

The role of physical activity in maintaining health after mastectomy

Rola aktywności fizycznej w utrzymaniu zdrowia po amputacji piersi

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Abstract

The treatment of breast cancer requires intensive methods. Depending on the severity of the disease surgery, radiotherapy, chemotherapy, or endocrine therapy is applied. In most cases these methods are combined, thus increasing the chances of recovery, but also intensifying side effects. Until recently, physical activity was contraindicated in the treatment of malignant tumours. Currently, an increasing number of studies confirm the beneficial effect of physical activity on the physical and mental state of people after the treatment of malignant tumours. The paper presents selected studies showing the impact of physical activity on the physical fitness of women treated for breast cancer. The authors draw attention to the difficulty of comparing the results of physical activity due to the use of different questionnaires and different methods. Furthermore, the paper includes recommendations on forms of exercise indicated for cancer patients, as well as situations that require restrictions or constitute a contraindication for physical activity.

Streszczenie

Leczenie raka piersi wymaga zastosowania intensywnych metod. W zależności od stopnia zaawansowania choroby stosuje się leczenie operacyjne, radioterapię, chemioterapię, hormonoterapię. W większości przypadków metody te łączy się, co zwiększa szanse wyleczenia, ale także potęguje skutki uboczne. Jeszcze do niedawna wysiłek fizyczny był przeciwwskazany po leczeniu nowotworów złośliwych. Obecnie zwiększa się liczba badań, które potwierdzają korzystny wpływ aktywności fizycznej na stan fizyczny i psychiczny osób po leczeniu nowotworów złośliwych. W pracy przedstawiono wybrane badania ukazujące wpływ aktywności fizycznej na sprawność kobiet leczonych z powodu raka piersi. Autorzy zwracają uwagę na trudności związane z porównywaniem wyników aktywności fizycznej ze względu na stosowanie odmiennych kwestionariuszy i różnych metod. Przedstawione zostały również zalecenia dotyczące form ćwiczeń wskazanych dla pacjentów onkologicznych, a także sytuacje wymagające ograniczenia bądź będące przeciwwskazaniem do podejmowania aktywności fizycznej.

The issue of physical movement in terms of its importance for health has been present in various research projects for a long time. In the history of medicine, you can find examples taken from the writings and drawings of the ancient Chinese, Egyptians, Persians, which show that from as early as 2,000 years BC breathing exercises, massage, and gymnastics were

used to maintain or restore health. In ancient Greece, the importance of physical activity was stressed by the “father of medicine” Hippocrates, who lived between the fifth and fourth centuries BC. The views of Galena, a Roman physician who lived in the second century AD, are almost identical with modern ones, when one reads that the exercise should be to care for the health.

Cicero in his treatise on old age entitled *Cato Maior de senectute* wrote about the need to preserve physical and mental activity into the later years of one's life [1]. In later centuries, we have no evidence of exposing physical movement in the context of health. In the Middle Ages the work of Galena, *Gerokomia*, which mentioned disease prevention and disabilities in old age, was frequently referred to. It was only Hufeland, a German doctor, who in his book entitled *Macrobiotics or the Art of Prolonging Life*, published in 1799, listed the factors that helped to maintain health and a long life. A lot of space is devoted to matters regarding physical movement. However, the medicine of the nineteenth century and the first half of the twentieth century dealt only with physical health and the treatment of diseases, not prevention. Infectious diseases were an exception, especially after their causes were discovered and following the invention of bactericidal drugs and antibiotics. Drugs and improved living conditions caused quantitative growth of the world population and thus the aging of societies. However, the health situation of the population, after a period of temporary improvement, is not good today as the infectious diseases have been taken over by diseases characterised by the onset of the disease without obvious symptoms and a hidden course in the early stages. These chronic diseases include: atherosclerosis, obesity, diabetes, degenerative arthritis, osteoporosis, and most of the cardiovascular diseases. Nowadays, it is not one specific factor (previously this was bacteria) that triggers a disease but two, three, or more that contribute to the deterioration of health. Searching for the causes of these chronic diseases, risk factors leading to the occurrence of many diseases were discovered. The significance of the deficiency in physical movement was stressed first in epidemiological studies, initially only cross-sectional studies. Started in the small town of Framingham (USA) in 1950, the studies contributed to the detection of additional health risk factors other than known risk factors such as: errors in nutrition, smoking, alcoholism, addiction to medication, or exposure to harmful environmental factors. Gerontological prevention referred to these causes of morbidity as *biological* risk factors. Most modern diseases among adults and older people are associated with the exposure to risk factors and not with the consequences of processes of biological ageing of the body [2].

