



Do chronic disease and running background influence the motivation for breast cancer survivors to run?

Patxi León-Guereño¹ · Ewa Malchrowicz-Moško² · Oscar González Rodríguez³ · Garazi Yurrebaso Atutxa⁴ · Mateusz Rozmiarek⁵ · Jurgi Olasagasti-Ibargoiien¹ · Joanna Grupinska⁶ · Arkaitz Castañeda-Babarro¹

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Abstract

Purpose To try to understand the reasons why women who have overcome breast cancer run, and to consider the influence that health, running background and age have on their motivation for running.

Methods A total of 152 women amateur runners, all of them cancer survivors, completed an online survey comprised of 56 items from the motivations of marathoners' scales (MOMS). Moreover, athletes were asked about whether they were suffering from any another chronic disease (yes, no), and about their running history (runner prior to breast cancer or not).

Results The results showed that the main motives for these athletes to run are health-related, with the highest scores being evidenced in physical health dimensions. Our results also showed that those women who ran prior to detection of the disease obtained higher scores in five out of nine MOMS dimensions than those who reported not having run before being diagnosed with the disease.

Conclusion This study showed that breast cancer survivors place great importance on health motives with regard to running, and that running prior to detection of the disease influenced the motivation of the female runners.

Keywords Breast cancer · Running · Motivation · Chronic disease · Health · Running background

Introduction

Breast cancer affects more than a million women worldwide each year, being considered the most invasive cancer in women [1]. According to the latest report on malignant

neoplasms in Poland, this disease constitutes the second most common cause of death in the country after lung cancer, and even though there was a decline in breast cancer mortality from the mid-1990 s until 2010, the following years saw it increase by more than 16% [2], following the

✉ Patxi León-Guereño
patxi.leon@deusto.es
Ewa Malchrowicz-Moško
malchrowicz@awf.poznan.pl
Oscar González Rodríguez
oscargisl@gmail.com
Garazi Yurrebaso Atutxa
garaziurrebaso@deusto.es
Mateusz Rozmiarek
rozmiarek@awf.poznan.pl
Jurgi Olasagasti-Ibargoiien
jurgi.olasagasti@deusto.es
Joanna Grupinska
joanna.grupinska@wco.pl
Arkaitz Castañeda-Babarro
arkaitz.castaneda@deusto.es

¹ Health, Physical Activity and Sports Science Laboratory, Department of Physical Activity and Sports, Faculty of Education and Sport, University of Deusto, 48007 Bilbao, Spain
² Faculty of Physical Education, Józef Piłsudski University of Physical Education in Warsaw, Marymoncka 34, 00-968 Warsaw, Poland
³ Programa on Line Tescal, Donostia-San Sebastian, Spain
⁴ Department of Education, Faculty of Education and Sport, University of Deusto, 48007 Bilbao, Spain
⁵ Department of Sports Tourism, Faculty of Physical Culture Sciences, Poznan University of Physical Education, Krolowej Jadwigi 27/39, 61-871 Poznan, Poland
⁶ Poznan University of Medical Sciences, Chair and Department of Medical, Chemistry and Laboratory Medicine, 60-806 Poznań Greater Poland Cancer Center, 8 Rokietnicka Street, Poznan, Poland

same trend worldwide [3]. Although breast cancer is most often diagnosed in postmenopausal women, it may also affect premenopausal women and even men [4]. There has been an increased trend in women under 40 with breast cancer [5] making this fact particularly relevant. The risk factors influencing the incidence of breast cancer are manifold—among others, fertility, early first and late last menstruation, genetic burden, use of hormonal contraception, obesity, alcohol, diet low in fiber or diet rich in saturated fat [6]. In addition to the effects of diet on breast cancer risk [7], lifestyles are of great importance [8], with the practice of physical activity (PA) being a risk factor in cases where such activity is absent [9].

