



Original research

Reasons and predictors of discontinuation of running after a running program for novice runners



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ABSTRACT

Objectives: To determine the proportion of participants of a running program for novice runners that discontinued running and investigate the main reasons to discontinue and characteristics associated with discontinuation.

Design: Prospective cohort study.

Methods: The study included 774 participants of Start to Run, a 6-week running program for novice runners. Before the start of the program, participants filled-in a baseline questionnaire to collect information on demographics, physical activity and perceived health. The 26-weeks follow-up questionnaire was used to obtain information on the continuation of running (yes/no) and main reasons for discontinuation. To determine predictors for discontinuation of running, multivariable logistic regression was performed.

Results: Within 26 weeks after the start of the 6-week running program, 29.5% of the novice runners ($n = 225$) had stopped running. The main reason for discontinuation was a running-related injury ($n = 108$, 48%). Being female (OR 1.74; 95% CI 1.13–2.68), being unsure about the continuation of running after the program (OR 2.06; 95% CI 1.31–3.24) and (almost) no alcohol use (OR 1.62; 95% CI 1.11–2.37) were associated with a higher chance of discontinuation of running. Previous running experience less than one year previously (OR 0.46; 95% CI 0.26–0.83) and a higher score on the RAND-36 subscale physical functioning (OR 0.98; 95% CI 0.96–0.99) were associated with a lower chance of discontinuation.

Conclusions: In this group of novice runners, almost one-third stopped running within six months. A running-related injury was the main reason to stop running. Women with a low perceived physical functioning and without running experience were prone to discontinue running.

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1. Introduction

Worldwide, the number of people with overweight and obesity has more than doubled between 1980 and 2013.¹ This is mainly due to changes in diet and a more sedentary lifestyle.²

An increasing number of people have sedentary jobs, resulting in less physical activity during the day.³ Moreover, in most European countries sports participation rates have remained the same since the 1990s and in some countries the rates have even decreased.⁴ In response to this general sedentary behavior, many sport promotion programs have been started in European countries.⁵ However, a common problem among novice sport participants is the high rate of discontinuation.^{6,7}

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Running is an accessible type of sport, because it is inexpensive and can be done when and where one likes.^{8,9} Moreover, many running events and running programs for novice runners are available that stimulate people to start running.¹⁰ However, for a healthy and active lifestyle it is important that novice runners not only run during the preparation for a running event or during a running program, but they also continue running after such an event or program. Among recreational runners participating in a running event, about 50% have stopped running by 10 years after the event.¹¹ In novice runners, 16% have stopped running after 180 days and 27% after 270 days.¹² However, little is known about the percentage of novice runners that continue running after participating in a running program. To prevent discontinuation of running in the future, more insight is required into the proportion and characteristics of novice runners that have stopped running.

In the Netherlands, a supervised running promotion program, 'Start to Run', is organized twice a year by the Dutch Athletics Federation at different locations throughout the Netherlands. During the Start to Run program, novice runners can participate in one group training and in one or two individual training sessions per week. In 2013, the ultimate goal of Start to Run was to be able to run for 20 min without breaks after six weeks training. An earlier study showed that 69% of the participants of this program were still running after six months.¹³ However, this latter study had only 100 participants, and the main reasons for discontinuation and characteristics that make novice runners prone to stop are unknown. Therefore, the aims of the present study were to determine the proportion of participants of Start to Run that discontinued running and to determine the main reasons for stopping and the characteristics associated with discontinuation of running.

2. Methods

Potential participants of this study were novice runners (aged 18–65 years) who signed up for the Start to Run program in March or September 2013. Runners willing to participate were asked to sign digital informed consent and complete the baseline questionnaire one week before the program started. A follow-up questionnaire was sent to the participants 26 weeks later (i.e. 20 weeks after Start to Run ended). The present study is part of the NLStart2Run-study¹⁴ and was approved by the Medical Ethical committee (No. 2012/350) of the University Medical Center Groningen.