According to the definition provided in the Constitution of the World Health Organisation (WHO) in 1948, health is "a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity". Previously, health was recognised as being limited to physical health, not taking into account the relationship between health and illness and the mental state and social situation of the person. The WHO's approach was a milestone in the

development of prevention and treatment. However, this definition of health was also criticised, accusing it of being a static rather than a dynamic approach [3]. This critical assessment of the definition of health has led to the emergence of a new concept: the promotion of health. The term views health as the ability to achieve full physical, mental, and social potential while taking into account the challenges of the environment. The aim of health promotion is to increase the health potential, not only to prevent disease.

In recent years an assessment has been conducted on what factors determine human health and to what extent. It is believed that:

- the relevance of genetic factors is only 5–15%,
- the physical environment is in the range 5–10%,
- the social environment – 20–25%,
- lifestyle – up to 50%.

The most important factor for health promotion is therefore lifestyle, which includes, among others, physical activity. This in turn affects the development of civilisation diseases, including cancer. Also it plays a major role in the recovery of people treated for cancer [2].

The guidelines for the promotion of physical activity among older adults defines physical activity as any performed activity in daily life associated with movement, including work, rest, exercise, and sport [4].

It is well known that regular exercise has many physiological, psychological, and social benefits – both short and long term. It has been proven to improve overall well-being, and physical and mental health, limit certain conditions and diseases, reduce the risk of developing certain diseases, and support an independent lifestyle behaviours, etc. [4]. Physical activity can be a factor directly affecting the health, and therefore also the physical fitness and physical performance, of individuals and entire populations [5]. A lack of regular exercise as well as a sedentary lifestyle reduce independence and contribute to the onset of many chronic diseases. Active lifestyle helps delay the onset of physical weakness and diseases, thereby greatly reducing the cost of health and social care [6]. As early as in the 1950s the beneficial effects of exercise in the prevention of premature aging processes were scientifically confirmed [7].

According to Kozłowski, "...sufficient physical activity is the most effective of the known ways of delaying aging and of maintaining physical capacity of the body decreasing with age and the related decrease in the ability to work and other forms of life activity". Although quoted frequently, these words still maintain a sense of constancy in the light of contemporary scientific research. Similarly, Ślężyński writes "...the adaptive capabilities of advanced age are much more limited, which is a sign of involution. However, research suggests that rational lifestyle and physical activity adapted to the biological age and to exercise

capacity, involution processes can be reduced, delaying motor skills regress" [8].

According to Kulakowski, physical activity should be a regular part of everyone's life and exercise should be performed at least half an hour a day for most of the week – preferably every day [9]. Unfortunately, among the elderly there is still a prevailing belief that exercise, even a little, is inadvisable for them. In addition, over the years the spontaneous need for physical movement disappears, whereas the tendency to reduce the physical effort also in everyday life, striving for physical comfort, or even physical laziness, becomes stronger. Wrongly understood health care for elderly patients eliminates any physical activity, limiting efforts to a minimum [10].

Maintaining proper balance between physical activity and rest as well as remaining in a vertical and horizontal position is a prerequisite for health. People spend about 30% of their entire life sleeping. Sleeping in the supine position, in which the burden of adaptation mechanisms of the body to the action of gravity is negligible, is not accidental. However, bed rest, obviously necessary in the course of many diseases, is sometimes excessive. Bed rest in the supine position leads to a decrease in hydrostatic pressure in the circulatory system and other body areas of water. Additionally, it reduces the pressure on the bones along the long axis. The first changes occur in the body as fast as between zero and 3 days of staying in bed [11].

Older people's access to physical activity is (therefore) limited by the "stereotype of the elderly", imposed by society, which creates the image of a specific lifestyle appropriate for the elderly perceived as people with disabilities. Łobożewicz's research shows that physical activity in the elderly is of an occasional nature and its duration is far from the recommended standards [12]. Most frequently, the elderly are engaged in march-training on a treadmill, walking and training on an ergometer in a sitting position. Recently, weight training has been introduced triggering positive reactions by reducing body fat and expanding muscle mass [13].

