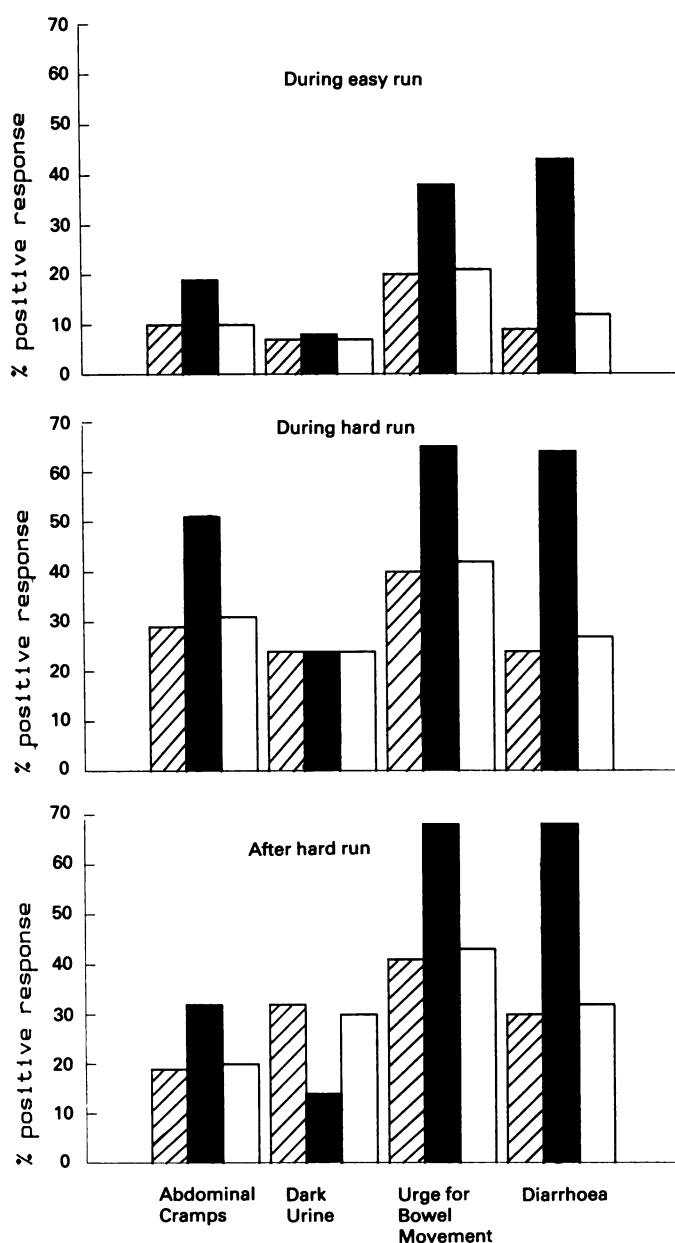


Fig. 2: Frequency of lower gastrointestinal tract symptoms in 471 marathon runners (433 male, 38 female). Bars represent the percentage of respondents answering positively for each symptom.

▨ Male ■ Female □ All runners

appetite, vomiting, heartburn). Seventy-four per cent of respondents indicated that they suffered from one or more lower tract symptom, 56% from one or more upper tract symptom. Seventeen per cent of respondents were asymptomatic, i.e. they never, or rarely, suffered any adverse GI symptom associated with running.

Of the 38 female respondents in this study only 2 (5%) were asymptomatic. Seventy-six per cent of females suffered one or more upper GI tract symptom, and 87% suffered one or more lower GI tract symptom. The urge to have a bowel movement was experienced by 74% of females and diarrhoea by 68%. Seventy-six per cent of female runners suffered the urge to have a bowel movement or diarrhoea during or after a run (46% "frequently"). With the exception of dark urine, all symptoms were experienced by a greater percentage of women than of men, with loss of appetite ($p < 0.05$), nausea ($p < 0.01$), abdominal cramps ($p < 0.05$), the urge to have a

bowel movement ($p < 0.05$) and diarrhoea ($p < 0.01$) being statistically significant. Younger runners (< 34 years) suffered more frequently from loss of appetite ($p < 0.01$), nausea ($p < 0.01$) and abdominal cramps ($p < 0.05$). They also tended to suffer more from the urge to have a bowel movement and diarrhoea. Less experienced runners (< 5.5 years running experience) suffered more frequently from the urge to have a bowel movement ($p < 0.05$) than more experienced runners. Runners who performed larger weekly training mileages (> 37 miles/week) more frequently experienced darkened urine ($p < 0.01$) than those with lower training mileages. Better runners, i.e. those with a best marathon time below 3 h 34 min, suffered more from vomiting ($p < 0.05$) than poorer runners.

Of those runners who suffered GI disturbances (391 respondents), 283 (73%) thought that running was the cause. The most common strategies to combat the symptoms were to run in the fasted state (35%) and to ensure having a bowel movement before the run (20%). Twenty-six per cent took no avoiding actions. Twenty-nine per cent of sufferers thought that GI symptoms adversely affected their training or competitive performance and 3 runners volunteered information that they had passed blood in the urine.