The first section of the baseline questionnaire collected data on demographics (sex, date of birth, height and weight). Body mass index (BMI) was calculated from weight and height. Regarding lifestyle, participants were asked if they smoked (yes/no/used to) and how often they drank alcohol. For the analyses, alcohol use was categorized into three categories: (i.) less than once a month, (ii.) between once a month and three times a week, and (iii.) more than three times a week. The next section included questions on physical activity. Physical activity in daily life was assessed with the Short Questionnaire to Assess Health-enhancing Physical Activity (SQUASH),¹⁵ where a higher score indicates more physical activity in daily life. Previous sport experience was established by asking about earlier running experience (yes/no; if yes, more or less than one year ago) and structural experience with other sports (yes/no). This section also asked about earlier running-related injuries (yes/no) defined as an injury to the feet, legs or lower back in the past that was caused by running, and other musculoskeletal complaints (yes/no). Finally, the participants were asked if they intended to continue running after the Start to Run program (yes/maybe/no). In the last section of the baseline questionnaire the participants' motivation to exercise was obtained with the Behavioral Regulation in Exercise Questionnaire-2 (BREQ-

2).¹⁶ Using the scores on the five subscales, the relative autonomy index (RAI) was calculated with a higher RAI score indicating a higher level of intrinsic motivation. Perceived health was administered with the Dutch version of the RAND 36-item Health Survey (RAND-36), which was translated from the standardized SF-36 Health Survey.¹⁷ Only the scores on the subscales physical fitness, mental health, vitality and general health (range 0–100, with a higher score indicating a better perceived health) were used in the present study.

The 26-week follow-up questionnaire obtained information on the continuation of running. Runners were asked if they were still structurally running (with no specific definition on running distance or frequency). Participants who were still running were asked for the main reason to continue running, their way of running (alone/in a group) and how much time they currently spent on running during one week (minutes). The participants who discontinued running were asked what was their main reason to stop running (no time/running is not the preferred sport/health issues/running-related injury/other injury/other reasons) and if they intended to start running again in the future (yes/no).

Differences in baseline characteristics between the participants who did and did not fill in the follow-up questionnaire were analyzed with the independent t-test, Mann-Whitney U test or chi-square test. For participants who filled-in the follow-up questionnaire and were therefore included in the analyses, descriptive statistics [frequencies and percentages for categorical data; mean and standard deviation (SD) for numeric data] were calculated for both the baseline and follow-up measures. Univariate logistic regression analysis was performed to test the univariate associations between the separate predictors and the outcome (i.e. discontinuation of running). To determine predictors for discontinuation, multivariable logistic regression analysis (enter method) was performed, with discontinuation of running as dependent variable and the baseline variables as independent variables. A p-value ≤ 0.05 was considered statistically significant. All analyses were performed with SPSS Statistics version 21.

3. Results

Of the 7660 novice runners that signed up for Start to Run in March and September 2013, 1936 runners were included in the NLStart2Run-study (Fig. 1). The 26-week follow-up questionnaire was filled in by 774 participants (43.7%). Three participants did not indicate whether they were still running and were excluded from the present analyses. Compared with the participants who did not fill in the follow-up questionnaire, participants who filled in the follow-up questionnaire were on average more frequently male (24.9% vs. 19.3%, $p=0.005$), older (44.6 (10.1) vs. 42.1 (9.9) years, $p<0.001$), had a lower BMI (25.3 (3.7) vs. 25.8 (4.3) $\text{kg}\cdot\text{m}^{-2}$, $p=0.034$) and a higher score on the RAND-36 subscales mental health (74.7 (15.1) vs. 72.8 (16.1), $p=0.012$), vitality (62.3 (17.3) vs. 60.4 (18.1), $p=0.024$) and general health (72.2 (15.6) vs. 69.4 (17.3), $p=0.001$). Furthermore, the participants who filled in the follow-up questionnaire more often had earlier experience with running (43.2% vs. 36.8%, $p=0.002$) and other sports (46.9% vs. 39.9%, $p=0.003$) and reported that they had more frequently had a running-related injury in the past (20.3% vs. 15.1%, $p=0.005$).

At baseline, the average age of the participants included in the analyses was 44.6 (SD 10.1) years and the majority was female (75.0%) (Table 1). Most participants had no previous running experience (56.8%) and 53.1% had never participated in other sports. Furthermore, 79.6% of the participants reported no history of running-related injuries, while the majority reported no history of other musculoskeletal complaints (64.0%).