A positive relationship between physical fitness and cognitive efficiency, good cheer, and high self-esteem has also been observed [14]. Physical activity maintained lifelong allows for proper functioning until old age. According to some authors, physical exercises may improve impaired functions, even if they are started later in life and performed to a limited extent. It is believed that adverse biological changes are often the result of a lack of physical activity, and not a function of age [15].

The definition of physical activity is of particular importance in the face of the threats that the modern world poses to man. Civilisation, undoubtedly carrying many benefits and achievements, has become the cause of the development of many diseases referred to

collectively as lifestyle diseases, which include, inter alia, cancer. According to the World Health Organisation, cancer is the second most frequent cause of disability in the world after cardiovascular diseases. The same analysis shows that 50% of human failures could be avoided. During the twentieth century the share of physical labour, and hence the muscles, in everyday activities decreased by around 80% in favour of intellectual work. In addition, the pace of life and its stressful impact on modern man increased. All of the above elements can lead to the escape into the world of addiction, creating additional threats to human life and health. If low physical activity, poor diet, and smoking are among the risk factors for cancer diseases it is likely that a lifestyle change can significantly reduce the risk of these diseases [16].

In Poland, the most commonly diagnosed cancer among women is breast cancer, and epidemiological indicators and forecasts point to an upward trend of its occurrence [17].

Breast cancer treatment is lengthy and requires very intensive methods. Depending on the severity of illness treatments include surgery, radiotherapy, chemotherapy, or hormone therapy. In most cases these methods are combined, thus increasing the chances of a recovery, but also enhancing their side effects [13].

Disorders of the musculoskeletal, respiratory, neurological, and cardiovascular systems appear. Within the respiratory system, impairment of lung ventilation, usually of a restrictive nature, is common. Irradiation of the chest may lead to extensive damage to the endothelial vessels and the alveoli. The pH of the respiratory tract (mucosal inflammation) may lead to pulmonary inflammation. Lung function tests often show a decrease in vital capacity and total lung capacity.

In the circulatory system, even many years after radical treatment of breast cancer, disturbances of cardiac rhythm and coronary fibrosis may occur.

Among the complications of the musculoskeletal system are dysfunction of the upper limb on the operated side and the disturbance of posture. The pathomechanics begins with the overload of the shoulder joint, leading to disorders of statics and dynamics of the chest and spine. Shoulders, shoulder blades, and waist triangles are disturbed and there is a deepening of thoracic kyphosis. The distortion of the chest in patients who have undergone mastectomy, altering the static body, causes further problems, typically back pain, which in turn leads to changes in muscle strength of the body. In women after breast cancer treatment peak torque, work, and power of flexor and extensor muscles of the trunk decreases by approximately 50% compared with healthy women [17]. Another negative consequence of the treatment may be swollen lymph nodes of the upper limb on the operated side [18]. As a result, radical treatment of breast

cancer and functional disorders resulting from the above treatment lead to a reduction in physical fitness and exercise capacity. Thus, they make it difficult to meet the necessities of life, resulting in decreased quality of life and self-esteem of women treated for breast cancer. Another consequence of the treatment is the deregulation of the immune system. After the surgery NK cell activity is reduced. The chemotherapy can lead to significant impairment of T, B, and NK lymphocyte cell activity. It also causes a reduction of the total number of lymphocytes. Ionising irradiation may be the cause of a reduced number of NK cells. These disorders of the immune system, leading to a reduction in overall body resistance, can in turn result in frequent infections and even contribute to the recurrence of cancer [17].

Until recently, physical activity was contraindicated in the treatment of cancer. This was due to the belief in its possible immunosuppressive activity (especially in the case of high-intensity effort), increase in cardiotoxicity (caused by radiation therapy and chemotherapy), fear of pathological bone fractures (resulting from their weakened structure), and the reluctance of patients associated with their poor mental state. The so-called saving lifestyle and avoiding strenuous physical activity were recommended, which resulted in the reduction of activity and consequently led to a reduction in exercise capacity, increased symptoms of fatigue, and a further reduction of quality of life. Currently, an increasing number of studies confirm the beneficial effect of physical activity on the physical and mental state of people after treatment of malignant tumours [13].

Regular physical exercise leads to countless positive changes in the physical and mental health of women treated for and cured of breast cancer. The strength and efficiency of skeletal muscles as well as cardiovascular and respiratory efficiency increase, resulting in greater exercise capacity [13, 19].