There was little consensus among respondents regarding the causes of GI symptoms. Anecdotal information suggested that nerves and diet were perceived as possible causes. Various substances were taken in an attempt to control the symptoms. These included kaolin and morphine, antacid tablets, diarrhoea tablets, coedine phosphate and hot drinks. Other "remedies" included decreasing fibre in the diet, relaxation, eating breakfast slowly, training on grass surfaces, ensuring good footwear, not "pushing yourself too hard" and the inclusion of sit-ups in training.

DISCUSSION

The data obtained in this study needs careful analysis for several reasons. Firstly, runners suffering from GI disturbances may be more likely to respond than those who do not experience such symptoms. To encourage as many runners as possible to reply, all runners competing in the race were sent a questionnaire. Before the race questionnaires were handed out at the entrance to the changing rooms, notices were posted reminding runners of the survey and frequent requests were made via the public address system. However, it remains an acknowledged problem of the use of questionnaires that sufferers may be more likely to respond. Secondly, estimation of baseline GI symptoms were not sought, although it was made clear that questions referred to running-induced symptoms as opposed to pre-existing GI disturbances. Thirdly, the study only applies to running. Other endurance events (walking, cycling, swimming) might yield different results. Despite these reservations, we feel that the size of sample in this study, the careful wording of the questionnaire and the weight of additional anecdotal evidence offered by runners, suggests that a substantial problem does exist.

Table I compares our findings with those of four other studies that have investigated similar problems in different populations. Trends for individual symptoms are remarkably similar, with lower bowel dysfunction being the most common symptom. Additionally, our findings that female and younger runners are more prone to suffer support previous findings (Keeffe et al, 1984).

The widespread variation in the age and ability of the runners in this study allows a more complete picture of the incidence of running-induced GI symptoms to emerge. By allowing the runners themselves to decide what was an easy or hard run we aimed to produce a more even interpretation of symptoms across the group. It is not surprising that upper GI symptoms are infrequent during an easy run. However, lower GI symptoms are surprisingly frequent during an easy run with 10% of all runners experiencing diarrhoea. The finding that symptoms occur more frequently during or after a hard run than an easy run suggests an effect of exercise load. However, it should be remembered that a "hard" run might refer to either increased duration or increased intensity. Some runners can identify a time or a distance when symptoms are most likely to occur, whereas others indicate that it is "how hard they push themselves" that determines whether or not the symptoms occur.

It is interesting that younger runners have more anorexia and nausea, while those with less running experience have a more frequent urge to have a bowel movement. It may be that they run harder, or do not adapt to training as completely as older, more experienced athletes. It would be valuable to know the frequency of symptoms in subjects new to running compared with "veteran" runners and to determine the effects of both increased duration and intensity of training on symptoms.

Although direct comparison of sex groups is made difficult by the large difference in sample size (38 women, 433 men), it is nevertheless interesting to note the marked differences seen in this study. The fact that only 2 out of 38 female runners never or rarely suffer these symptoms suggests to us that a sex difference does exist, especially in terms of lower bowel dysfunction. It is accepted that abdominal discomfort can be caused by the menstrual cycle, but the frequency of symptoms seen in this study is too great to be attributable totally to this cause.

A review of the literature on running-induced GI disturbances provides little insight to their aetiology, although some authors have speculated on the subject. Mechanical causes may be involved, with the constant pounding motion of running causing internal damage (Blacklock, 1977; Dawson et al, 1985). Alternatively, hypertrophy of the psoas muscle may cause it to press against the colon, stimulating increased motility and defaecation (Porter, 1982). Haemodynamic mechanisms may play a part as blood is shunted away from the gut to the working muscles during exercise (Rowell, 1974). If the gut became ischaemic, fluid reabsorption may be disrupted, causing diarrhoea (Newsholme and Leech, 1983).

Exercise is known to raise plasma levels of some GI hormones (Brandsborg et al, 1978; Hilsted et al, 1980; Sullivan et al, 1984; Riddoch et al, 1987) and as a number of these hormones are potent diarrhoeal agents there is the possibility of a neuroendocrine cause. In particular, increased gastrin levels may produce gastric dysfunction and motilin and vasoactive intestinal polypeptide (VIP) may cause increased lower bowel motility and diarrhoea. It has also been shown that gut ischaemia raises levels of VIP (Modlin et al, 1978), but whether levels would be high enough to cause diarrhoea remains uncertain.

Raised plasma levels of prostaglandins may cause a variety of GI symptoms and marathon running has been found to cause levels to rise (Demers et al, 1981). Many runners take non-steroidal anti-inflammatory agents,

especially aspirin, before running and these are known to ameliorate the effects of prostaglandins. However, this form of medication can itself cause loose motions and faecal blood loss (Robertson et al, 1987). Finally, excess oral vitamin C, routinely taken by some athletes, can cause diarrhoea (Hoyt, 1980).

CONCLUSIONS

The findings of this survey are in broad agreement with other, similar studies, indicating that GI disturbances amongst long-distance runners are a widespread problem. The causes of such symptoms are unknown and until they are discovered we cannot prescribe effective remedies for those who suffer. The sports science literature contains only speculative information, and further research is needed to investigate the effects of exercise on the functioning of the GI tract. Given that one-third of the sufferers in this study considered their training or competitive performance to be affected adversely by GI disturbances, we feel that this is an important area of future research.

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