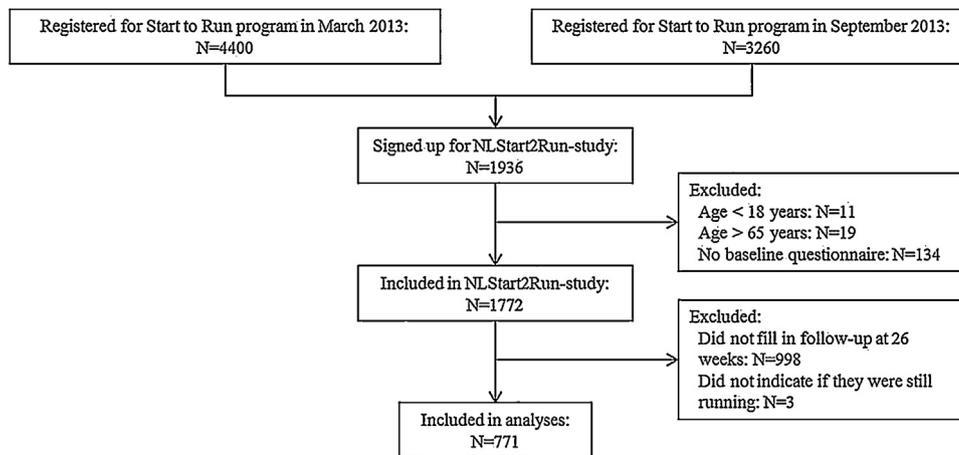


Fig. 1. Flowchart of the participants.

Table 1
Frequencies and percentages or means and standard deviations (SD) of the baseline characteristics.

	All participants		Continued running		Stopped running	
	N	%/Mean (SD)	N	%/Mean (SD)	N	%/Mean (SD)
Sex	771		546	70.5%	225	29.1%
Male	192	24.9%	151	27.7%	41	18.2%
Age (years)		44.6 (10.1)		44.7 (10.1)		44.3 (10.0)
BMI (kg.m ⁻²) ^a		25.3 (3.7)		25.1 (3.6)		25.6 (4.1)
Running experience						
No	437	56.7%	300	54.9%	137	60.9%
Yes, more than one year ago	215	27.9%	151	27.7%	64	28.4%
Yes, less than one year ago	119	15.4%	95	17.4%	24	10.7%
Earlier running injury						
Yes	157	20.4%	113	20.7%	44	19.6%
Participating in other sports						
Yes	360	46.7%	257	47.1%	103	45.8%
Earlier musculoskeletal complaints						
Yes	277	35.9%	188	34.4%	89	39.6%
Intended to continue running						
Yes	660	85.6%	483	88.5%	177	78.7%
Maybe	110	14.3%	62	11.4%	48	21.3%
No	1	0.1%	1	0.2%	0	0.0%
Smoking						
Yes	58	7.5%	42	7.7%	16	7.1%
No, but used to	298	38.7%	213	39.0%	85	37.8%
No, never did	415	53.8%	291	53.3%	124	55.1%
Alcohol use						
(Almost) none	203	26.3%	128	23.4%	75	33.3%
Maximally 3 times per week	448	58.1%	336	61.5%	112	49.8%
>3 times per week	120	15.6%	82	15.0%	38	16.9%
SQUASH questionnaire ^b						
Total score		6403 (3511)		6381 (3584)		6455 (3335)
RAND-36 questionnaire ^c						
Physical functioning		92.0 (10.4)		92.9 (9.1)		89.6 (12.6)
Mental health		74.7 (15.2)		75.8 (14.1)		72.1 (17.2)
Vitality		62.3 (17.3)		63.8 (16.0)		58.6 (19.7)
General health		72.2 (15.6)		73.2 (15.2)		69.5 (16.3)
BREQ-2 questionnaire						
RAI score ^d		11.4 (4.5)		11.5 (4.6)		11.3 (4.3)

^a BMI was missing for one participant.

^b A higher score indicates more physical activity in daily life.

^c A higher score indicates a better perceived health, scores missing for six participants.

^d Relative Autonomy Index, a higher score indicates more self-determination, score missing for six participants.

A total of 70.5% (n = 546) of the participants who started the Start to Run program continued running at 26 weeks. They ran on average 98.9 (SD 89.7) min/week and the majority (55.7%) ran in a group. Becoming healthier and fitter was the most frequently mentioned reason to continue running (n = 431, 78.9%). Other reasons were: to lose weight (n = 50, 9.1%), achieve an athletic goal (n = 47, 8.6%),

social contact (n = 14, 2.5%), fun (n = 13, 2.4%) and mental health (n = 9, 1.6%).

