INTELLECTUAL OUTPUT 1

DANCING WITH HEALTH –
An EU collaborative partnership for active lifestyles for the prevention and treatment of breast cancer

Manual for health and sport professionals and dance teachers/therapists

Co-funded by the Erasmus+ Programme of the European Union

THIS OUTPUT HAS BEEN REALISED WITH THE CONTRIBUTION OF ALL THE PROJECT PARTNERS:

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1. INTRODUCTION

Every year in Europe more than 200,000 women are affected by breast cancer, with an incidence varying from 5 to 10% depending on the country. It has been shown that by being more physically active the chances of developing breast cancer can be reduced. Compared to women doing less than 30 minutes of activity per week, those meeting the physical activity guidelines (150 minutes per week of moderate intensity physical activity) had their risk reduced by around 35%.

Studies show that in general, physical activity has positive effects on several pathologies, mostly relating to the increase of special neurotransmitter substances in the brain (endorphins), which create a state of wellbeing. Exercising on a regular basis also enhances the functions of the circulatory, respiratory, skeletal, and muscular systems, all related to a better quality of life.

Despite the large evidence base that physical activity has a positive effect on prevention and treatment in breast cancer survivors, the majority of this population are inactive. Enjoyable and sociable physical activities such as dance, as well as creative arts therapies such as dance movement therapy that provide both physical and psychological benefits, are becoming increasingly prevalent in supporting cancer patients with their recovery.

The importance of psychological support for women with breast cancer cannot be overlooked and research suggests it should be integrated as part of a holistic approach to recovery. Post surgery (mastectomy, lumpectomy or mastectomy with breast reconstruction) and many years following treatment, women affected by this pathology experience anxiety, depression and distress, often related with their changing body image, functional limitation and weight gain, which can negatively affect their quality of life.

Dance Movement Therapy (DMT) is a form of psychotherapy, which according to the European Association for Dance Movement Therapy (EADMT 2020), “offers individuals of all ages and abilities a space to explore what drives them, assisting people to develop self-awareness and sensitivity to others and also to find a pathway to feeling more comfortable in their own skin”.

Although the work can be diverse, practitioners often base their work on the following premises:

- Movement is a language, the first language. Nonverbal and movement communication begins in utero and continues throughout the lifespan. Dance movement therapists believe that nonverbal language is as important as verbal language and use both forms of communication in the therapeutic process.
- Mind, body, and spirit are interconnected.
- Movement can be functional, communicative, developmental, and expressive. Dance movement psychotherapists observe, assess,

and intervene by looking at movement, through these lenses, as it emerges in the therapeutic relationship in the therapeutic session.

- Movement is both an assessment tool and a primary mode of intervention.

(Payne 1992; Meekums 2002; Karkou and Sanderson 2006).

This study integrates the above concepts and, as argued by Horowitz (2000), utilises several strategies that aim: "to foster a physically and emotionally safe, non-judgmental environmental that is respectful and individual limitations and achievements; to facilitate individual expression and communication with other people; to increase body creativity, awareness, spontaneity and healthy self-image; to promote and integrate emotional stability (including anger management and stress reduction); and to support personal growth through insight, energy and an expanded movement repertoire.

In recent years, there is growth in research activity relating to outcome studies (Karkou, Aithal, Zubala and Meekums 2019; Koch et al 2019). Aspects of the therapeutic process have also been the subject of several interdisciplinary research studies (Karkou, Oliver and Lycouris 2017; Zubala and Karkou 2018), while in others the positive contribution of dance movement therapy to specific diseases such as neurodegenerative and/or chronic ones has been highlighted (Goodill 2005).

At present, DMT is well-recognized as a form of supportive psychological therapy used in several hospitals as well as at comprehensive clinical cancer centers. In this context it is often referred to as Medical Dance Movement Therapy as it is shaped to specifically apply to the needs of those with a primary illness (Goodill 2005). Moreover, evidence increasingly suggests that dance movement therapy could be a very powerful tool in the recovery of breast cancer survivors (Serlin, Goldov and Hansen 2017; Dibble-Hope, 2000; Ho, 2016b; Sandel et al., 2005).

Dance movement therapists are often professional dancers to begin with, but have additional specialized training, often at a Masters level, that offers licence to practise. The presence of qualified practitioners is patchy and certainly very diverse from one country to another. The EADMT (2020) that represents professional associations of dance movement therapy in Europe, advocates the practice, establishes appropriate standards of training and promotes its legal and clinical recognition in different countries in Europe.

The DANCING WITH HEALTH project is mindful of the boundaries between DMT and therapeutic dance. The project features a dance protocol with the aim of improving physical health and to influence longer term activity levels for women with breast cancer, whilst also having a strong therapeutic character influenced by DMT research and practice to enhance psychological outcomes. It has the potential to be modified depending on the qualifications and skills of the practitioners delivering the sessions. Research work is essential to allow this work to develop further.

2. THE PROJECT

The project “An EU collaborative partnership for active lifestyles for the prevention and treatment of breast cancer- DANCING WITH HEALTH (DWH)”, co-financed in 2008 by the ERASMUS+ SPORT programme of the European Union, aims to promote physical activity in the form of dance to breast cancer survivors by offering an innovative dance protocol to involve them in a moderate / vigorous physical activity and as a consequence, to help them accept and reconnect with their bodies, build new self-confidence, enhance self-expression, address feelings of isolation, depression, anger and fear and to strengthen personal resources and above all, to do physical activity necessary for their wellbeing.

The project has a strong sports and exercise framework, highlighting that exercise for cancer patients has a double role. The first is connected with physical education, movement and health information, concepts contained in the primary directions of the EU. The other role is connected with learning and education. Through training, patients can be supported by skilled experts who can properly accompany them in their difficult path of treatment and recovery.

In order to evaluate the feasibility and the benefits of a specific dance protocol in breast cancer survivors, a pilot study was developed to evaluate the effectiveness of a therapeutic dance programme on psychological and physiological parameters in the different participating European countries (Italy, Bulgaria, Lithuania, Netherlands and UK). In the study, about 60 breast cancer survivors aged between 30- 65 years old, who performed different surgery and cancer related treatments, have been enrolled. The protocol provided two lessons per week, lasting one hour each for a total of thirty-two sessions over four months in 2019.

PARTNERS

The project DANCING WITH HEALTH sees the participation of seven organizations from five European countries **coordinated by Università degli Studi di Roma Foro Italico (Italy).**

Project partners are:

- IncontraDonna onlus (Italy)
- Associazione ISES (Italy)
- Edge Hill University (UK)
- Bulgarian Sport Development Organisation (Bulgaria)
- Klaipėda Region Women Information Centre (Lithuania)
- University Medical Center Utrecht (The Netherlands)

THE PHASES OF THE PROJECT

- Development of an **innovative dance protocol for breast cancer survivors and women** to involve them in a moderate / vigorous physical activity that they can sustain and enjoy, in order to improve their psychophysical wellbeing;
- **Training (train the trainers)** of dance therapists and physical activity professionals to standardize the protocol and make it transferable and replicable in other contexts and countries.
- Organisation of **public events** to promote the project and disseminate information on relevant topics such as the importance of physical activity for the maintenance of health. This includes physical activity and its role in the prevention and treatment of diseases; dance and its psychological and physiological effects, dance movement psychotherapy and cancer care.

The sessions/lessons were generally organized as follows:

- 10 minutes warm-up.
- 40 minutes individual or small groups work at an intensity between 50 and 70% of the theoretical maximum frequency of the subject.
- 10 minutes cool-down.

The protocol combines an introduction to a range of dance styles (merengue, bachata, cha-cha-cha, salsa, rumba and tango) with exercise components. The pilots were delivered by three facilitators per group of 10-12 women. Facilitators included experienced professional dancers with at least five years of experience and exercise professionals with qualifications in sports and movement sciences, which reflects the skills needed to deliver the core protocol. In the UK the facilitators were registered dance movement psychotherapists who also had extensive professional dance and exercise/sports expertise and so the delivery of the protocol in this particular pilot was enhanced therapeutically.

Given the diverse recognition of dance movement therapy in different countries, the project retained a strong influence from dance movement therapy practice but allowed for diverse dance practitioners to be involved in the delivery of the pilot intervention which became a dance practice with a strong therapeutic character (see other such examples in Karkou, Oliver and Lycouris 2017 and see Karkou and Sanderson 2006 for differences between dance movement therapy and therapeutic dance). As a result, the current manual reflects both its influences from dance movement therapy as well as its openness to be delivered safely from diverse dance practitioners who are not qualified and trained dance movement therapists in their country of residency and practice. Depending on the qualifications of the facilitators, stronger psychotherapeutic or dance emphasis is encouraged.

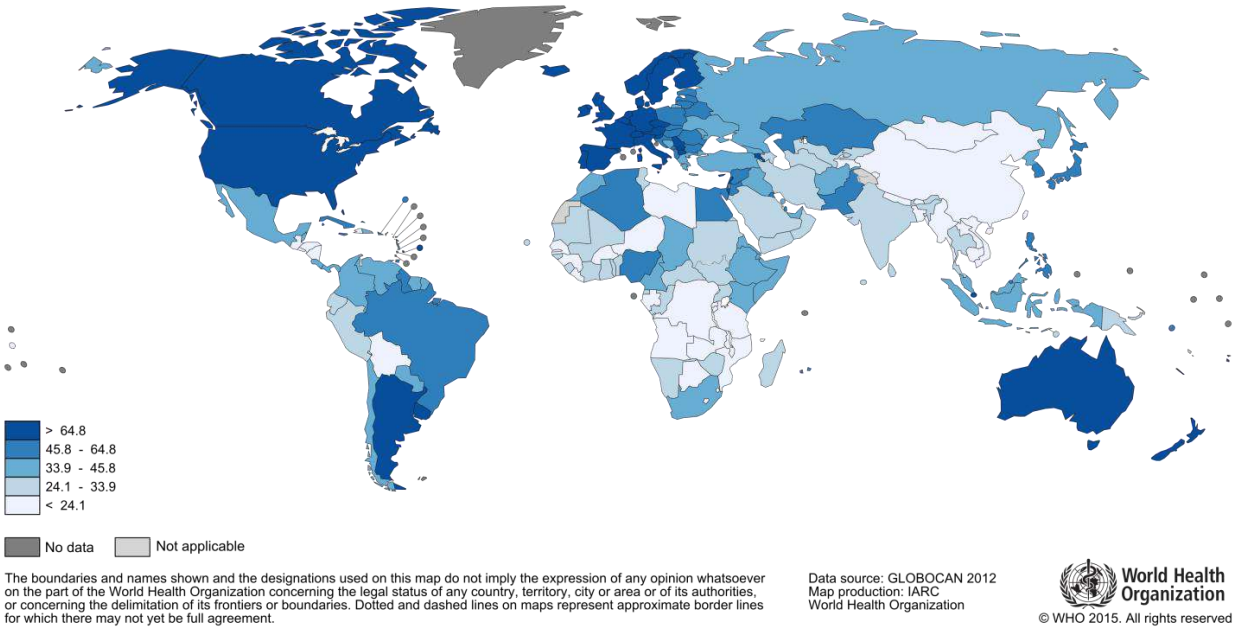
3. THE MANUAL

This manual has been developed for health and sport professionals and dance teachers/therapists who want to learn more about the dance protocol and how to replicate it.
It has been developed by the University of Rome “Foro Italico”, in cooperation with all the partners of the project.