Even though cancer can be considered a chronic disease [10], cancer survivors can suffer from several chronic diseases that coexist, such as type 2 diabetes, asthma, osteoporosis, and comorbid chronic diseases, which might have an influence on these cancer survivors' psychological aspects [11]. Chronic diseases have been associated, among other things, with patients' fatigue [12] anemia [13] and also psychological variables or mental disorders [14]. For this reason, research work attempts to better understand the influence that chronic diseases have on cancer survivor patients [15]. Likewise, PA has been widely researched in relation to chronic diseases [16], and the benefits of PA during cancer survivorship have been shown in literature [17]. In fact, PA participation has been associated with cancer survivor patients' physical and mental wellbeing improvement [18]. Research also shows the important role of PA in the primary prevention of breast cancer [19–25]. However, it is sometimes difficult for the cancer survivor population to be encouraged to take up PA, as fears of pain and fatigue are very common [26], and the incidence of depression is two to three times higher in cancer survivors than in the general population [27]. Because of this difficulty, interventions have been proposed to increase and improve the PA of these patients [28], and health professionals should be aware about this importance [29]. Regular PA brings beneficial effects not only in the physical sphere, but also in mental and social relations [30]. Within PA, there are several sports which have been studied in context with breast cancer patients, such as dragon boat [31, 32], rowing [33] and cycling [34], although running or jogging, due to the ease with which it can be practiced, is one of the most representative in current society [35], and therefore needs to be considered. Given the importance of running within PA, and because of its beneficial effect, not only in terms of the physical aspects but also in other dimensions [36] some research has been associated with analyzing the benefit of running in breast cancer survivors [37–40]. Within this research, very diverse physical and physiological variables have been associated with these benefits, such as bone health [41] cellular immune system

and inflammatory processes [40], proving the importance of PA for these patients' health [42].

Breast cancer survivors' preferences in terms of exercise level and activity program have been studied [42]; however, psychological aspects related to PA in this population have not been properly studied [43], and there is a lack of information in this regard. Among the psychological variables, athletes' motivation has been widely analyzed in literature, [44]. In terms of properly analyzing motivation for running, the motivation of marathoners' scale (MOMS), developed by Masters et al. [45], proved to be an important step forward in this field [46]. This survey has been used to analyze athletes' motivation in relation to different endurance sports such as triathlon [47] and cycling [48], and in different sports contexts such as motivational differences between federated and not federated athletes [49]. According to studies conducted using MOMS, amateur athletes' motivation to run has been mostly associated with variables such as gender and age [50–55], with age being an important variable in relation to runners' performance [56] in terms of motivation for running [57, 58]. Other variables include number of years' running experience [46, 55], training habits [59] marital status [52], and older adult athletes' motives for running [50, 54]. Apart from these, variables associated with inactive people [60], those according to different distance [61] and those related to training volume [53, 55], or contextual variables such as running during the night [62], and the influence of living large cities or rural areas [63] may also be taken into account. Even though motivation to practice physical activity during cancer survivorship has been analyzed [18], little has been done to try and understand breast cancer survivor athletes' motives for running [43] and even less so in relation to other variables related to their health status and running background. Therefore, the motives for running among this special population remain unclear. The aim of this research is thus to try and better understand cancer survivor athletes' motives for running. We also wish to ascertain whether running prior to diagnosis of cancer and/or suffering from a chronic disease influences athletes' motivation.

Methods

Participants and study design

This study takes the form of descriptive, quantitative, cross-sectional research, in which 152 women runners (aged 46.49 ± 7.83), all of them breast cancer survivors, completed an online survey, and provided written informed consent for participation in the survey. All participants were amateur runners who had suffered from breast cancer and only women of legal age participated.