In total 225 participants (29.1%) stopped running within 26 weeks. A running-related injury was the most frequently reported (n = 108; 48.0%) reason to stop running. Other reasons were an injury not related to running (n = 26, 11.6%), no time (n = 26, 11.6%), running is not the preferred sport (n = 31, 13.8%), health issues

Table 2
Results of univariate and multivariable logistic regression analysis for discontinuation of running.

	Univariate analysis		Multivariable analysis	
	OR	95% CI	OR	95% CI
Sex				
Female	1.72**	1.17–2.53	1.68*	1.09–2.59
Age (years)	1.00	0.98–1.01	1.00	0.99–1.02
BMI (kg.m ⁻²)	1.04	0.99–1.08	1.04	0.99–1.09
Running experience				
No	Reference		Reference	
Yes, more than one year ago	0.93	0.65–1.32	0.96	0.62–1.51
Yes, less than one year ago	0.55*	0.34–0.90	0.54*	0.30–0.98
Earlier running injury				
Yes	0.93	0.63–1.38	1.20	0.71–2.02
Participating in other sports				
Yes	0.95	0.70–1.30	1.02	0.71–1.45
Earlier musculoskeletal complaints				
Yes	1.17	0.85–1.59	1.07	0.76–1.51
Intended to continue running				
Yes	Reference		Reference	
Maybe	2.11**	1.40–3.20	2.06**	1.31–3.24
No	0.00	0.00–0.00	0.00	0.00–0.00
Smoking				
No	Reference		Reference	
No, but used to	0.94	0.68–1.30	0.89	0.46–1.71
Yes	0.85	0.48–1.65	0.96	0.67–1.38
Alcohol use				
(Almost) none	1.76**	1.23–2.51	1.61*	1.10–2.36
Maximally 3 times a week	Reference		Reference	
>3 times a week	1.39	0.90–2.16	1.61	0.99–2.62
SQUASH questionnaire				
Total score	1.00	1.00–1.00	1.00	1.00–1.00
RAND-36 questionnaire				
Physical functioning	0.97**	0.96–0.99	0.98*	0.96–1.00
Mental health	0.99**	0.98–1.00	1.00	0.98–1.01
Vitality	0.98**	0.97–0.99	0.99	0.98–1.00
General health	0.99**	0.98–1.00	0.99	0.98–1.01
BREQ-2 questionnaire				
RAI score ^a	0.99	0.96–1.03	1.03	0.99–1.07

* P < 0.05.

** P < 0.01.

^a Relative Autonomy Index.

(n = 29, 12.9%) and other reasons (n = 5, 2.2%). Of the runners that stopped running, 72% indicated that they intended to start running again in the future. This applied, in particular, to the runners who stopped running because of health issues (82.8%) or because they had no time (96.2%).

Univariable logistic regression analyses showed that being female (OR 1.72; 95% CI 1.17–2.53), being unsure about continuation of running after the Start to Run program (OR 2.11; 95% CI 1.40–3.20) and (almost) no alcohol use compared to alcohol use maximally three times per week (OR 1.76; 95% CI 1.23–2.51) were associated with a higher chance of discontinuation of running (Table 2). Previous running experience less than one year ago (OR 0.55; 95% CI 0.34–0.90), and a higher score on the RAND-36 subscales physical fitness (OR 0.97; 95% CI 0.96–0.99), mental health (OR 0.99; 95% CI 0.98–1.00), vitality (OR 0.98; 95% CI 0.97–0.99) and general health (OR 0.99; 95% CI 0.98–1.00) were associated with a lower chance of discontinuation. The multivariable logistic regression model showed that being female was associated with a higher chance of discontinuation than being male (OR 1.68; 95% CI 1.09–2.59) (Table 2). Previous running experience less than one year ago was associated with a lower chance of stopping compared to no previous running experience (OR 0.54; 95% CI 0.30–0.98). Furthermore, (almost) no alcohol use was associated with a higher chance of discontinuation than alcohol use maximally three times per week (OR 1.61; 95% CI 1.10–2.36). Also, being unsure about continuation of running after the Start to Run program was associated with a higher chance of discontinuation than wanting to continue running (OR 2.06; 95% CI 1.31–3.24). Finally, a higher score

on the RAND-36 subscale physical functioning was associated with a lower chance of discontinuation (OR 0.98; 95% CI 0.96–1.00).