Increasing maximal oxygen uptake in older women treated for breast cancer and performing regular exercise is associated with adaptation of their skeletal muscles, which are involved in training. Changes in the skeletal muscles include increasing the activity of the oxidizing enzymes, an increase in the density of capillaries and the concentration of myoglobin, as well as muscle glycogen and better adaptation of muscle fibres, resulting in an increased number type I fibres. Increasing the maximum oxygen consumption after exercise is also associated with an increase in stroke volume and greater arteriovenous difference in oxygen content.

Physical exercise can also affect the immune system. Thanks to the cytolytic activity of NK cells and monocyte function, the proportion of circulating granulocytes and the duration of neutropaenia are improved [13].

Another beneficial effect of physical activity is connected with alleviating the effects of radiotherapy and chemotherapy, and reducing adverse changes in the psyche, such as depression, anxiety, and fatigue [20].

Physical exercises are recommended for patients who have undergone radical surgical treatment and those in palliative care in each phase of the disease, during the treatment, after the treatment, and even in the terminal stages of cancer. The issues of the mechanism for these changes and the type and intensity of exercise, as well as the permissible load, still need to be discussed. Most authors dealing with this problem recommend aerobic exercise, which is defined as rhythmic contractions and relaxation of large muscle groups for a prolonged period of time. Marching training on a treadmill, and walking and training on an ergometer in a supine or sitting position, are the most frequently recommended types of exercise. Positive changes were also observed as a result of endurance exercises. Endurance training enhances the ability to exercise in people treated for malignant tumours, which makes it easier for them to perform daily activities and decreases fatigue. Lately, strength training has also been recommended. It requires the involvement of external skeletal muscles against the external resistance [13].

Reducing the physical capacity of women after mastectomy is usually reversible. This is possible thanks to early physiotherapy, which can prevent the reduction of physical capacity or even lead to its improvement [20].

The aim of comprehensive physiotherapy is thus not only to increase the range of motion in the joints of the shoulder girdle and upper limb on the operated side, increase muscle strength of the upper limbs, prevent the formation of lymphedema by preventing stagnation of lymph in the upper limb on the operated side, but also to increase physical fitness and the ability to exercise, posture correction, and activation of the immune system. Implementation of physiotherapy takes place in a variety of organised forms. It begins at the department of surgery and should be continued as an outpatient or in residential settings (rehabilitation courses) as general gymnastics, gymnastics and swimming in the water, and prevention and treatment of secondary lymphoedema [17, 21].

Developed by Mike and introduced initially in the Centre of Oncology in Warsaw, and gradually throughout the country in all institutions performing radical operations of breast cancer, the rules of conduct apply to three periods of rehabilitation. The first period is the woman's stay in the hospital and usually lasts 3–5 days. The second one starts after leaving the hospital; the patient should then receive assistance in a rehabilitation or outpatient clinic. The third period, occurring later, reinforces the rehabilitation results

obtained earlier, either at rehabilitation centres or in spas or clubs for women after mastectomy (i.e. Amazons).

In the postoperative period at the hospital, the patient is introduced to a specific, high arrangement of limbs, using a wedge. Such a method of laying a hand prevents early postoperative complications, namely lymphoedema. Initially, rehabilitation includes the fingers, hands, and forearm, as well as shoulder girdle joints of the operated side, using active exercises and breathing to improve lung efficiency after surgery, and to affect the delicate, gentle stretching of forming scars. The order of the trained parts of the body initiates the functioning of a muscle pump from the perimeter to the centre of the body. To perform an exercise starting positions that facilitate the outflow of blood and lymph from the system are selected. In the following days the range of physiotherapy exercises increases including active exercises of the shoulder girdle in seating and standing positions. In the third stage of the inpatient rehabilitation exercises in a standing position against the wall, ladders, and previously performed active exercises are implemented.

Active and self-assisted exercises proposed to the patient follow the principle of increasing their range depending on the capabilities and efficiency of the individual organism. It is recommended that they perform the exercises every 2 h for a period of 10 min. In addition to these instructions, the patient receives educational materials on proper conduct in everyday life so as to protect themselves from postoperative complications. As a result of radical surgery a woman is exposed to the loss of the breast, reducing the mobility of the shoulder girdle, reducing muscle strength in the limb and shoulder girdle on the operated side, and frequent lymphoedema of the arm and forearm [22].