Measurements

Participants were asked about some socio-demographic variables related to their running experience [46]: their running history (runner prior to breast cancer or not), age and their health status (chronic disease or not). The previous running history of the participants was operationalized as a nominal variable with two response categories: running prior to breast cancer detection (1) or not running prior to breast cancer detection (2). We also wanted to know whether they were suffering from a chronic disease, which was defined as a persistent and recurring health problem, with a duration measured in months and years [64]. e.g., diabetes, asthma, osteoporosis, etc. This variable also became a nominal variable with two response categories: having chronic disease (1) or not having chronic disease (2). The motivation of marathoners' scales (MOMS) was used, this being originally created by Master et al. [45], and adapted to the Polish version by Dybała [65]. The questionnaire comprises nine dimensions which are divided into four groups of motivational dimensions: physical health with two dimensions (general health orientation, weight concern), social motives with two dimensions (affiliation, recognition), achievement motives with two dimensions (competition, personal goal achievement), and psychological motives, comprising three dimensions (psychological coping, self-esteem, life meaning). The questionnaire consists of 56 items using a 7-point Likert scale, with seven being the highest score and one referring to the least important reasons for jogging. The reliability coefficients obtained in our sample ranged from 0.67 for the *health orientation* dimension to 0.88 for the *Competition* dimension.

Procedure

The questionnaire was sent to all Amazonkas patients' organizations comprising patients who had been previously diagnosed with breast cancer in the Greater Poland region and Poznan city, and the online survey package used was Google Forms technology [66]. All the participants were provided with detailed information about the research, and their acceptance was required. Other than that, the Checklist for Reporting Results of Internet E-Surveys "CHERRIES" [67] and the items contained in it were monitored during the process involved in creating the questionnaire. The study was undertaken in accordance with the Helsinki Declaration of 1964. On the other hand, in accordance with the regulations in force in Poland, the study did not require any formal ethical approval, although the survey clearly indicated at the beginning that all participants had given their informed consent about the study. Respondents were informed about the nature and course of the questionnaire, and responses were voluntary and confidential.

Statistical analysis

Normality was analyzed through skewness and kurtosis, and homogeneity through Levene's test, with homogeneity of variance being assumed in most cases (in those cases in which the variances of the groups of a variable were considered statistically different, a correction of the t-test was performed, adjusting the degrees of freedom in the test, possibly resulting in decimal numbers). Descriptive analyses (mean and standard deviation) and reliability indices were calculated using Cronbach's alpha. For mean comparisons, the Student's *t* test for one sample and two independent samples was used, the effect size being calculated using Cohen's *d*, and the Bonferroni correction being used to control the family error rate obtained after conducting several simultaneous hypothesis tests. Finally, a MANCOVA—a simple extension of the ANCOVA principles for multivariate analysis (multiple dependent variables)—was carried out—taking the nine motivational dimensions as dependent variables [68]. Having a chronic disease and running prior to being diagnosed with the disease constituted the independent variables, while age was introduced as a covariate. The normality of the independent variables and covariate was analyzed using the Kolmogorov-Smirnov test. To test the homogeneity of the covariance matrices, the Box's *M* test was used, which yielded significant results. Finally, the Eta-squared η^2 or general correlation index was used to test effect size.

Results

The mean scores and standard deviations of the nine MOMS motivational dimensions, and the correlation among those dimensions, are shown in Table 1. The highest motivation scores among female breast cancer survivors are associated with physical health,—first, weight concern ($M = 5.08$, $SD \pm 0.71$) and health orientation ($M = 4.80$, $SD \pm 0.65$),

Table 1 Mean scores, standard deviations and alphas of the nine dimensions of the Motivation of Marathoners' Scale (MOMS)

	M	SD	α
Health Orientation	4.80	0.65	0.677
Weight Concern	5.08	0.71	0.717
Personal goal achievement	3.08	0.92	0.762
Competition	2.62	1.32	0.880
Recognition	3.43	1.05	0.876
Affiliation	3.09	1.02	0.841
Psychological coping	4.46	0.74	0.857
Life meaning	4.38	0.70	0.848
Self-esteem	4.63	0.75	0.836
Total	4.10	0.69	