4. Discussion

This study aimed to determine the proportion of participants of the Start to Run-program that discontinued running and to investigate the main reasons to stop running and the characteristics associated with discontinuation. The results showed that 29.5% of the novice runners had stopped running 26 weeks after the start of a 6-week running course. The main reason to stop was a self-reported running-related injury. Being female, being unsure about continuation of running after the Start to Run program and (almost) no alcohol use were associated with a higher chance of discontinuation of running. Previous running experience less than one year ago and a higher score on the RAND-36 subscale physical functioning were associated with a lower chance of discontinuation.

The proportion of runners that stopped running (29.5%) six months after the Start to Run program started is comparable to the proportion reported by Ooms et al. (31%).¹³ However, both studies had a high loss to follow-up (56% and 43%, respectively), which possibly caused selection bias. In the present study the group of participants who filled in the follow-up questionnaire included significantly older runners and more males compared with the group of participants who did not fill in the follow-up questionnaire. Furthermore, the runners that filled in the follow-up questionnaire had more previous experience with running and other sports and perceived themselves to be physically fitter (higher RAND scores).

Additionally, it is likely that participants who were still running were more inclined to fill in the follow-up questionnaire than participants who stopped running. Therefore, in the present study the high loss to follow-up may have led to an underestimation of the discontinuation of running. Consequently, it seems that at least one-third of the participants of a running course for novice runners stops running within 26 weeks. However, the goal of both the Start to Run program and of most participants was to continue running after the program. Therefore, these findings emphasize the need for measures to prevent discontinuation from running among novice runners.

A running-related injury incurred during the program or follow-up was the main reason to stop running. Since about half of the participants stopped running due to a running-related injury, injuries seem to be a considerable problem among novice runners. This is previously confirmed in other studies showing injury proportions in novice runners ranging from 7.8 to 84.9%.^{18,19} Although it cannot be retrieved from the data of the current study, it seems unlikely that everyone who stopped running because of an injury still suffers from this injury. It therefore seems hard to restart running again after an injury. In order to decrease the discontinuation, it seems therefore important to pay more attention to injury prevention and the restart of running after an injury. Running courses offer a good setting to inform novice runners about these topics. For example, they could be informed about important risk factors for running injuries and how to start running again after an injury. However, more research on the prevention of injuries is necessary. Although several risk factors for running-related injuries have been identified^{20,21} no effective prevention program has been identified so far. This may be because the cause of running injuries is multifactorial while previous prevention studies have mainly focused on single risk factors.^{22,23}

One aim of the present study was to investigate characteristics associated with the discontinuation of running. Since about half of the participants who stopped running did so because of a running-related injury, it might be expected that the factors associated with discontinuation of running are similar to those associated with sustaining a running-related injury. However, additional analyses showed that this is not the case. Multivariate logistic regression analysis with only the participants who stopped because of reasons other than a running-related injury yielded results similar to those including all participants.

In the present study (almost) no alcohol use was associated with a higher chance of discontinuation. However, the underlying mechanism behind this possible association is unclear. Alcohol use was included as a lifestyle factor of participants. Perhaps, alcohol use is a proxy variable for a non-measured variable in the present study, and not for lifestyle, since the opposite would have been expected.

It is interesting that no association was found between the answers on the BREQ-2 questionnaire and the discontinuation of running. The BREQ-2 was designed to measure motivation toward exercise¹⁶ and we expected that this motivation would influence the continuation of running. The reason that no association was found may be due to the small variance in the scores on the BREQ-2 between the participants. However, being unsure about the continuation of running after the Start to Run program was associated with a higher chance of discontinuation than intending to continue running. Therefore, one single question about the intention of running seems a better indicator for the motivation toward running than the BREQ-2 questionnaire.

In response to the increasing rates of sedentary behavior and obesity, physical activity is being promoted worldwide.⁵ Running is an accessible form of physical activity and is seen as one of the most efficient ways to improve the physical fitness.²⁰ In the present study, the main reason to continue running was 'to become healthier and fitter', indicating that participants were aware of the

health benefits of increasing physical activity levels. However, continuation of physical activity in health promotion programs is a challenge. Discontinuation and drop-out are also high in lifestyle programs.^{24,25} Studies on compliance and dropout in lifestyle programs have identified many different predictors (e.g. BMI, age).^{25–27} However, there is no agreement between these studies regarding the predictors.²⁸ The discontinuation in lifestyle programs that included an exercise component was on average somewhat lower than that of the Start to Run program.²⁹ In these lifestyle programs the discontinuation ranged from 0 to 50%, with half of the programs having a discontinuation of less than 10%. The injury risk in the lifestyle programs is possibly lower than in the Start to Run program. Since the main reason for discontinuation after the Start to Run program was an injury, this may explain our higher discontinuation. Furthermore, the higher discontinuation may also be due to the duration of the Start to Run program (6 weeks) which is relatively short compared to that of lifestyle programs (4–72 months).²⁹ Therefore, increasing the length of the Start to Run program might result in a lower discontinuation.