The manual summarizes the scientific evidence relating to breast cancer and cancer care post-surgery, highlights the importance of physical activity and dance in the prevention and treatment of numerous diseases (non-communicable chronic diseases), presents research on integrative therapies during and after breast cancer treatment and on dance and dance movement therapy with breast cancer patients. It then describes the project pilot action phases (recruitment of patients, test of functional and psychological evaluation) and the training methodology (the dance protocol).

The final chapter describes the results of the pilot action of this project as motivation and inspiration for other professionals to apply our protocol in their contexts.

4. SCIENTIFIC EVIDENCE



Breast Cancer

Breast cancer is the most common type of cancer in women worldwide. Women in Western countries (Western Europe, North America and Australia & New Zealand) have the highest risk of being affected. (For more information visit: https://gco.iarc.fr/today/data/factsheets/cancers/20-Breast-fact-sheet.pdf

In Europe, we see more than 500,000 new cases of breast cancer each year, and more than 150,000 women die of breast cancer.
Since the majority of breast cancer patients survive for more than 10 years, the number of women living with or after breast cancer is high (more than 2 million in Europe).

There are many risk factors which increase a person's risk of breast cancer.
Many of them you cannot change: (https://www.cdc.gov/cancer/breast/basic_info/risk_factors.htm):

Getting older. The risk for breast cancer increases with age; most breast cancers are diagnosed after age 50.

Genetic mutations. Inherited changes (mutations) to certain genes, such as BRCA1 and BRCA2. Women who have inherited these genetic changes are at higher risk of breast and ovarian cancer.

Reproductive history. Early menstrual periods before age 12 and starting menopause after age 55 expose women to hormones longer, raising their risk of getting breast cancer.

Having dense breasts. Dense breasts have more connective tissue than fatty tissue, which can sometimes make it hard to see

tumors on a mammogram. Women with dense breasts are more likely to get breast cancer.

Personal history of breast cancer or certain non-cancerous breast diseases. Women who have had breast cancer are more likely to get breast cancer a second time. Some non-cancerous breast diseases such as atypical hyperplasia or lobular carcinoma *in situ* are associated with a higher risk of getting breast cancer.

Family history of breast cancer. A woman's risk for breast cancer is higher if she has a mother, sister, or daughter (first-degree relative) or multiple family members on either her mother's or father's side of the family who have had breast cancer. Having a first-degree male relative with breast cancer also raises a woman's risk.

Previous treatment using radiation therapy. Women who had radiation therapy to the chest or breasts (like for treatment of Hodgkin's lymphoma) before age 30 have a higher risk of getting breast cancer later in life.

Women who took the drug diethylstilbestrol (DES), which was given to some pregnant women in the United States between 1940 and 1971 to prevent miscarriage, have a higher risk. Women whose mothers took DES while pregnant with them are also at risk.

There are other risk factors that can be modified: (https://www.cdc.gov/cancer/breast/basic_info/risk_factors.htm):

Not being physically active. Women who are not physically active have a higher risk of getting breast cancer.

Being overweight or obese after menopause. Older women who are overweight or obese have a higher risk of getting breast cancer than those at a normal weight.

Taking hormones. Some forms of hormone replacement therapy (those that include both estrogen and progesterone) taken during menopause can raise the risk of breast cancer when taken for more than five years. Certain oral contraceptives (birth control pills) also have been found to raise breast cancer risk.

Reproductive history. Having the first pregnancy after age 30, not breastfeeding, and never having a full-term pregnancy can raise breast cancer risk.

Drinking alcohol. Studies show that a woman's risk for breast cancer increases with the more alcohol she drinks.

Smoking. A large systematic review and meta-analysis (Sollie M, Bille C. Smoking and mortality in women with cancer-based systematic analysis with 400,944 breast cancer cases. Gland Surg. 2017 Aug; 6 (4): 385-393) found a 28% increase in breast cancer-associated mortality in those who were current smokers compared to never smokers. The mortality in former smokers was equal to the one found in never smokers. This indicates that breast cancer patients ceasing to smoke can lower their risk of dying from their breast cancer disease dramatically, and possibly regain the risk of a never smoker.

Work place. The relationship between occupation and female breast cancer has been studied in a review of Connie Cl et al. (Engel CL, Sharima Rasanayagam M, Gray JM, Rizzo J. Work and Female Breast Cancer: The State of the Evidence 2002-2017. New Solut. 2018 May; 28 (1): 55-78). The authors undertook a scoping review to assess the literature from 2002 to 2017 on this topic. Case–control, cohort, and meta-analytic studies suggest that women working

as flight attendants, in medical professions, some production positions, sales and retail, and scientific technical staff are likely to have elevated risk of breast cancer. In addition, occupational exposures to night-shift work, ionizing radiation, some chemicals, job stress, and sedentary work may increase risk of breast cancer. Occupational physical activity appears to decrease risk. Workplace exposures to passive smoke and occupational exposure to nonionizing radiation do not appear to affect breast cancer risk. Some studies of occupational categories and workplace exposures indicate that risk may be modified by duration of exposure, timing of exposure, dose, hormone-receptor subtypes, and menopausal status at diagnosis. The compelling data from this review reveal a substantial need for further research on occupation and breast cancer.

However, it is important to realize that breast cancer is NEVER a woman's own fault.

(Breast) cancer risk is not related to personality. Stress, being anxious, being introverted etc. is not a cause of breast cancer.

Table 3. Hazard Ratios and 95% Confidence Intervals for Death After Cancer According to Cancer Site, per a One-Score Increase in Extraversion and Neuroticism, in 2,733 Finnish (1976–2004) Persons[a]

Cancer Site (Cancer Cases/Deaths)	Extraversion						Neuroticism					
	Unadjusted HR[b]	95% CI	*P* Value[b]	Multivariate HR[b,c]	95% CI	*P* Value[b]	Unadjusted HR[b]	95% CI	*P* Value[b]	Multivariate HR[b,c]	95% CI	*P* Value[b]
All sites ($n = 2,733/n = 1,548$)	0.99	0.97, 1.01	0.34	1.00	0.98, 1.02	0.86	0.99	0.97, 1.01	0.40	1.00	0.98, 1.02	0.61
Specific sites												
Stomach ($n = 137/n = 110$)	1.00	0.94, 1.08	0.95	1.00	0.93, 1.07	0.95	0.99	0.91, 1.07	0.78	0.99	0.90, 1.08	0.73
Colorectum ($n = 217/n = 131$)	0.96	0.90, 1.03	0.26	0.97	0.90, 1.05	0.43	0.96	0.89, 1.04	0.29	0.93	0.86, 1.01	0.09
Lung ($n = 263/n = 238$)	1.05	1.00, 1.11	0.06	1.05	1.00, 1.11	0.05	0.96	0.92, 1.01	0.11	0.96	0.91, 1.01	0.15
Breast[d] ($n = 474/n = 154$)	0.95	0.89, 1.02	0.13	0.98	0.92, 1.04	0.49	1.00	0.93, 1.07	0.98	1.02	0.95, 1.09	0.68
Prostate[e] ($n = 327/n = 143$)	1.01	0.95, 1.07	0.83	1.02	0.96, 1.09	0.49	0.99	0.93, 1.05	0.68	1.00	0.94, 1.07	0.93
Urinary organs (excluding kidney) ($n = 102/n = 61$)	1.03	0.92, 1.14	0.63	1.01	0.91, 1.13	0.83	1.02	0.92, 1.12	0.73	0.99	0.88, 1.11	0.82
Nervous system ($n = 120/n = 71$)	1.04	0.95, 1.15	0.40	1.05	0.93, 1.17	0.43	1.03	0.95, 1.12	0.50	1.05	0.95, 1.16	0.36

Abbreviations: CI, confidence interval; HR, hazard ratio.

[a] Time since cancer diagnosis was used as the underlying time scale. All analyses were stratified according to gender.

[b] Obtained by linear trend tests.

[c] Adjusted for age at cancer diagnosis (continuous variable), information on cancer stage (nonlocalized, localized, unknown), smoking status (ever, never, unknown), alcohol consumption in g/month (none, 1–250, 251–500, ≥501, unknown), body mass index in kg/m^2 (<18.5, 18.5–24.9, ≥25.0, unknown), and length of education in years (≤9, ≥10, unknown).