Table 2 Comparison of means for a sample

	Test value = 4,10			
	<i>t</i>	df	<i>p</i> _{Bf}	Diff
Health orientation	13,274	151	> 0.001	,70,373
Weight concern	16,934	151	> 0.001	,98,224
Personal goal achievement	– 3,932	151	> 0.001	– ,29,518
Competition	– 13,760	151	> 0.001	– 1,47,500
Recognition	– 7,779	151	> 0.001	– ,66,798
Affiliation	– 12,004	151	> 0.001	– 1,00022
Psychological coping	6,127	151	> 0.001	,36,930
Life meaning	5,025	151	> 0.001	,28,910
Self-esteem	8,677	151	> 0.001	,53,240

Table prepared by the authors

Bold values indicate statistically significant

followed by psychological motives; self-esteem ($M=4.63$, $SD \pm 0.75$), psychological coping ($M=4.46$, $SD \pm 0.74$) and life meaning ($M=4.38$, $SD \pm 0.70$). The lowest motivation scores obtained by these women are associated with achievement and social motives, with the lowest scores being performance-related competition ($M=2.62$, $SD \pm 1.32$) and personal goal achievement ($M=3.08$, $SD \pm 0.92$), and with low scores also being evidenced in social motive-related dimensions; affiliation ($M=3.09$, $SD \pm 1.02$) and recognition ($M=3.43$, $SD \pm 1.02$).

By comparing the means for a sample, the difference in the nine MOMS dimensions and the mean of the total scale score were examined. It can be seen in Table 2 that the differences in the scores obtained for the nine scales with respect to the total scale mean are statistically significant.

By comparing the means for independent samples, the difference in the nine MOMS dimensions was examined between women who ran prior to detection of the disease and those who did not. It can be seen in Table 3 that those women who ran prior to breast cancer obtained significantly higher scores in the dimensions related to personal goal achievement, competence, affiliation, psychological coping and self-esteem than those who did not do so.

Using independent sample mean comparisons, the difference in MOMS dimensions between women with or without chronic illness was examined. We can see from Table 4 that there are no significant differences in any of the MOMS dimensions between women with or without chronic disease.

Table 5 shows the MANCOVA results for all nine dependent variables entered simultaneously for each of the main factor effects and the covariate. The covariate age showed a significant effect with the dependent variables entered simultaneously [68] (Wilks' Lambda = 0.766; $F_{9,139} = 4.712$; $p < 0.001$) and moderate effect size ($\eta^2 = 0.234$). Likewise, the independent *running before illness* variable (Coancmc) showed a significant effect with the motivational dimensions taken together (Wilks' Lambda = 0.846; $F_{9,139} = 2.814$; $p = 0.005$) and moderate effect size ($\eta^2 = 0.154$).

Table 6 shows the Univariate analyses deriving from the MANCOVA (Table 6) evidenced significant effects in the case of the independent variable "Coancmc" in terms of personal goal achievement ($F = 6.903$, $p = 0.01$), competition ($F = 11.068$, $p = 0.001$), affiliation ($F = 6.184$, $p = 0.014$) and self-esteem ($F = 4.345$, $p = 0.03$), and low effect sizes ($\eta^2 = 0.045$; 0.07; 0.04; 0.029).