The most painful problem that requires prompt action is to supplement a breast defect. A properly selected prosthesis in terms of size, weight, and shape, used immediately after the healing of wounds and removal of dressings, prevents static disorders of the torso and scoliosis. It also has a huge impact on the patient's mental state. Both cancer and breast loss, recognised as an attribute of femininity and motherhood, can cause depression or feelings of lesser value and attractiveness. In addition to the prosthesis the patient should have a chance to undergo a surgical breast reconstruction. The use of breast reconstruction operations does not relieve the patient from regular exercises to increase the flexibility of the scar and enhance muscle efficiency of the body.

Physical rehabilitation in the second and third periods after mastectomy should lead to a constant improvement of physical and indirectly mental fitness, and is based on the dynamic, rhythmic work of muscles, which impacts blood vessels and lymphatic vessels to facilitate the outflow of the venous blood

and lymph. For many women, especially in the third stage of post-operative treatment, with the consent of the oncologist, various physical treatments, such as massages, baths, and electrotherapeutic treatments acting locally may be implemented [23].

Previous studies have shown that physical activity becomes an accepted part of the treatment in oncology. It is a secondary prevention of physical and mental limitations caused by malignant disease and its treatment. Consequently, physical exercise contributes to the return of cancer patients to normal life, thereby realising the primary objective of rehabilitation. Exercises are usually well tolerated, regardless of the tumour grade and method of treatment. They are safe and do not cause any side effects. They can be used as endurance or resistance training, in continuous and interval forms, under supervision or alone [13, 17].

Numerous studies worldwide point to the fact that the activity of women after mastectomy deserves a deeper knowledge and usage for the development and promotion of physical culture [24]. Literature also reports that physical activity in the form of physiotherapy brings numerous advantages [25, 26]. The concept of physical activity is fairly comprehensive and includes many elements, such as domestic activities, recreation, and sport, so reliable measurement of all these activities is quite difficult. This measurement is particularly complicated in people who have survived such a severe disease as cancer. Also, it is difficult to compare the results of the physical activity of patients due to the use of different questionnaires and different methods.

According to the research conducted by Dobosz, the physical activity of Polish women in different ages continues to be unsatisfactory. The outcome of the research shows inappropriate habits, beliefs, attitudes, and behaviours with regard to healthy physical culture. This is reflected in a negative trend in the creation of a physically active lifestyle, and is manifested by low participation in sports and leisure activities in the younger age groups as well as a gradual decrease in the share of women doing them as you move up the age scale [27]. It is estimated that in the United States, approximately 50% of women over 75 years of age do not participate in any physical activity. However, American women's participation in various forms of organised sports and recreational activities is more satisfactory. Unfortunately, also among American women interest in physically active leisure activities decreases with age [28].

Many authors verify the beneficial effect of physical exercise as a factor in primary and secondary prevention of many diseases, and refer to inactivity as a so-called independent risk factor [24].

Regular physical activity is also associated with the prevention of occurrence of certain cancers and even with a reduction in mortality [29].

On the basis of her studies, Chwałczyńska discovered that the use of physical activity depends on the age. Fifty-five women treated for breast cancer were examined during the research. On the basis of a questionnaire including questions about sports activities, physical activity, time spent on physical activities in relation to the period before surgery, preferably undertaken forms of movement, frequency and intensity of exercise and physical activity, as well as causes of failing to exercise, the author discovered that older women, despite a higher awareness of the importance of physical activity, perform it less often than younger women [15].

Despite a decline in physical activity over the years, numerous studies show that women treated for breast cancer perform basic household activities.

According to Andrzejewski *et al.*, 64% of women performed standard household chores: cleaning, cooking, shopping, and vacuuming, and 36% also performed activities other than those mentioned. Half of the respondents said their health to a small extent limited the accuracy of performing housework. Twenty-three percent of the group responded that health did not limit the accuracy of the work while 26% of the group said that the state of their health limited the accuracy of performed household tasks to a large extent [30].