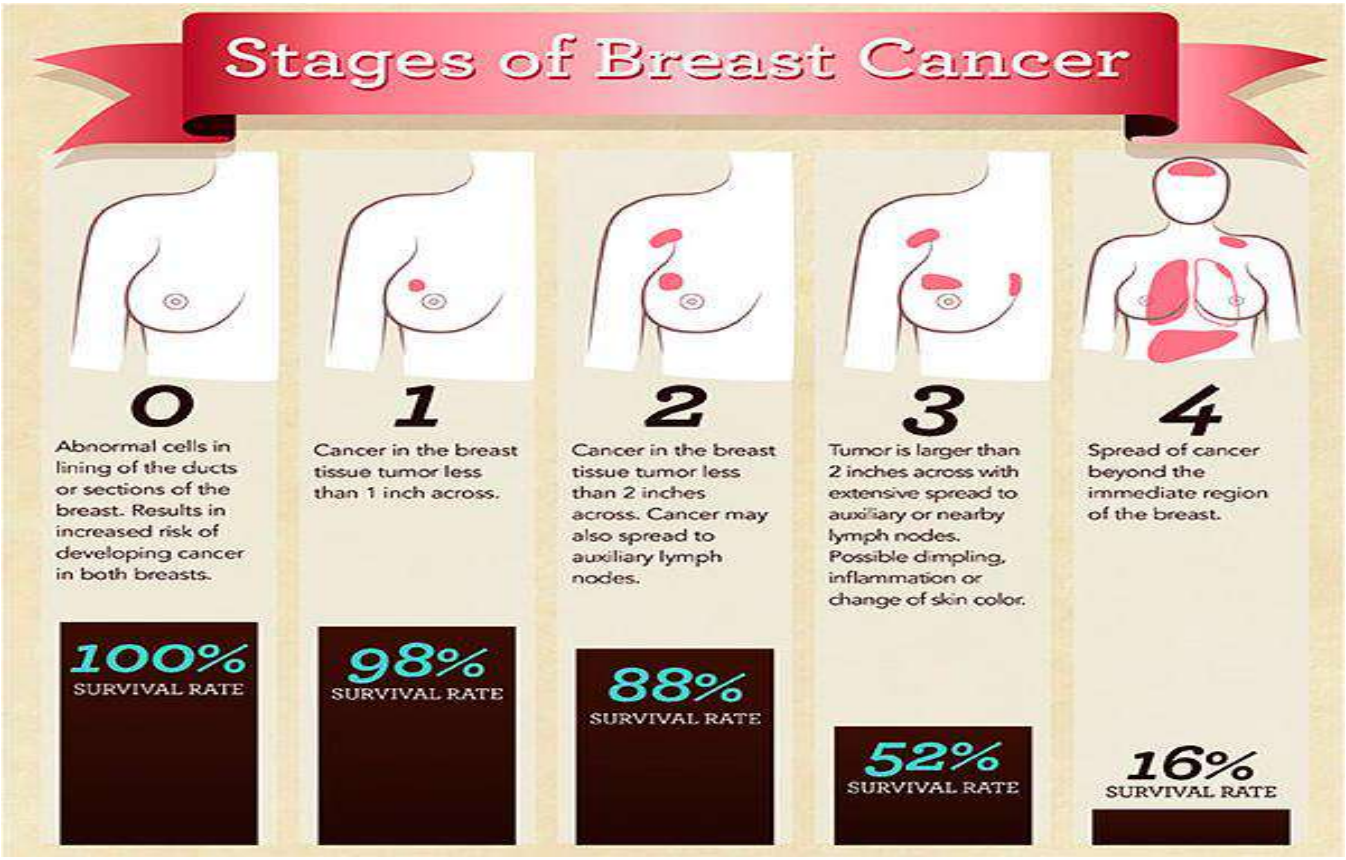
[d] The analysis included only women, and multivariate HRs were further adjusted for parity (nulliparity or parity).

[e] The analysis included only men.

Stages of Breast Cancer

There are several stages of breast cancer, varying from very early breast cancer to advanced disease.

(http://www.cancer.ca/en/cancer-information/cancer-type/breast/staging/?region=on):



Surgery For Breast Cancer – Less Is More

The vast majority of women with breast cancer have surgery as part of their treatment. Usually, they undergo surgery of the breast and axilla (depending on the extent of the disease) (https://www.cancer.org/cancer/breast-cancer/treatment/surgery-for-breast-cancer.html).

Breast conserving surgery: (also called a *lumpectomy*, *quadrantectomy*, *partial mastectomy, or segmental mastectomy*) – A surgery in which only the part of the breast containing the cancer is removed. The goal is to remove the cancer as well as some surrounding normal tissue. How much of the breast is removed depends on the size and location of the tumor and other factors.

Mastectomy: Here, the entire breast is removed, including all of the breast tissue and sometimes other nearby tissues. Some women may also get a double mastectomy, in which both breasts are removed.

To find out if the breast cancer has spread to axillary (underarm) lymph nodes, one or more of these lymph nodes will be removed and looked at under the microscope. This is an important part of figuring out the stage (extent) of the cancer. Lymph nodes may be removed either as part of the surgery to remove the breast cancer or as a separate operation.

The two main types of surgery to remove lymph nodes are:

Sentinel lymph node biopsy*:* a procedure in which the surgeon removes only the lymph node(s) under the arm to which the cancer would likely spread first. Removing only one or a few lymph nodes lowers the risk of side effects from the surgery.

Axillary lymph node dissection (ALND): a procedure in which the surgeon removes many (usually less than 20) lymph nodes from under the arm.

Some women choose to undergo reconstructive surgery. Here, the breast is reconstructed using either a breast prosthesis, or a woman's own tissue.

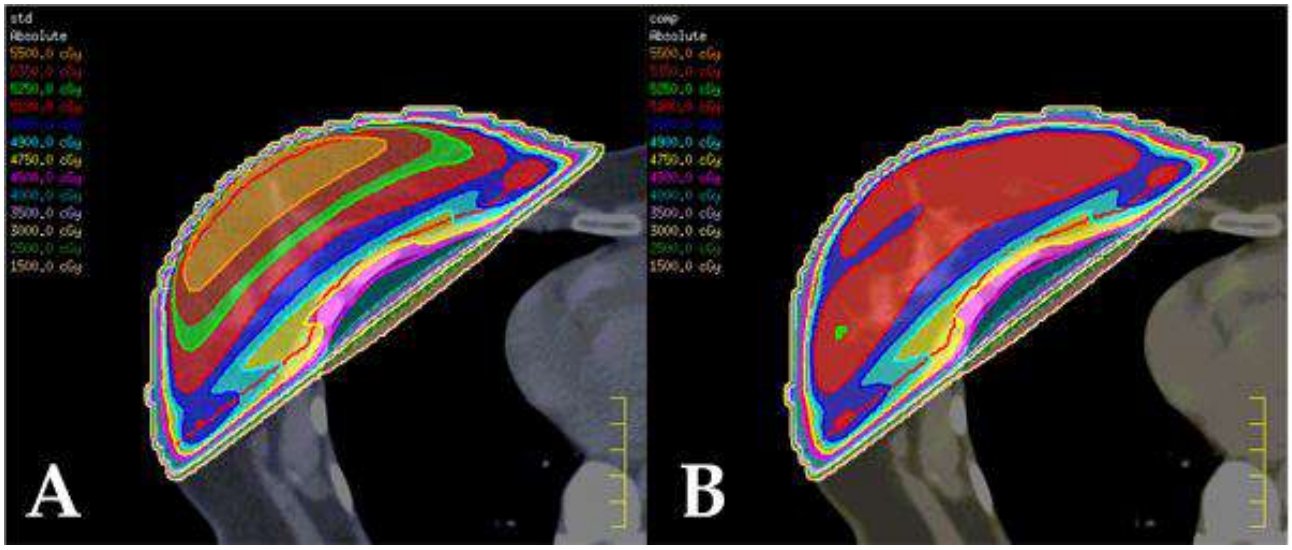
Radiotherapy

Radiotherapy is a treatment for cancer that uses carefully measured and controlled high energy x-rays.

In primary breast cancer it aims to destroy any cancer cells that may be left behind in the breast area after surgery.

Depending on the extent of the disease, radiotherapy is given to the breast only, or also to the axilla, chest wall, and in some cases to the area around the neck and collar bone.

The total dose of radiotherapy is given in daily ‘fractions’, usually spread over a period of 16-23 days (or longer).



Lymphedema

One of the side effects of surgery and radiotherapy include lymph edema.

The buildup of lymph, a fluid your body makes, happens when lymph vessels or nodes that the fluid travels through are missing, damaged, or removed (for example as a result of axillary surgery or radiation therapy).

Although there's no cure for lymphedema, when caught early, treatment can reduce some signs and symptoms and stop them from getting worse.

Signs and symptoms of lymphedema include:

- Swelling in the breast, arm or hand (for example, you may notice a tighter fit of rings or watches)
- Feeling of tightness, heaviness or fullness
- Feeling of tightness in the skin or a thickening of the skin
- Pain or redness.

In the past, there was some concern that exercise increased the risk of lymphedema in breast cancer survivors and worsen symptoms in those who developed the condition.

However, after recovery from breast surgery, light arm exercises don't appear to increase the risk of lymphedema. It's best to avoid strenuous exercise right after breast surgery though.

Women with symptoms of lymph edema should talk with their health care provider before starting an exercise program.

Effects of the Radiotherapy

Breast radiation may also cause other problems, including fatigue, shoulder problems (frozen sholder), redness of skin.

In the long term, the risk of cardiac problems and lung problems may be somewhat increased in some breast cancer survivors.

Chemotherapy

A substantial proportion of women with breast cancer are treated with chemotherapy. Women on active chemotherapy treatment do not participate in the DANCING WITH HEALTH program.
In the months and years after chemotherapy, women may still experience late effects and long-term side effects.

Long term effects:

- Problems with memory, attention and coordination
- Polyneuropathy
- Fatigue
- Early menopause
- Weight gain
- Heart problems

Hormone Therapy

A substantial proportion of women (i.e. those with hormone sensitive tumors) are treated with hormone therapy. Usually for at least five years after diagnosis. For many women, hormone therapy strongly induced debilitating symptoms. Some of the long term effects reported include:

- Hot flushes
- Mood swings
- Sexual problems
- Osteoporosis
- Weight gain

In women with breast cancer, the global health status declines in the first months following treatment. After 12 months, it is comparable to that of the general population.

On the whole however:

- Women with breast cancer report poorer role (work, child care) and social functioning, in particular in the first months after diagnosis. This effect persists until after 3 years.
- Women with breast cancer report more symptoms of anxiety up to more than 3 years after diagnosis than the healthy female population.
- Women with breast cancer report poorer functioning of memory and concentration than healthy women. This effect persists until after 3 years.
- Women with breast cancer experience more fatigue than healthy women, in particular in the months after their diagnosis. After 3 years, breast cancer survivors still report more problems of fatigue than healthy individuals.

This description does not provide a complete overview of the problem and no claims or advice can be made towards patients (and their treatments) based on this manual. The patient's physician is always responsible for giving the green light for the patient to participate in the dance programme. However key aspects of the problems faced by women who go through breast cancer treatment are outlined and described as potentially useful reference points for facilitators involved in delivering the programme.

5. PHYSICAL ACTIVITY & HEALTH

People living in modern societies tend to move less and eat more than their energy expenditure allows. Research increasingly shows how insufficient physical activity, especially when associated with overfeeding, impairs metabolic and general health, with an effect occurring just a few days after the initiation of a deleterious lifestyle (Knudsen et al 2012). Sedentary behaviors damage most of the human tissues, organs and functions while physical activity and exercise benefit all physiological functions.