Table 3 Women who were runners prior to breast cancer vs. women who were not

Motives	Runners (<i>n</i> = 69)		Not Runners (<i>n</i> = 83)		Diff	IC 95%	<i>t</i> _(df)	<i>p</i> _{Bf}	<i>d</i>
	M	SD	M	SD					
Health orientation	4.86	0.69	4.75	0.61	0.111	[– 0.09, 0.322]	1.050 ₍₁₅₀₎	0.246	0.16
Weight concern	5.02	0.78	5.12	0.64	– 0.104	[– 0.33, 0.126]	– 0.893 ₍₁₅₀₎	0.373	0.14
Personal goal achievement	4.11	0.98	3.54	0.79	0.565	[0.27, 0.85]	3.848 _(129,887)	> 0.001	0.64
Competition	3.15	1.47	2.18	0.98	0.978	[0.56, 1.39]	4.704 _(114,358)	> 0.001	0.62
Recognition	3.65	1.22	3.24	0.86	0.412	[0.06, 0.75]	2.352 _(118,603)	0.020	0.38
Affiliation	3.43	1.16	2.81	0.80	0.617	[0.29, 0.94]	3.735 _(117,676)	> 0.001	0.62
Psychological coping	4.65	0.83	4.31	0.62	0.331	[0.09, 0.56]	2.804 ₍₁₅₀₎	0.006	0.46
Life meaning	4.48	0.82	4.31	0.59	0.170	[0.06, 0.40]	1.441 _(120,151)	0.152	0.23
Self-esteem	4.84	0.83	4.45	0.63	0.391	[0.15, 0.62]	3.275 ₍₁₅₀₎	0.001	0.52

T TEST comparisons among MOMS' nine dimensions and breast cancer survivor running background

PBf Bonferroni correction

Bold values indicate statistically significant

Table 4 Athletes with chronic disease vs. athletes without chronic disease

Motives	Chronic Disease (n = 61)		No Chronic Disease (n = 91)		Dif	IC 95%	$t_{(df)}$	p_{Bf}	D
	M	SD	M	SD					
Health orientation	4.91	0.68	4.72	0.62	0.186	[− 0.02, 0.39]	1.735 ₍₁₅₀₎	0.085	0.29
Weight concern	5.11	0.67	5.06	0.74	0.054	[− 0.18, 0.28]	0.458 ₍₁₅₀₎	0.648	0.07
Personal goal achievement	3.60	0.96	3.93	0.88	− 0.331	[− 0.63, − 0.03]	− 2.190 ₍₁₅₀₎	0.030	0.35
Competition	2.30	1.26	2.84	1.32	− 0.537	[− 0.96, − 0.11]	2.500 ₍₁₅₀₎	0.014	0.41
Recognition	3.25	1.04	3.55	1.05	− 0.301	[− 0.64, 0.04]	− 1.734 ₍₁₅₀₎	0.085	0.28
Affiliation	2.86	0.96	3.25	1.04	− 0.385	[− 0.71, − 0.05]	− 2.301 ₍₁₅₀₎	0.023	0.39
Psychological coping	4.41	0.76	4.50	0.73	− 0.093	[− 0.33, 0.15]	− 0.757 ₍₁₅₀₎	0.450	0.16
Life meaning	4.42	0.70	4.36	0.71	0.054	[− 0.17, 0.28]	0.461 ₍₁₅₀₎	0.646	0.08
Self-esteem	4.60	0.77	4.65	0.74	− 0.053	[− 0.30, 0.19]	− 0.426 ₍₁₅₀₎	0.674	0.06

T-TEST comparisons among MOMS nine dimensions and breast cancer survivor health status

PBf Bonferroni correction

Table 5 Multivariate contrasts

Effect	Variable	Lambda of Wilks	F	Df hypothesis	df error	p	η^2
Covariable	Age	0.766	4,712	9	139	>0.001	0.234
	Enfcro	0.944	0,919	9	139	0.510	0.056
VI	Coancm	0.846	2,814	9	139	0.005	0.154
	EnfxCoan	0.969	0,492	9	139	0.878	0.031

Table prepared by the authors

F Snedecor F statistic, df degree of freedom, η^2 = Eta Squared

Table 6 Multivariate analysis and adjusted means

	Running prior to being diagnosed with breast cancer						
	Yes	No	Diff	F	p	η^2	
	M	M					
Personal Goal Achievement	4	3,61	0,389	6,903	0.010	0.045	
Competition	2,97	2,29	0,676	11,063	0.001	0.070	
Affiliation	3,30	2,89	0,415	6,184	0.014	0.040	
Self-esteem	4,78	4,45	0,265	4,345	0.039	0.029	