In some other studies conducted by Chwałczyńska women did not report problems in performing daily activities such as dressing, eating, and washing. Most of them (about 70%) found it difficult to exercise, especially while involving the upper limbs, e.g. when carrying shopping or suitcases. A significant proportion of respondents (about 60%) did not return to work, but most of them (about 70%) retained some non-professional activity (hobby). Increased perception of fatigue and pain, affecting restrictions in everyday life, extended the period of rest. Only a few patients lived a sedentary type of life. Walking, even for a longer period of time, was not a problem for them, but the majority (80%) reported a decrease in the efficiency of household chores and everyday life [31].

Nowicki and Ostrowska's research shows that half of women in the 5th and 6th months after the surgery had no trouble adjusting to the limitations of the disease. Most women (67%) at 6 months after surgery claimed that they were still doing what they liked despite their health state. Differences in the number of women who could not do what they liked, with the passage of time were not statistically significant [32].

An attempt to assess physical activity in women treated for breast cancer was also made by Czerniak. Her study showed that more than half of the women reported very low and low levels of activity of most types (physical activity in housework – 71.2%, physical activity at work – 61.5%, physical activity outside the Amazons' club (Polish Mastectomized Women's Club

– 55.8%, physical activity in time free – 53.8%). Physical activity performed at the Amazons club was an exception. In this case, high and very high levels were diagnosed in 66% of the respondents. The researcher also observed a significant percentage of respondents with a medium level of physical activity [24].

On the other hand, women after mastectomy belonging to the Mastectomized Women's Club in Wrocław, when asked about performing rehabilitation exercises at home, replied that they practice sometimes – half of the respondents, 36% of women exercised regularly, and 14% did not exercise at home at all because, as they claimed, they took part in group exercise at the club for the Amazons three times a week [30].

According to Górska-Doś, 60% of respondents increased their physical activity after surgery. However, the author did not take into account the age groups, including the study of women between 35 and 68 years of age. Compared with the research conducted by Chwałczyńska, age group division proved to be important, because as many as 36% of respondents in the older group showed a reduction in physical activity after surgery, while in the younger group the outcome was only 18.5% [33]. Similar conclusions were presented by Woźniewski, who stated that after the diagnosis of breast cancer women tend to reduce physical activity by approximately 2 h a week. This concerns mainly overweight women (41%) or those after additional radiotherapy and/or chemotherapy (50%) [13].

Irwin *et al.*, after examining 812 women, confirmed that physical activity levels decreased significantly after the diagnosis of breast cancer. Patients limited their physical activity by about 2 h per week from the time before the diagnosis until after the diagnosis (decrease by 11%; $p < 0.05$). Greater restrictions on sporting activities were observed in women who underwent radiotherapy and chemotherapy (decrease by 50%) compared with women who only underwent surgery (decrease by 24%) or who received radiotherapy only (23%; $p < 0.05$). A larger decrease in physical sports activity was observed in obese patients (41% decrease) compared with patients with normal body weight (24% decrease; $p < 0.05$) [34].

The fact that there is a growing awareness of the importance of physical exercise is comforting. This is testified by the research conducted by Malicka, in which 94% of women after mastectomy confirmed the need for regular physical training [35].

In a study conducted by Chwałczyńska more than 50% of respondents participated in various forms of physical activity, dedicating more time to it than before the treatment. Unfortunately, only 17% did so regularly, and 36% did not participate in any activities, mainly due to age, feelings of discomfort, and fatigue [36].

In subsequent studies, the author assessed a group of 55 women after breast cancer treatment. The pa-

tients were divided into two groups: group I – aged 60 years and group II – over 60 years. On the basis of an anonymous questionnaire consisting of 87 questions (medical data, sports activities, quality of life, and general data), both groups had a high awareness of the need for physical activity (> 70%). So why did 27% of patients in group I and as many as 58% of group II confirm that they did not play any sport? Women in the first group (aged 60 years) as a reason for refraining from physical activity indicated lack of time, lack of a partner to exercise with, and poor economic conditions, whereas women over 60 years of age gave bodily restrictions, fatigue, pain, and discomfort as reasons [15].

In the group of women over 60 years of age, in a study conducted by Dębicka and Konowalska, the main obstacles to active participation in physical activity included poor health (64.3%) and a lack of access to sports facilities (30.4%) [37].