Furthermore, exercise has an anti-aging effect, counteracting mortality. There is a clear relationship between the amount of physical activity, mortality and longevity, as was reported by Paffenbarger et al (1986) in one of the first study on “Physical activity, all cause of mortality and longevity”.

Even more important than adding years to life, is adding life to the years. Living longer is of course a good thing, but it is also important to extend life expectancy in good health, postponing as much as possible or avoiding physical disability and impairment of cognitive function. In this respect, physical activity is a precious tool for successful ageing.

Aging well implies taking care of our body while still young, targeting the factors that influence the decline of biological functions. In a recent study, Belsky et al. (2015) tracked 18 biomarkers related to physiological integrity in multiple bodily systems (related to inflammatory state and immune functions; cardiorespiratory function; renal function; body composition; blood lipid profile; long term blood glucose control) in young individuals. It is quite remarkable that most of the “anti-ageing” targets identified in that study are positively affected by physical activity, which is therefore a powerful anti-ageing tool.

Physical inactivity is related to the occurrence of a number of diseases. Where cardiovascular diseases are concerned, the amount of exercise is related with heart attack risk. The Harvard Alumni Study was one of the first epidemiologic studies to examine the relationship between physical activity and incidence of heart attack. The relative risk for first heart attack for those who climbed less than 50 stairs a day compared to those who climbed fifty or more was 1.25. For men who walked less than five city blocks daily, their relative risk for a first heart attack was 1.26 when compared to men who walked more than five blocks a day Men who burned less than 2000 kilocalories per week had a relative risk of 1.64 compared to men who burned more than 2000 kilocalories weekly. Later analyses found increased physical activity level was associated with lower coronary heart disease risk when considered singly. When considered along with age, BMI, alcohol intake, hypertension, diabetes, smoking status and early parental death, higher levels of physical activity were also apparently protective.

Stroke is also related to the amount and the intensity of physical activity, as was reported in several investigations. There have been studies that have argued that physical activity in reducing the risk of ischemic stroke can be (Sacco et al 1998).

It is possible that some of the positive effects of exercise are the result of having an impact on metabolism (American Heart Association 2009). Exercise has been reported as able to act on all factors at the same time. In this respect exercise may be viewed as a “poli-pill”, being able with a single assumption to target a multitude of bodily functions in a coordinated manner and without side effects. Similar results have been reported amongst cancer survivors (Oosting et al 2010).

Type 2 diabetes is one of the biggest health problems nowadays, and it is largely influenced by lifestyle, meaning mainly nutrition and physical activity. The good news is that being physically active reduces the risk of developing diabetes or at least postpones its occurrence. Evidence in this respect has accumulated during the last two decades, with the first studies being regarded as “classic studies” (Pan et al 1997; Tuomilehto et al 2001; Knowler et al 2002).

A large number of studies on exercise cover its benefits on a number of different areas:

- Sarcopenia (Fiatarone et al 1994)
- Osteoporosis (Tong et al 2019; Vieira 2013)
- Rheumatic disease (Benatti et al 2015)
- Mood disorders and cognitive functions (Goodwin 2003; Barnes 2015)

Overall, exercise represents a very powerful tool for prevention and treatment in many diseases, as extensively and nicely reviewed by Pedersen & Saltin (2015).

6. QUANTITY & QUALITY OF PHYSICAL ACTIVITY

The public recommendations for physical activitysuggest to perform at least 150 minutes of moderate intensity aerobic exercise per week (e.g. brisk walking), or at least 75 minutes of vigorous aerobic exercise per week (e.g. jogging); to these, resistance training should be added twice a week, targeting the major muscle groups.

A larger amount of physical activity than recommended can provide additional benefits. On the other hand, even smaller amounts of activity is still able to provide some benefits. Therefore, the message that should be given is that "something is better than nothing".

Another practical question one may try to address, is whether or not exercising only during weekends and not during the week-days is still effective in promoting health. According to a study by O'Donovan et al (2017), "weekend warrior and other leisure time physical activity patterns characterized by 1 or 2 sessions per week may be sufficient to reduce all-cause, CVD, and cancer mortality risks regardless of adherence to prevailing physical activity guidelines". In any case, it should be borne in mind that splitting the recommended exercise volume throughout the week is certainly a better solution, especially for those individuals/patients who benefits from a frequent exercise stimulus (e.g diabetic patients).
In addition to the recommendations on physical activity, suggestions on reducing sedentary time have been also put forward, which could be done by breaking up sitting time with 'activity breaks'.

In modern western societies, when a large portion of daily hours are spent sitting, sedentary lifestyle is increasingly shown to be deleterious for several aspects related to health. In fact, as reported by Levine (2015): "*Epidemiological, physiological and molecular data suggest that sedentary lifestyle can explain, in part, how modernity is associated with obesity, more than 30 chronic diseases and conditions and high healthcare costs. Excessive sitting--sitting disease--is not innate to the human condition. People were designed to be bipedal and, before the industrial revolution, people moved substantially more throughout the day than they do presently. It is encouraging that solutions exist to reverse sitting disease. Work environments, schools, communities and cities can be re-imagined and re-invented as walking spaces, and people thereby offered more active, happier, healthier and more productive lives*."

Children, adults and older individuals should all therefore, be invited to "move more and sit less", engaging a peripatetic and active lifestyle. In this regard, it is worth mentioning that sedentariness and inactivity are not anymore used as synonymous. More specifically, an inactive individual is one that is not reaching the minimum amount of physical activity recommended, whilst the sedentary one is someone who spends most

of their daily time seated or in a reclined position, which results in a low energy expenditure level (<1,5 METs). In this view, it is possible that an individual would be physically active but sedentary (as would be the case if, for example, he exercises early in the morning but spend the rest of the daily time in front at the computer at work).

It is important to take all opportunities to move, and this could be done within different physical activity domains during leisure time, as well as during the working hours. Several studie reported a clear benefit of interrupting sedentariness with short but frequent bouts of exercise. The data reported by Peddie et al (2013) is just one such example that shows how short physical activity breaks can be effective in improving postprandial metabolic control even in healthy adults. Even the simple alternating between sitting and standing work, by means of the so called ‘standing desks’, “could be a potential solution for a sedentary lifestyle to prevent weight gain in the long term. Future studies should aim to assess the effectiveness and feasibility of this strategy” (Saeidifard 2018).

The effect of exercise is increasingly compared with that of drugs, and in most cases/studies exercise has a similar potency just like medicines. The exercise can be properly dosed to meet the needs of the different individuals, from the athlete to the deconditioned elderly patient. On the other hand, exercise is a better medicine than drugs, as it has a lager spectrum of action and, when properly adapted to the functional capabilities of the various individuals, it has virtually no contraindications.

The problem is that, while it takes just a few seconds to ingest a pill, exercising requires more effort and dedication. The solution may be to invest in enjoyment, choosing the exercise that is not only effective but also enjoyable. In this respect dance has an enormous potential, as it is both an effective exercise to improve physical fitness and is fun.

7. PHYSICAL ACTIVITY & CANCER

Physical activity can also have positive effect in the prevention of cancer, as it was reported by Moore et al in (2016), where they examined the “Association of Leisure-Time Physical Activity With Risk of 26 Types of Cancer in 1.44 Million Adults.”

They found that “Leisure-time physical activity was associated with lower risks of many cancer types” and suggest “health care professionals counseling inactive adults should emphasize that most of these associations were evident regardless of body size or smoking history, supporting broad generalizability of findings.”

In contrast, obesity, dietary factors and inappropriate nutrition has been linked with cancer risk (Seiler et al 2018). These factors, associated with basic diseases, can promote the onset of tumors. Therefore, physical activity that prevents pathologies has a generic and indirect function also of cancer prevention.

For women with breast cancer, sleep deficiency is common and distressing throughout the care continuum. Matthews et al. (2018) describes the scope and quality of evidence related to exercise interventions to improve sleep in women with breast cancer. Fifteen studies met the criteria and twelve were judged to be excellent quality. The most frequent intervention was walking, primarily during the time of chemotherapy. Eleven studies reported post intervention improvement in sleep deficiency. Most yoga, qigong, and dance intervention studies reported no differences between groups. Emerging evidence exists for the effectiveness of aerobic exercise to improve various sleep outcomes in women with breast cancer.

8. DANCE & BREAST CANCER

In one of its simplest definitions, dance is the act of moving your feet and body to music (Cambridge Dictionary 2020). Although this definition gives an idea of the physicality and musicality of dancing, it by no means gives a full picture of the other factors at play. In Carr's (1997) article the Meaning in Dance, dance is deconstructed into numerous concepts. This includes David Best's definition that dance is different from sport in that it is about artistic (including the aesthetic) communication or expression. This idea of dance being a medium for self-expression gives rise to the discussion regarding the potential psychological effect of dance. Dr Lovatt, a dance psychologist in the UK advocates that dance can promote physical, social and emotional benefits. Not only does it release more endorphins than any other exercise, it can boost self-esteem, help with pain and can often be an outlet for pent up emotions (Lovatt 2016).

Several studies have shown the impact of dance in improving physical and psychological health specifically in breast cancer patients. It is known that physical activity positively effects the course of breast cancer, reducing the negative side effect of related treatment, increasing the quality of life in patients and reducing the recurrences; this could be related to the effects of exercise on different hormone expressions and on the level of DNA methylation related to specific tumor suppressor genes regulation that appears to be directly involved in the progression of these diseases (Grazioli et al 2017). Although this correlation was studied by several researchers, few breast cancer patients regularly engage in physical activity (Rethorst et al 2018). The cause could be attributed to lack of knowledge on the part of the patient, their family members or even doctors, about the benefits of physical activity or even worse, the lack of awareness about the damage caused by inactivity. It is therefore, important to promote physical exercise for women with a breast cancer diagnosis, and stress the importance of including physical activity as early as possible in their lifestyle.

Dance as a physical activity is considered to be engaging and fun (Sturm et al, 2014), providing opportunities for social connections and support (Pisu et al, 2017), factors which could support participation for women with breast cancer in physical activity and minimise potential drop-out. If well-structured, in terms of intensity, duration and frequency, evidence shows it could improve physiological and psychological outcomes

for cancer patients (Sturm et al, 2014; Pisu et al, 2017) notably breast cancer patients (Sandel et al, 2005; Loo et al, 2019; Malicka et al, 2011; Kaltsatou et al 2011).