The present study showed that especially women with low perceived physical functioning and without running experience are prone to stop running. To prevent discontinuation, it is important that trainers are aware that these participants are prone to drop-out from running. With this knowledge, trainers might adapt their programs for novice runners by for example paying more attention to these specific groups or by separating these participants into specific training groups that pay extra attention on the continuation of running after the program. Offering an attractive post-program may contribute in a positive way. Furthermore, it seems important to pay extra attention to perceived physical functioning, since a higher perceived physical functioning was associated with a lower chance of discontinuation. Novice runners with a low perceived physical functioning might be encouraged to increase their physical functioning before they participate in a running course (e.g. by improving physical fitness by walking). This, in turn, may lower the chance of discontinuation of these runners.

Strengths of this study include the large study population and the relatively long follow-up. A limitation is the considerable loss to follow-up, which might have caused underestimation of the discontinuation. Furthermore, different reasons to stop running may act as competing risks, which might have underestimated the percentage of participants who reported at follow-up to have stopped due to a running injury. Participants who stopped for reasons other than an injury, might have stopped because of an injury if the other causes had been absent. To address these two limitations, a time-to-event analysis that takes competing risks into account would have been ideal.³⁰ However, since the time points when runners actually stopped running were not recorded, such an analysis is not possible. Furthermore, recall bias could have influenced characteristics such as running history, injury history and previous sports participation. Also the self-reported continuation of running and injuries might have been influenced by differences in interpretation between runners. In future research clear definitions of running continuation and injuries should be provided to participants. Moreover, this study only included participants in a program for novice runners. However, there are also many runners that start running by themselves. The results of the present study mainly apply to novice runners participating in the Start to Run program.

5. Conclusion

This study showed that about one-third of the novice runners participating in a running program stopped running within six months. To decrease the discontinuation of running extra attention should be paid to injury prevention, both during running programs

and in future studies evaluating the effects of preventive measures for runners. Furthermore, precautions should be taken to prevent discontinuation of running among women with low perceived physical functioning and without prior running experience.

Practical implications

- Since the discontinuation among novice runners is high, measures are required to prevent discontinuation and dropout from running.
- Because running-related injuries are the most important reason to discontinue running, injury prevention among novice runners requires attention.
- Athletic trainers should be aware that especially women with low perceived physical functioning and without prior running experience are at increased risk to discontinue running.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.jsams.2018.06.003>.