In a study of Andrzejewski 86% of patients confirmed that they paid particular attention to a healthy lifestyle since they underwent mastectomy. All patients were engaged in some form of physical activity such as group gymnastics three times a week. Thirty percent of respondents participated in intensive walks and 10% rode a bike. Most of the respondents declared that surgery had changed their form of spending leisure time (63% of respondents) while 36% had to give up their favourite activities after the surgery, most frequently their professional career, sunbathing, swimming, or long walks. Fifty-seven percent of patients changed their eating habits of after the surgery. Those people reduced the intake of fried and fatty foods, and their menu was based on vegetables and fruit [30].

The literature devoted to the problem of breast cancer points to the positive role of physical therapy to prevent certain cancers, including breast cancer. It has been observed that the incidence of cancer in people with active lifestyles or active sports in the past was significantly lower compared to those who led a sedentary lifestyle.

The relation between physical activity and the risk of breast cancer was first shown by Frisch *et al.* in 1985 on a group of 5398 graduates of American universities. They observed a statistically significant increased risk of incidence of this type of cancer among graduates who did not practice athletics in their study period in comparison to those who practiced this sport discipline [38].

Similar relations were perceived by Albanese *et al.*, although the impact of physical activity on risk was not so large. The observed reduced risk of cancer in women who were physically active after menopause confirms earlier observations made by Frisch *et al.* Moreover, the authors also noticed a reduction in the risk among younger women before menopause declaring a high level of physical activity. The researchers

put forward a proposal that prolonged athletic training strengthens the active lifestyle, which reduces the risk of breast cancer in men and the risk of breast and reproductive organ cancer in women, and that the proper lifestyle that protects against the disease should occur earlier in life [38].

The above findings are confirmed in the work of Kruk, in which the material of the study was 256 women after mastectomy and 548 women in a control group. Based on the declared disciplines, time spent on training per day, frequency of participation in sports, and the length practicing sports, the women were divided into inactive, active, and very active. The results showed that a much higher percentage of women in the control group consisted of persons active or very active in sports (58.9%) than in women after mastectomy (15.6%). Also, the percentage of women in the control group classified as inactive (41.1%) was much lower than in women after mastectomy (84.4%). The results obtained by the author confirm that active practicing of sport in the past may reduce the risk of breast cancer [38].

Although exercise is increasingly recommended for women treated for breast cancer and there is more and more evidence of its positive impact, there are conditions in which the practice of sport can be greatly reduced or even contraindicated. This is due to both poor conditions and consequences of on-tological treatment. Prudent use of exercises under close medical supervision is required by people with anaemia, impaired immune system, astigmatism, and dizziness. With haemoglobin concentrations of less than 8.0 g/100 ml high-intensity exercises that require a large amount of oxygen, due to the restricted possibilities of its transport in the blood, should be avoided. The reduction in the number of neutrophils below $0.5 \times 10^9/l$ requires the elimination of these forms of movement that may expose the patient to infection. At the same time, platelet counts below $50 \times 10^9/l$ require the elimination of physical activities associated with the risk of injury. In the case of astigmatism and dizziness exercises that require balance and coordination, e.g. walking or training on a treadmill, should be avoided.

Other factors that also limit physical training include severe cachexia (loss of more than 35% of body weight), inflammation (body temperature above 38°C), shortness of breath, severe nausea, bone pain, significant muscle weakness, and extreme fatigue. In each of these cases, the causes of such conditions should be examined because they influence the choice of exercises and their intensity [13, 26].

Following on from Woźniewski and his previous experience, it can be assumed that for those treated for or cured of a malignant tumour the most preferable exercises are those of a natural form of movement involving large muscle groups, especially marching

training on a treadmill and walking, as well as riding on a cycle ergometer. The program should be carried out at least 3–5 times a week at a moderate intensity, of course taking into account individual physical capabilities. The intensity at the level of 50–75% VO₂max or HR_{rez}, or 60–80% of maximum heart rate appropriate for ages is recommended. Patients suffering from malignant cancer and during treatment are not recommended to practice strenuous exercises, while those cured may practice them. Exercises should be performed at least 20–30 min a day as a continuous effort. In the case of low exercise tolerance or side effects of cancer treatment that does not limit the possibility to perform physical exercises, interval training is recommended. Increasing the intensity should be done carefully and slowly, especially in patients during treatment or immediately after its completion [13].

When choosing exercises for women treated for or cured of breast cancer, not only biological but also mental aspects should be taken into consideration. The exercises should be compatible with their interests, connected with positive sensations, and should give pleasure [13, 26].

Conflict of interest

The authors declare no conflict of interest.

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