Other barriers to engagement in physical activity could be physiological and psychological impairments related to the disease and their side effects. Fatigue, asthenia and depression can create a vicious circle amplifying the problems and decreasing the patient's quality of life (Schneider et al 2003). Physical activity can often be a struggle for cancer patients and survivors who often suffer from cancer-related fatigue, which can have a significant impact both mentally and physically (Cancer Research UK). In a study by Sturm et al (2014), the effect of dance as a holistic sport activity in cancer patients with moderate or severe fatigue was evaluated. Whilst only a small study of 40 participants, results showed significant improvements in fatigue levels, and the study concluded that dance could be an appropriate, effective approach to improving physical health for cancer patients.

Breast cancer diagnosis can happen at any age, however it is shown to be more common after the menopause (World Cancer Research Fund 2020). An analysis of 50 studies by Rodrigues-Krause et al (2019) on the use of dance as an intervention to promote functional and metabolic health in older adults, show that any dance style can induce positive functional adaptations in older adults (aged 55+), especially in relation to balance. Whilst this study did not focus on cancer patients, the findings support the view that dancing may be a viable exercise intervention to promote health-related benefits particularly for older women.

In relation to dance interventions and breast studies which have promising results and give an indication of the impact of dance interventions on physical and psychological measures. Loo et al (2019) conducted a small pilot cultural dance intervention for breast cancer survivors, in which it was noted a sustainable increase in physical activity was achieved, with potential to improve quality of life, increase vigor, and decrease levels of circulating cytokines associated with obesity and inflammation. In a different study of physical activity on life satisfaction, acceptance of illness and adaptation to breast cancer, Malicka et al (2011) found that of the many types of physical activity included in the study, dance was noted as one of the most important for quality of life. In 2017, Boing et al conducted a systematic review of articles which investigated the influence of dance as adjuvant therapy in breast cancer. This included dance movement therapy and a number of dance styles such as ballroom, Greek, ballet, sacred and jazz. Both physiological improvements: increased range of motion and strength in upper limb

and functional capacity were observed, as well as psychological improvements: self-image, femininity, mood, self-esteem, physical well-being, perceived stress, pain, consciousness, depression, couples trust, anxiety and fear. The conclusion being that dance can be effective alternative adjuvant treatment in breast cancer. Informed by the findings from this review, Boing et al went on to conduct a study in 2018, which saw breast cancer patients attending a twelve weekly belly dance programme. The study reported that 'belly dance can be a viable form of physical activity for women with breast cancer. It was associated with benefits for quality of life, fatigue, and depressive symptoms'(pag. 460). Whilst in this case there was not a significant difference between the experimental and control group, the findings have supported a further trial for Boing et al, to conduct a larger randomized control trial delivering pilates and dance interventions, with the aim of improving both physical and psychological quality of life outcomes for breast cancer patients.

Using dance as a potential way of easing patients into becoming more active is supported by a study by Pisu et al (2017) where thirty-one breast cancer patients took part in a ballroom dance group intervention. Findings included significant positive effects on physical activity and Quality of Life. It was noted that participants enjoyed spending time to exercise together and saw this activity as supporting them to become more physically active. A different study by Kaltsatsou et al (2011) takes this idea of transitioning into more exercise based physical activity further by combining traditional Greek dancing with upper body training in a mixed exercise program for women with breast cancer. The results of the experimental group showed significant increases for physical function, handgrip strength, life satisfaction and also a decrease in depressive symptoms.

Whilst most of these studies were small and larger control trials are needed, together the findings indicate that dance or an integrated dance and exercise programme could be a viable way of engaging breast cancer patients in physical activity and have the potential to benefit breast cancer patients both physiologically, socially and psychologically.

9. DANCE MOVEMENT THERAPY (DMT) & BREAST CANCER

The Association for Dance Movement Psychotherapy UK (ADMP UK 2020), one of the most established and long standing professional association in Europe, defines Dance Movement Psychotherapy as involving "… a relational process in which client/s and therapist engage creatively using body movement and dance to assist integration of emotional, cognitive, physical, social and spiritual aspects of self." (p. 1). Improving health and wellbeing is a key outcome of the process of integration and of the intervention itself. The discipline emerged as a professional field in the 1940's as early pioneers, many of whom were accomplished dancers, began to realize the benefit of using dance and movement as a form of psychotherapy (Karkou and Sanderson 2006). According to Karkou and Sanderson (2006), DMT has challenged the Cartesian dualism, whereby the body is seen as inferior to the mind and has developed into a holistic form of therapy, asserting that mind, body, and spirit are inseparable and interconnected. It is believed that changes in the body reflect changes in the mind and vice versa (Payne 1992). As such, there are arguments that both conscious and unconscious movement of the person affects total functioning, and also reflects the individual's personality.

Theoretically the discipline draws from humanistic psychotherapy, psychoanalytic/psychodynamic principles, developmental ideas, artistic/creative theories and techniques and active/directive practices. There is also a strong eclectic/integrative character in most approaches used in the field as argued by Karkou and Sanderson (2006). The work of Laban informs and strongly influences the work with some practitioners relying primarily on the therapeutic value of movement/dance components of the practice. There are other practitioners who highlight the interpersonal and relational components of the work as the results of influences from Marion Chace. There are also strong influences from intrapersonal and intrapsychic work, especially when influenced by the authentic movement approach of Mary Whitehouse (Karkou and Sanderson 2006).

Whilst often small in size and varying in design and delivery, DMT studies are growing in prevalence and scale, with positive results in relation to mental health and wellbeing, including the reduction of depression, anxiety, stress and improving Quality of Life (QoL) and body image perception. In Brauninger's (2012) multi-site randomized controlled trial of 162 participants who suffered from stress, results showed the DMT intervention significantly improved QoL, particularly in relation to psychological well-being in the short and long term. Notably there was also a positive impact on physical health in the short term indicating the physical dance component can work harmoniously with psychological therapy to provide a holistic support to recovery. These findings are supported by a meta analysis conducted by Koch et al (2014), of 23 evidence-based primary studies across 15 populations including both

DMT interventions and therapeutic dance for the treatment of health-related psychological problems. This analysis suggested that DMP and dance are effective for increasing quality of life and decreasing clinical symptoms such as depression and anxiety. It also yielded small but consistent effects for improvement of well-being, mood, affect, and body image which is often a significant issue for women who have had breast surgery.

Other studies have focused on using DMT for populations diagnosed with a primary medical illness. This is often referred to as Medical Dance Movement Psychotherapy (Goodill 2005) a field which is attracting increasing interest and growing in research activity. In her book *An introduction to medical dance/movement therapy: health care in motion,* Goodill presents a range of research studies which show how working creatively with the mind/body connection can encourage the healing process. Melsom, (cited by Goodill 2005 p31) identifies four features of DMT that make it a suitable treatment option for medical populations:

- The integration of mind, body, emotions, creativity and spirituality
- The inclusion of relaxation, breathwork and imagery within the therapeutic process
- The use of touch, mirroring, synchrony and body empathy
- The facilitation of work towards new ways of physical and emotional coping
- The promotion of emotional healing

In a systematic review of therapeutic dance interventions for physical and mental illnesses, including both DMT and ballroom dance, Kiepe et al (2012) found that DMT had a positive impact for patients with breast cancer, improving quality of life as well as for patients with depression, and decreasing psychological distress. It was also noted that ballroom dances such as tango improved balance and coordination in patients with Parkinsons. This is potentially a useful finding for cancer patients who often suffer from dizziness, vertigo and balance issues (Cancer Treatment Centers of America 2020).

Integrated healthcare and DMT research activity has been gaining in momentum and quality over the decades and there are now numerous significant studies for group interventions for women with breast cancer (Dibble-Hope, 2000; Ho, 2016b; Sandel et al., 2005; Serlin et al., 2000/ 2017?;). Qualitative findings from Dibbel-Hope, 2000 and Serlin et al., 2000 highlight that there are significant patient perceived benefits, and improvements in several aspects of Quality Of Life (QoL). Evidence of DMT improving QoL for breast cancer patients is also evident in Sandel et al's (2005) study which evaluated a twelve-week therapeutic dance movement programme that addressed the physical and emotional needs of women following treatment for breast cancer. This intervention was found to substantially improve a breast cancer specific quality-of-life measure. Physical symptoms such as stress and pain which in turn affect women psychologically can also be ameliorated. In a twelve session DMT intervention in China, Ho et al. (2016) found that DMT showed 'significant effects on buffering the deterioration in perceived

stress, pain severity, and pain interference'(pag.824). In fact, dance movement therapy increases the general quality of life in in with cancer, helping during the treatment and decreasing physical symptoms. In fact, it improves mental well-being, attention, and appreciation for the self and body; improve total functioning; bridge back to a normal and better life; and participate in shared positive experiences.

Objective versus subjective measures of change is an important notion, and one that is highlighted in Dibbell-Hope's (2000) study where quantitative analysis showed minimal improvement in mood (POMS), distress, body-image and self-esteem. There was however statistically significant changes in vigour, fatigue and somatization. What is extremely insightful and useful is the qualitative subjective data (semi structured interviews and written evaluations) which 'indicated strongly self-perceived improvement in mood, distress, body-image and self-esteem including: increase in awareness, acceptance and appreciation of the body and the self; decrease in negative mood and worry about the future; and increase in feelings of strength, ease, hope and social support' (Dibbell-Hope 2000 p65). This brings into question the importance of gaining qualitative data particularly for interventions that are aimed at supporting 'the self' and addressing emotional and psychological issues. It was also noted in Dibell-Hope's study that age and past experience with dance and sports, appeared to have an impact on satisfaction of body-image and self-esteem, supporting the view stated earlier in a previous section that the earlier in a life a woman starts to exercise or return to exercise after treatment the better, subject to having medical clearance.

Despite the promising nature of numerous smaller studies, it is important to further develop research activity in order to generate more substantial randomised control trial data. Three randomised-control trials were evaluated in the Cochrane Collaboration review of DMT (Bradt et al 2015) where it was noted that dance movement therapy was well tolerated, with small dropout rates but that there was not sufficient evidence to support claims of effectiveness at that time (Bradt et al.,2015). This indicates acceptability of the therapy, and bodes well for future studies with larger samples and more rigorous designs.

The evidence shows that a DMT intervention or a dance programme integrated or shaped by DMT may offer physical, psychological, emotional and social benefits for women with breast cancer. Future studies could evaluate a larger or longer program that covers the post-treatment period and/or a longer follow-up period to better elucidate the potential benefits and sustainability of the intervention. Research that informs the design or optimal duration of such interventions would also be useful.