Table prepared by the authors

Discussion

There is scientific evidence supporting the benefits of physical activity in general and running in particular [69]. This fact includes the target group of the present study—women breast cancer survivors, for whom the underlying reasons that pushed them to practice running were still unknown. The aim of this study, therefore, was to study in depth and better understand the motivations of women breast cancer survivors to practice running while, at the

same time, to explore whether other variables, such as running prior to the diagnosis of cancer or having other chronic diseases, influenced the current motivation for such practice. Previous research with breast cancer survivors [33] indicated that they tended to be physically inactive, and that, although they did not know what type of exercise was most suitable for them, they showed interest and willingness to adhere to exercise programs [42]. This was the case with the study sample in this research, as all of them practiced running more or less frequently.

The main finding from the present study suggests that the key motives for breast cancer survivors to run are mostly related to their health, with weight concern ($M = 5.08$, $SD \pm 0.71$) and health orientation ($M = 4.80$, $SD \pm 0.65$) obtaining the highest scores among the nine motivation dimensions. In contrast, competition-related motives scored the lowest. These results are partially in line with previous research in which general health orientation and weight concern were of great importance to running among adult athletes [43, 52, 55]; however, competition motives such as personal goal achievement proved to be greater in that research compared to our current research [51–53] [43, 54, 70]. Likewise, our results also showed that those women who ran prior to detection of the disease obtained higher scores in most MOMS dimensions than those who reported not having run before being diagnosed with the disease. They differed on some motivational scales once the effect of age was removed. Specifically, the adjusted means for the *personal goal achievement*, *competition*, *affiliation* and *self-esteem* dimensions obtained higher scores in those women who ran before being diagnosed with the disease. This result could suggest that it is the previous link with running and the sensations generated by the experience of running that positively influence these women's motivation. Therefore, it could be surmised that women who ran prior to the onset of the disease might have been more oriented towards the achievement of personal goals and competition and at the psychological level would present greater coping capacity and self-esteem, evidencing motivation behavioral changes partially in line with previous research [71].

Having a chronic disease, such as diabetes, osteoporosis, etc., showed statistically significant differences in the *competition*, *affiliation* and *personal goal achievement* dimensions in the first analyses performed. But once the effect of age had been controlled, these differences disappeared. It therefore appears that having a chronic disease is not an important factor in determining women's motivation. Cancer patients and/or survivors are often insufficiently active, even though the vast majority of them (80%) are eager to participate in exercise programs or know what type of exercise is the most suitable for them [33]. In this sense, our results showed that *running background* in these specific populations, obtains higher scores in most MOMS dimensions, except in *weight concern*. However, statistical significance was obtained related to performance motives (personal goal achievement, competition), social motives (recognition, affiliation) and two of the psychological dimensions (psychological coping, self-esteem), with motivation scores being significantly higher in those women who were runners prior to breast cancer. These results are partially in line with previous research, in which healthy women obtained higher motivation scores than women who had suffered from breast cancer in *health orientation* and *performance*, while

weight concern, *social* and *psychological motives* proved to be lower (?) (Translator/proofreader note: yes, I suppose 'lower? Must be correct here) [43]. On the other hand, Avancini et al. showed that compared to healthy controls, cancer survivors expressed motivation and barriers specifically related to their oncological disease [72].