References

1. Ng M, Fleming T, Robinson M et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; 384(9945):766–781.
2. Lau DC, Douketis JD, Morrison KM et al. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. *CMAJ* 2007; 176(8):S1–S13.
3. Church TS, Thomas DM, Tudor-Locke C et al. Trends over 5 decades in U.S. occupation-related physical activity and their associations with obesity. *PLoS One* 2011; 6(5):e19657.
4. Downward P, Lera-Lopez F, Rasciute S. The correlates of sports participation in Europe. *Eur J Sport Sci* 2014; 14(6):592–602.
5. Christiansen NV, Kahlmeier S, Racioppi F. Sport promotion policies in the European Union: results of a contents analysis. *Scand J Med Sci Sports* 2014; 24(2):428–438.
6. Muller-Riemenschneider F, Reinhold T, Nocon M et al. Long-term effectiveness of interventions promoting physical activity: a systematic review. *Prev Med* 2008; 47(4):354–368.
7. Robison JL, Rogers MA. Adherence to exercise programmes. Recommendations. *Sports Med* 1994; 17(1):39–52.
8. Buist I, Bredeweg SW, Lemmink KA et al. Predictors of running-related injuries in novice runners enrolled in a systematic training program: a prospective cohort study. *Am J Sports Med* 2010; 38(2):273–280.
9. Taunton JE, Ryan MB, Clement DB et al. A retrospective case-control analysis of 2002 running injuries. *Br J Sports Med* 2002; 36(2):95–101.
10. Buist I, Bredeweg SW, Bessem B et al. Incidence and risk factors of running-related injuries during preparation for a 4-mile recreational running event. *Br J Sports Med* 2010; 44(8):598–604.
11. Koplan JP, Rothenberg RB, Jones EL. The natural history of exercise: a 10-yr follow-up of a cohort of runners. *Med Sci Sports Exerc* 1995; 27(8):1180–1184.
12. Bertelsen ML, Rasmussen S, Nielsen RO. The impact of running injuries in relation to other reasons for discontinued running in novice runners. *Br J Sports Med* 2017; 51:296.
13. Ooms L, Veenhof C, de Bakker DH. Effectiveness of Start to Run, a 6-week training program for novice runners, on increasing health-enhancing physical activity: a controlled study. *BMC Public Health* 2013; 13:697.
14. Kluitenberg B, van Middelkoop M, Diercks RL et al. The NLstart2run study: health effects of a running promotion program in novice runners, design of a prospective cohort study. *BMC Public Health* 2013; 13:685.
15. Wendel-Vos GC, Schuit AJ, Saris WH et al. Reproducibility and relative validity of the short questionnaire to assess health-enhancing physical activity. *J Clin Epidemiol* 2003; 56(12):1163–1169.
16. Markland D, Tobin V. A modification to the behavioral regulation in exercise questionnaire to include an assessment of a motivation. *J Sport Exerc Psychol* 2004; 26(2):191–196.
17. Hays RD, Sherbourne CD, Mazel RM. The RAND 36-Item Health Survey 1.0. *Health Econ* 1993; 2(3):217–227.
18. Kluitenberg B, van Middelkoop M, Diercks R et al. What are the differences in injury proportions between different populations of runners? A systematic review and meta-analysis. *Sports Med* 2015; 45(8):1143–1161.
19. Van Ginckel A, Thijs Y, Hesar NG et al. Intrinsic gait-related risk factors for Achilles tendinopathy in novice runners: a prospective study. *Gait Posture* 2009; 29(3):387–391.
20. van der Worp MP, ten Haaf DS, van Cingel R et al. Injuries in runners: a systematic review on risk factors and sex differences. *PLoS One* 2015; 10(2):e0114937.
21. van Gent RN, Siem D, van Middelkoop M et al. Incidence and determinants of lower extremity running injuries in long distance runners: a systematic review. *Br J Sports Med* 2007; 41(8):469–480, discussion 80.
22. Bredeweg SW, Zijlstra S, Bessem B et al. The effectiveness of a preconditioning programme on preventing running-related injuries in novice runners: a randomised controlled trial. *Br J Sports Med* 2012; 46(12):865–870.
23. Buist I, Bredeweg SW, van Mechelen W et al. No effect of a graded training program on the number of running-related injuries in novice runners. *Am J Sport Med* 2008; 36(1):35–41.
24. Jiandani D, Wharton S, Rotondi MA et al. Predictors of early attrition and successful weight loss in patients attending an obesity management program. *BMC Obes* 2016; 3:14.
25. Batterham M, Tapsell LC, Charlton KE. Predicting dropout in dietary weight loss trials using demographic and early weight change characteristics: implications for trial design. *Obes Res Clin Pract* 2016; 10(2):189–196.
26. Hadziabdic MO, Mucalo I, Hrabac P et al. Factors predictive of drop-out and weight loss success in weight management of obese patients. *J Hum Nutr Diet* 2015; 28(Suppl 2):24–32.
27. Colombo O, Ferretti VV, Ferraris C et al. Is drop-out from obesity treatment a predictable and preventable event? *Nutr J* 2014; 13:13.
28. Moroshko I, Brennan L, O'Brien P. Predictors of dropout in weight loss interventions: a systematic review of the literature. *Obes Rev* 2011; 12(11):912–934.
29. Schwingshackl L, Dias S, Hoffmann G. Impact of long-term lifestyle programmes on weight loss and cardiovascular risk factors in overweight/obese participants: a systematic review and network meta-analysis. *Syst Rev* 2014; 3:130.
30. Nielsen RO, Malisoux L, Moller M et al. Shedding light on the etiology of sports injuries: a look behind the scenes of time-to-event analyses. *J Orthop Sports Phys Ther* 2016; 46(4):300–311.