10. THE PILOT ACTION

The DANCING WITH HEALTH protocol has been developed to evaluate the feasibility and the benefits of a therapeutic dance programme in breast cancer survivors, and the efficacy of this intervention on psychological and physiological parameters in the participating European countries (Italy, Bulgaria, Lithuania, Holland and UK).

In the study, 50-60 breast cancer survivors were enrolled (n=10/12 participants in each partnering country). The women were aged between 30 and 65 years old and had experienced different surgery and cancer related treatments. The programme provided two sessions per week, 1 hour each for a total of 32 hours in four months.

Before and after the programme, the physical, functional and psychological status of the women was evaluated.

11. EVALUATION METHODS

NB. All the tests described below have to be administered by expert operators: health and sport professionals for physical and functional tests, and/or psychologists for psychological evaluation.

Before and after the 32 dancing classes, the physical, functional and psychological status of women was evaluated by health/sport professionals with the following tests:

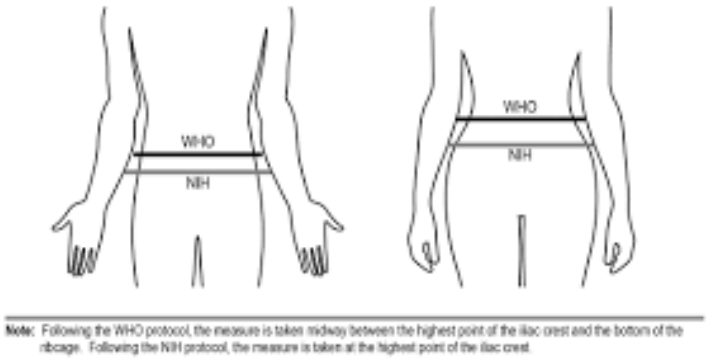
- Anthropometric measurements
- Cardiorespiratory fitness
- Muscle strength
- Balance
- Flexibility
- Psychological and fatigue evaluation.

Functional evaluation

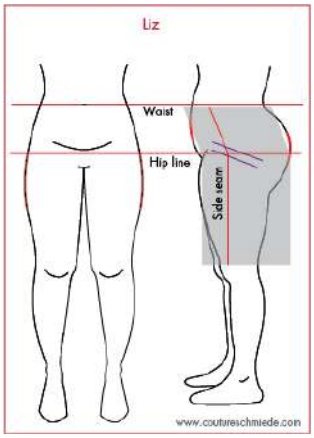
Anthropometric measurements

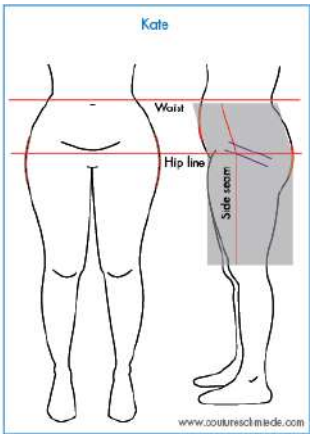
- Weight, Height and BMI: using the following formula, weight (kg)/[height (m2)]. With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared. This is a very simple and immediate test, as well as waist circumference evaluation, able to evaluate the weight status. High values of BMI are considered a risk factor correlated with an increased cancer recurrence and mortality.
- Circumference evaluation: Specifically the Waist circumference, that is an index of abdominal adiposity and the Hip circumference (waist to hip ratio), alone these measurement can not determine a future pathological condition, but they can evaluate were the fat is located in the body, and this could be a predictor of future disease such as cardiovascular or type II diabetes.

Figure 1
Waist circumference measurement sites for men and women based on World Health Organization (WHO) and National Institutes of Health (NIH) protocols



Note: Following the WHO protocol, the measure is taken midway between the highest point of the iliac crest and the bottom of the ribcage. Following the NIH protocol, the measure is taken at the highest point of the iliac crest.





Cardiorespiratory fitness

6 minute walking test: This test measures the residual functional capacity (RFC) of patients and it is generally recommended for diagnostic purposes, in fact this test determines the starting point distinguishing sedentary work, light work, or medium work. It is based on a self-peace mode, i.e. the patient chooses his intensity of effort, walks at the preferred speed and can perform stops and use a support. During the execution, a heart rate monitor is applied to the patient. The test field must be flat and cones are applied every 5 meters to calculate the distance travelled each minute by the patients. At the end of the test, is asked to each patient to score on a fatigue scale from 1 to 10, related to how tired they felt.

Muscle strength

Handgrip: is a dynamometer that evaluates the hand grip strength, this is the index of the maximal contraction force (mainly isometric) exerted by the muscles of the forearm and the hand responsible of many movements such as the extension of the forearm, the flexion of the metatarsals and the phalanxes, the flexion of the fingers and of the adduction of the thumb. A number of studies in the literature have also shown that it is closely related to the force exerted by other muscle groups. The hand grip strength test is also part of multi test batteries used to evaluate the neuromuscular efficiency and can be used with different objectives: in the evaluation of motor deficits, in rehabilitation, in sports medicine, in sports practice, etc. The patient performs the test in a standing position with a 90 degree flexed elbow; the assistant sets the instrument and asks to the patient to tighten it as hard as possible for a few seconds. Usually, 2 repetitions were made per side, taking the mean value.

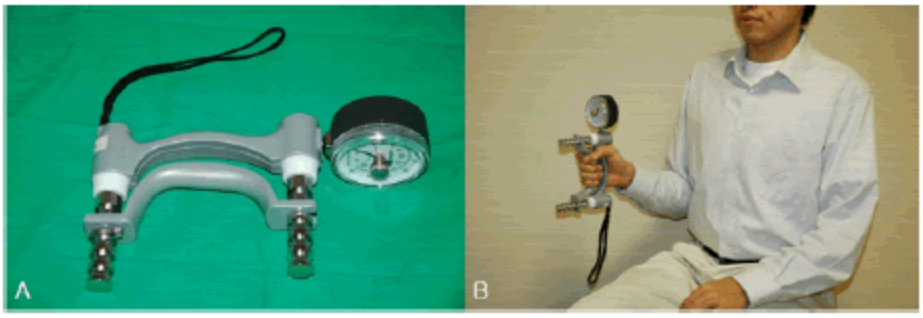
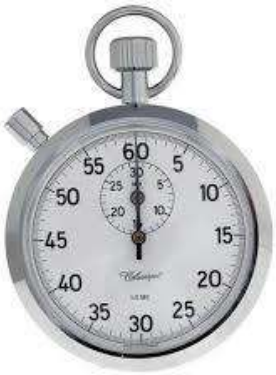


Figure 1: Jamar grip strength dynamometer (Hydraulic Hand Dynamometer, 5030J1) and the position of measurement (A) Jamar dynamometer is set at the level II (B) The subject is in a seated position with the shoulder adducted, not rotated to either side, and the elbow flexed to 90 degrees with the forearm and wrist in neutral position.

Normative Grip Strength Data [2,3]

		Males		*Females*	
Age	*Hand*	*Mean*	*SD*	*Mean*	*SD*
6-7	R	32.5	4.8	28.6	4.4
	L	30.7	5.4	27.1	4.4
8-9	R	41.9	7.4	35.3	8.3
	L	39.0	9.3	33.0	6.9
10-11	R	53.9	9.7	49.7	8.1
	L	48.4	10.8	45.2	6.8
12-13	R	58.7	15.5	56.8	10.6
	L	55.4	16.9	50.9	11.9
14-15	R	77.3	15.4	58.1	12.3
	L	64.4	14.9	49.3	11.9
16-17	R	94.0	19.4	67.3	16.5
	L	78.5	19.1	56.9	14.0
18-19	R	108.0	24.6	71.6	12.3
	L	93.0	27.8	61.7	12.5
20-24	R	121.0	20.6	70.4	14.5
	L	104.5	21.8	61.0	13.1
25-29	R	120.8	23.0	74.5	13.9
	L	110.5	16.2	63.5	12.2
30-34	R	121.8	22.4	78.7	19.2
	L	110.4	21.7	68.0	17.7
35-39	R	119.7	24.0	74.1	10.8
	L	112.9	21.7	66.3	11.7
40-44	R	116.8	20.7	70.4	13.5
	L	112.8	18.7	62.3	13.8
45-49	R	109.9	23.0	62.2	15.1
	L	100.8	22.8	56.0	12.7
50-54	R	113.6	18.1	65.8	11.6
	L	101.9	17.0	57.3	10.7
55-59	R	101.1	26.7	57.3	12.5
	L	83.2	23.4	47.3	11.9
60-64	R	89.7	20.4	55.1	10.1
	L	76.8	20.3	45.7	10.1
65-69	R	91.1	20.6	49.6	9.7
	L	76.8	19.8	41.0	8.2
70-74	R	75.3	21.5	49.6	11.7
	L	64.8	18.1	41.5	10.2
75+	R	65.7	21.0	42.6	11.0
	L	55.0	17.0	37.6	8.9

Five times Sit-to-Stand Test: This test analyses functional lower extremity strength, transitional movements, balance, and fall risk. A stopwatch is the tool required in order to measure the time in seconds that the patient needs to perform five times sit to stand from a chair.



Measures	Endurance, Strength, Transfers
Purpose	Measure number of stands completed in 30 seconds.
Time to Administer	30 seconds
Equipment Required	Chair and stopwatch

Balance

Fullerton Advanced Balance scale (FAB): it is a very complete test, specific for breast cancer survivors, and it is divided in ten different phases (see Table 1) that include balance and functional exercises.