Our results also suggest that the age of breast cancer survivors influences their motivation for running in general, and more specifically age may moderately mediate motivation related to personal goal achievement, competition, psychological coping, meaning in life or self-esteem, since statistical associations were found between athletes' motivation related to competition and personal goal achievement for younger athletes, while health orientation obtained higher scores in older runners. In line with our results, Gerasimuk et al. [57] showed that age was an important variable influencing the motivation for running of various types of runners, such as recreational runners, marathoners and ultra-marathoners. These authors showed that the older the runner, the more the motivation for running varied, i.e., personal goal achievement motivation decreased in importance, and the most important motives were related to self-esteem and health orientation, while young recreational runners' motives were mostly related to the *personal goal achievement* dimension. Likewise, Malchrowicz et al. [58] showed that younger runners were more motivated in terms of their results, while such motivation was significantly less important in the case of older runners. Taking these results into account, it could be suggested that as people get older, and as they enter new stages in life, they start placing more value on personal health and wellbeing, thus laying less emphasis on performance and result.

The findings with regard to breast cancer survivors who suffered from a chronic disease or not showed that there was no statistically significant difference between those women who did and did not have a chronic illness. However, in terms of competition and social motives, higher motivation scores were found in those women who did not have any chronic illness, and despite the fact that these differences are not significant, we consider that they should be further studied, since there is a gap in literature regarding motives behind practice on the part of this population [18]. From these results, we can interpret the fact that, regardless of having suffered from breast cancer or not, health status influences athletes' motivation for running. Our results also showed that athletes' age is associated with breast cancer survivors' general motivation, these results being in line with previous research related to running motivation and age, since athletes' age was a determining factor in relation to such running motivation [57, 58]. On the other hand, our results are not in line with previous research in which running experience did not show statistical difference in any of the nine dimensions associated with running motivation

[46]. Therefore, further research would be needed to better understand these findings.

Limitations

This study has certain limitations. Firstly, from a methodological standpoint, since some of the dimensions analyzed violate the assumptions of normality, some of the findings must be interpreted cautiously. Secondly, it should be noted that the sample size is not large, although it is true that, given the profile of the female runners, it is a very difficult sample to obtain. Thirdly, the fact that there is no research that has studied the variables in depth prevents us from making comparisons. Therefore, it would be interesting for future research to increase the sample of participants in order to minimize the methodological limitations mentioned above. Other than that, asking how long it has been since the diagnosis of cancer, and how long the athletes have been doing physical activity, could provide interesting information for future research. Despite these limitations, very few studies analyze the running motivations of this group and, to our knowledge, there is no study that analyzes the relationship between the running motivation of these women and chronic disease and running history.

Conclusion

In summary, this study showed that breast cancer survivors attach great importance to health reasons for running, and that running prior to detection of the disease influenced some of the motivational dimensions of the female runners. Notably, the motivations that drive women cancer survivors the most, i.e., weight control and health orientation, are more or less the same as what drives other women. Paradoxically, this is the greatest contribution of the research, because to date no emphasis has been placed on this group. One might think that, because they have suffered from a disease such as cancer, their motivation could be altered. In principle, this does not seem to be the case, although further research will be necessary to research into the functioning of motivation in this group, and to find out what other dimensions besides those used in the research are related to motivation and adherence to sports programs, in order to adapt them to the needs of this group, and to improve the participants' adherence to an active lifestyle.

Author contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Ewa Malchrowicz-Moško, Oscar González Rodríguez, Garazi Yurrebaso Atutxa, Mateusz Rozmiarek, Jurgi Olasagasti-Ibargoien, Joanna Grupinska and Arkaitz Castañeda-Babarro. The first draft of the manuscript was written by Patxi León-Guereño and all

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Data availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Conflict of interest The authors declare no competing interests.

Ethical approval and informed consent Survey was conducted in accordance with the Declaration of Helsinki. Moreover, the study does not have the characteristics of a medical experiment involving the participation of animals and humans. The online questionnaire was sent to the leaders of mass running events management in Poznan, e.g. to organizational units of the Amazonkas in the Greater Poland region (organization for BC women).

Informed consent As online surveys or questionnaires do not require the completion of a separate participant information sheet or consent form, completion of the survey was deemed to constitute informed consent. Respondents were informed about the nature and aims of the survey.

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