Equipment needed:

1. Stopwatch
2. Pencil
3. 2 and 36 inch rulers
4. 6 inch high bench (18'X18' stepping surface)
5. Masking tape
6. 2 Airex® pads
7. Length of non-slip material between pads if floor is not carpeted -Metronome

Table 1: Primary Systems and/or Mechanisms Evaluated on Each Individual Test Item

Test Item	Systems and/or Mechanisms Evaluated
1. Stand with feet together, eyes closed	Sensory systems and strategies (somatosensation, vision), internal representations, musculoskeletal components, neuromuscular synergies
2. Reaching forward to object	Sensory systems (vision), neuromuscular response synergies, musculoskeletal components, anticipatory mechanisms
3. Turn in full circle	Sensory systems and strategies (vestibular, vision), neuromuscular synergies, musculoskeletal components
4. Step up and over	Sensory systems and strategies (vision, somatosensation), anticipatory and adaptive mechanisms, neuromuscular synergies, musculoskeletal system
5. Tandem walk	Sensory systems and strategies (vision, somatosensation), neuromuscular synergies, musculoskeletal components
6. Stand on one leg	Sensory systems (vision), anticipatory and adaptive mechanisms, musculoskeletal components
7. Stand on foam, eyes closed	Sensory systems and strategies (vestibular), internal representations, neuromuscular synergies, musculoskeletal components
8. Two-footed jump	Neuromuscular synergies, musculoskeletal components, anticipatory and adaptive mechanisms
9. Walk with head turns	Sensory systems and strategies (vestibular, vision), neuromuscular synergies, adaptive mechanisms
10. Reactive postural control	Neuromuscular synergies, adaptive mechanisms, musculoskeletal system

Flexibility

Sit and reach test: measures the flexibility of the back and hamstrings muscles. For the exam you need a cube or a box with a millimetre rod. The patient positions is sitting on the ground with his legs extended forward and adherent to the floor, feet, possibly without shoes, in plantar flexion and attached to the box. The patient performs a front flexion of the torso with his arms forward, trying to touch the farthest point of the sh aft with his fingers. This test is very useful in order to evaluate the functional ability of legs in term of walking speed and dynamic balance which highly influence the quality of life.

Back Scratch test: test for shoulder mobility. The upper arm performs a combined movement of flexion, extrarotation and abduction; while the lower one is a combined movement of extension, intrarotation and adduction. The distance between the 2 fists behind the back is measured and one side is executed at a time. This test is very important test to evaluate the range of motion (ROM) of this specific joint that could be seriously compromised by certain surgery in breast cancer patients.

Psychological and fatigue evaluation

EORTC (BR23 + C30) quality of life (C30), functioning and symptoms and EORTC QLQ-FA12 questionnaire: this is another important tool able to evaluate the perception of fatigue in breast cancer patients. The European Organization for Research and Treatment of Cancer (EORTC) Quality of Life group developed this instrument to assess physical, cognitive, and emotional aspects of cancer-related fatigue. It is a specific and easy self-reported questionnaire to propose, which asks bout some specific experienced symptoms or problems during the past week. The psychometric coefficient is calculated using the sum formula and can be used by physician to assess the general degree of fatigue. It is possible to download the questionnaires at this link: https://qol.eortc.org/questionnaires/.

IPAQ questionnaire: International Physical Activity Questionnaire uses a self-reported method, and it is used to assess internationally comparable data about health-related physical activity. Specifically, it is composed by set of five questionnaires: part 1. Job related Physical Activity, this part includes paid or unpaid job, volunteer works that are performed outside home. All activities done around the proper home are excluded (i.e. gardening, housework etc.). Part 2. Transportation, this part is about the intensity and frequency of the job reported in the first part of the questionnaire. The travelling from and to work are not included. Part 2. Transportation and Physical Activity, this part is about all the travelling from place to place, including work and leisure time. Part 3. Housework, House Maintenance, And Caring For Family: these questions are about the intensity and frequency of all the activities performed during the week, beside work. Part 4. Recreation, Sport, And Leisure-Time Physical Activity: is about the frequency intensity and duration of a structured sport or physical activity, it is important to avoid all activities mentioned in the previous parts of the questionnaire. Part 5. Sitting: this last part is necessary to quantify the time spent in the sitting position, at work, home, visiting friend etc. It is possible to download the questionnaires at this link: https://sites.google.com/site/theipaq/

12. THE RESULTS

Italy

14 women have participated in the Italian project's dance protocol. The results of the functional and psychological evaluation of the group of participants are presented in the tables below.

Functional Evaluation

Tab.1 Functional Evaluation (n=14)	Pre (M±SD)	Post (M±SD)	Result (%)
Waist Circ (cm)	83,43±14,21	83,07±11,81	-0,43
Hip Circ (cm)	107,93±8,85	105,57±8,43	-2,18
Handgrip R (Kg)	24,01±5,62	29,33±3,41	22,17
Hangrip L (Kg)	22,84±4,91	26,86±2,96	17,61
SitToStand	19,14±6,25	20,07±3,08	4,85
Fullerton	40,00±0,00	40,00±0,00	0
Scratch Test R (cm)	20,50±8,57	20,79±9,40	1,39
Scratch Test L (cm)	22,46±8,74	22,00±9,47	-2,07
6minWalk (mt)	590,00±63,82	634,64±52,42	7,57

Table 1: Functional parameters evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The "result" has been calculated as difference between the pre and post reported in percentage. Circ= Circumference; R= right; L= left; 6minWalk= six minutes walking test; cm= centimetres; Kg= kilograms; mt= meters.

As shown in Tab.1, participants in the dance protocol experienced different positive functional effects after the dance classes together with a decrease in the circumference of the waist and hips. In fact, an increase in strength of the upper limbs (right arm + 22,17%, left arm + 17,61%) and of the lower limbs (Sit to Stand + 4,86) evidences the positive effects induced by the dance protocol on this parameter. The result of the 6 Minutes Walking Test also showed a significant increase (7,57%) indicating an improvement in the functional capacity of the participants (parameter related to Global Health). However, the effects on joint mobility have been less evident, indicating the need to introduce exercises aimed at improving this parameter during the training. Finally, the Balance Test (Fullerton) did not show any variation since the group already had the highest score achievable at the pre-assessment. Nonetheless, this figure indicates that no deterioration has been registered over time.

QLQ-C30 Questionnaire results

Tab.2 QLQ-C30 Functional (n=14)	Pre (M±SD)	Post (M±SD)	Result (%)
Physical Function	83,45±11,22	90,48±7,72	8,42
Role Function	85,71±18,32	94,05±12,42	9,72
Emotional Function	73,81±19,30	77,38±22,75	4,84
Cognitive Function	84,52±21,15	86,90±16,25	2,82
Social Function	75,00±21,43	85,71±18,32	14,29
Global Health	66,40±21,70	76,80±10,50	15,66

Table 2: Score of the EORTC QLQ - C30 evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

The results of the EORTC QLQ-C30 Functional questionnaire (Tab. 2) show a positive trend for all the variables evaluated: Physical Function, Role Function, Emotional Function, Cognitive Function, Social Function, and Global Health. This improvement is particularly evident for Physical Function (+8,42%) and for Global Health which increased by 15,66%. These data as a whole indicate an improvement in the Quality of Life of patients from physical, emotional and social point of view, after their participation in the DWH protocol.

FA12 Questionnaire results

Tab.3 FA12 (n=14)	Pre (M±SD)	Post (M±SD)	Result %
Physical Fatigue	22,86±20,87	16,90±13,49	-26,04
Emotional Fatigue	15,87±19,35	10,71±9,36	-32,50
Cognitive Fatigue	13,10±18,70	7,14±10,77	-45,45
Interference Daily Life	26,19±26,73	19,05±17,12	-27,27
Social Sequele	21,43±21,11	9,52±15,63	-55,56

Table 3: Score FA12 questionnaire evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

The EORC-FA12 results (Tab. 3) also show a decrease in all the measured variables (Physical Fatigue, Emotional Fatigue, Cognitive Fatigue, Interference Daily Life, Social Sequele) thus, indicating less fatigue after having participated in the dance protocol with consequent positive effects on the patients' Quality of Life. In particular, Social Sequele shows a decrease of 55,56% confirming how the fatigue impacts on the participant’s social.

Lithuania

11 women have participated in the Lithuanian project's dance protocol. The results of the functional and psychological evaluation of the group of participants are presented in the tables below.

Functional Evaluation

Tab.4 Functional Evaluation (n=11)	Pre (M±SD)	Post (M±SD)	Result (%)
Waist Circ (cm)	84,64±11,10	83,91±10,70	-0,86
Hip Circ (cm)	101,91±8,89	101,45±8,88	-0,45
Handgrip R (Kg)	18,95±4,39	19,59±4,59	3,36
Hangrip L (Kg)	15,21±3,54	15,27±3,10	0,42
SitToStand	12,00±2,00	12,55±1,63	4,55
Fullerton	28,18±8,82	30,64±7,54	8,71
Scratch Test R (cm)	14,00±5,73	13,36±5,46	-4,55
Scratch Test L (cm)	17,82±7,76	17,55±7,71	-1,53
6minWalk (mt)	468,45±19,94	468,55±20,56	0,02

Table 4: Functional parameters evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage. Circ= Circumference; R= right; L= left; 6minWalk= six minutes walking test; cm= centimetres; Kg= kilograms; mt= meters.

As showed in the table, there is a decrease in the waist and hip circumferences of the Lithuanian participants. In line with the Italian group, the strength of the upper (right arm + 3,34%; left arm + 0,42%) and lower limbs (Sit to Stand + 4,55%) has increased, albeit with a lower percentage. In the same way, data on joint mobility showed a slight improvement that probably could have been more evident if more specific exercises had been included in the training. The Fullerton test, unlike the Italian data, showed a significant improvement in the balance (+ 8,71%) highlighting how this protocol is able to positively influence this parameter. In this group of women, the functional capacity measured by the 6 Minutes Walking Test remained quite stable, indicating that there were no deteriorations or adverse events deriving from the participation in the dance protocol.

QLQ-C30 Questionnaire results

Tab.5 QLQ-C30 (n=11)	Pre (M±SD)	Post (M±SD)	Result (%)
Physical Function	69,70±9,60	68,48±8,99	-1,74
Role Function	74,24±22,81	72,73±21,44	-2,04
Emotional Function	80,30±22,75	86,36±21,50	7,55
Cognitive Function	83,33±16,67	83,33±16,67	0
Social Function	86,36±30,57	86,36±30,57	0
Global Health	30,30±7,70	31,06±9,20	2,50

Table 5: Score of the EORTC QLQ - C30 evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

The results of the EORTC QLQ-C30 Functional questionnaire (Tab. 5) show a stable situation, before and after the dance protocol, for Cognitive Function and Social Function variables.
On the other hand, a slight deterioration of Role Function and Physical Function parameters was registered according to what observed for the residual functional capacity, measured with the 6 Minutes Walking Test. Therefore, even if the DWH protocol had a little impact from a functional point of view, it seems to have influenced the participants at the emotional level (+ 7,55%) managing to improve Global Health (+ 2,50%).

FA12 Questionnaire results

Tab.6 FA12 (n=11)	Pre (M±SD)	Post (M±SD)	Result %
Physical Fatigue	30,30±9,60	31,52±8,99	4,00
Emotional Fatigue	19,70±22,75	13,64±21,50	-30,77
Cognitive Fatigue	16,67±16,67	16,67±16,67	0
Interference Daily Life	24,27±21,57	27,27±25,03	12,36
Social Sequele	45,46±26,97	33,33±25,82	-26,67

Table 6: Score FA12 questionnaire evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

The results of the EORC-FA12 (Tab. 6) reveal a slight increase in the physical level of fatigue, which also seems to impact more on everyday life. However, we registered a decrease of the negative impact that the fatigue has at emotional level (-30,77%), as confirmed by the EORTC-C30, and on the social repercussions (-26,67%), as showed by the Italian group.

Bulgaria

12 women have participated in the Bulgarian project's dance protocol. The results of the functional and psychological evaluation of the group of participants are presented in the tables below.

Functional Evaluation

Tab.7 Functional Evaluation (n=12)	Pre (M±SD)	Post (M±SD)	Result (%)
Waist Circ (cm)	99,75±9,90	100,54±12,02	0,79
Hip Circ (cm)	105,50±11,44	105,25±10,27	-0,24
Handgrip R (Kg)	24,30±4,76	24,68±4,11	1,54
Hangrip L (Kg)	21,61±3,93	22,89±4,04	5,94
SitToStand	11,08±4,06	13,58±5,02	22,56
Fullerton	33,92±7,70	35,67±5,94	5,16
Scratch Test R (cm)	1,50±7,29	0,16±7,73	-89,33
Scratch Test L (cm)	7,00±9,40	6,75±11,52	-3,57
6minWalk (mt)	407,00±69,30	411,00±72,30	0,98

Table 7: Functional parameters evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage. Circ= Circumference; R= right; L= left; 6minWalk= six minutes walking test; cm= centimetres; Kg= kilograms; mt= meters.

The data of this group show slightly conflicting results regarding the circumferences; in fact, there is a slight increase in the waist circumference, although not very significant, with a decrease in the hip circumference. As the Italian and Lithuanian group, an increase in strength, both for the upper (right arm + 1,59%; left arm + 5,94%) and for the lower limbs (Sit to Stand + 22,56%) has been registered; in particular, this is the highest value reported among the groups of all the partner countries. Also Bulgarian women show positive results relating to mobility, although not so evident. The balance test showed a significant improvement after the dance protocol (Fullerton +5,16%), in accordance with the data collected in Lithuania. In the same way, the results of the functional capacity assessed with the 6 Minutes Walking Test (+ 0,98) are very similar to the Lithuanian group.

QLQ-C30 Questionnaire results

Tab.8 QLQ-C30 (n=12)	Pre (M±SD)	Post (M±SD)	Result (%)
Physical Function	70,56±10,81	71,67±18,88	1,57
Role Function	80,56±21,12	83,33±15,89	3,45
Emotional Function	59,72±34,42	61,81±33,42	3,49
Cognitive Function	68,06±27,94	72,22±23,92	6,12
Social Function	62,50±31,08	77,78±29,59	24,44
Global Health	24,31±8,30	26,39±7,81	8,57

Table 8: Score of the EORTC QLQ - C30 evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

The results of the EORTC QLQ-C30 Functional questionnaire (Tab. 8) show a positive trend for all the variables evaluated: Physical Function, Role Function, Emotional Function, Cognitive Function, Social Function, Global Health). This improvement is particularly evident for Social Function (+24,44%) highlighting the socialising effect of the dance protocol on the participants. As for the other groups, data indicate an improvement in Global Health (+ 8,57%), with positive impact on the Quality of Life of the participants.

FA12 Questionnaire results

Tab.9 FA12 (n=12)	Pre (M±SD)	Post (M±SD)	Result %
Physical Fatigue	24,44±21,52	24,44±24,67	0,00
Emotional Fatigue	50,93±39,49	33,33±24,16	-34,55
Cognitive Fatigue	19,44±23,39	20,83±17,59	7,14
Interference Daily Life	36,11±33,21	27,78±27,83	-23,08
Social Sequele	30,56±33,21	19,44±22,29	-36,36

Table 9: Score of the FA12 Questionnaire evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

According to the data of the 6 Minutes Walking Test, the results of the EORC-FA12 (Tab. 9) do not show a decrease in the fatigue from the physical point of view, while it seems to have less impact on the emotional level (Emotional Fatigue – 34,55%), on everyday life (Interference Daily Life -23,08%) and on the social life of the participants (Social Sequele -36,36%), as showed in the Italian group and, in part, in the Lithuanian one. Despite a slight deterioration at cognitive level, fatigue, therefore, seems to have fewer repercussions on the quality of life of these patients after their participation in the dance protocol.

The Netherlands

14 women have participated in the Dutch project's dance protocol. The results of the functional and psychological evaluation of the group of participants are presented in the tables below.

Functional Evaluation

Tab.10 Functional Evaluation (n=14)	Pre (M±SD)	Post (M±SD)	Result (%)
Waist Circ (cm)	86,00±10,28	87,27±10,83	1,47
Hip Circ (cm)	99,29±13,37	102,17±7,33	2,90
Handgrip R (Kg)	25,14±5,91	25,47±5,10	1,29
Hangrip L (Kg)	23,86±4,11	24,71±4,27	3,59
SitToStand	13,07±2,56	14,07±2,46	7,61
Fullerton	33,14±4,28	33,33±4,06	0,57
Scratch Test R (cm)	9,57±8,91	8,90±10,18	-7,01
Scratch Test L (cm)	11,14±8,67	10,33±8,93	-7,27
6minWalk (mt)	483,21±48,22	532,47±59,60	10,19

Table 10: Functional parameters evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage. Circ= Circumference; R= right; L= left; 6minWalk= six minutes walking test; cm= centimetres; Kg= kilograms; mt= meters.

The figures of the Dutch group are not in line with those reported so far as regards the waist and hip circumferences which are increased after the dance protocol by 1,47% and 2,90% respectively. However, also in this group, some improvements in strength of the upper (right arm + 1,29%; left arm + 3,59%), and of the lower limbs (Sit to Stand + 7,61%) have been registered confirming once again the trend reported so far. The tests on joint mobility have shown a significant improvement in this parameter while the Fullerton test showed that the balance remained constant before and after the dance sessions. Finally, data collected from the 6 Minutes Walking Test demonstrate a significant increase in the functional capacity, in line with the results of the Italian group.

QLQ-C30 Questionnaire results

Tab.11 QLQ-C30 (n=14)	Pre (M±SD)	Post (M±SD)	Result (%)
Physical Function	86,22±11,67	87,56±10,65	1,55
Role Function	74,44±28,08	74,44±25,87	0
Emotional Function	77,22±20,53	80,00±20,61	3,60
Cognitive Function	71,11±23,96	72,22±24,12	1,56
Social Function	80,00±25,35	82,22±19,38	2,78
Global Health	26,11±22,46	28,61±26,95	9,57

Table 11: Score of the EORTC QLQ - C30 evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

The results of the EORTC QLQ-C30 Functional questionnaire (Tab. 11) show a positive trend for all the variables evaluated, except for Role Function, with very positive impact on Global Health increased by 9,57%. Data as a whole indicate an improvement in the Quality of Life of patients from a physical, emotional and social point of view, after their participation in the DWH protocol.

FA12 Questionnaire results

12 FA12 (n=14)	Pre (M±SD)	Post (M±SD)	Result %
Physical Fatigue	36,00±26,16	31,56±24,10	-12,35
Emotional Fatigue	22,96±21,61	21,48±23,93	-6,45
Cognitive Fatigue	13,33±15,69	17,78±20,38	33,33
Interference Daily Life	31,11±29,46	35,56±32,04	14,29
Social Sequele	2,22±8,61	11,11±20,57	400,00

Table 12: Score of the FA12 Questionnaire evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

In this group, the fatigue seems to have improved on the physical level (-12,35%), in line with the 6 Minutes Walking Test results, and on the emotional level (- 6,45%), but its repercussions on the cognitive, social and everyday life level have increased. Therefore, it seems that participation in the dance protocol of Dutch women has somehow aggravated the influence of the fatigue on these aspects of patients' lives.

UK

6 women have participated in the UK project's dance protocol. The results of the functional and psychological evaluation of the group of participants are presented in the tables below.

Functional Evaluation

Tab.13 Functional Evaluation (n=6)	Pre (M±SD)	Post (M±SD)	Result (%)
Waist Circ (cm)	82,77±8,43	82,88±6,35	0,14
Hip Circ (cm)	104,50±6,09	105,58±7,09	1,04
Handgrip R (Kg)	18,67±3,25	18,88±3,76	1,16
Hangrip L (Kg)	18,02±2,13	18,95±2,90	5,18
SitToStand	13,00±1,79	13,67±5,72	5,13
Fullerton	37,83±2,64	31,17±11,69	-17,62
Scratch Test R (cm)	3,08±4,65	3,75±4,29	+21,63
Scratch Test L (cm)	11,67±7,71	9,98±5,61	-14,43
6minWalk (mt)	520,58±65,74	561,67±138,34	7,89

Table 13: Functional parameters evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage. Circ= Circumference; R= right; L= left; 6minWalk= six minutes walking test; cm= centimetres; Kg= kilograms; mt= meters.

In the UK, 10 women participated in the dance protocol and completed it. However, due to the COVID-19 pandemic, and consequent lockdown, not all the participants were able to undergo the post tests. Therefore, only data of 6 women out of 10 are here reported.

The results, for most of the tests, are aligned with those of the other groups, especially with regard to the strength of the upper (right arm + 1,16%; left arm + 5,18%) and of the lower limbs (Sit to Stand + 5,13%) and the functional capacity (6 Minutes Walking Test + 7,89%). Conflicting results emerged in relation to the balance (Fullerton – 17,62%) and circumferences of the waist and hips (respectively + 0,14% and + 1,04%). This could be related to the small number of women who participated in the tests. Flexibility in this case also showed partial improvements, as in the other groups, which suggests the need to devote more time to specific exercises in the protocol.

QLQ-C30 Questionnaire results

Tab.14 QLQ-C30 (n=6)	Pre (M±SD)	Post (M±SD)	Result (%)
Physical Function	88,89±8,07	84,45±10,03	-5,00
Role Function	80,56±16,38	86,11±16,39	6,90
Emotional Function	34,72±25,50	62,50±31,95	80,00
Cognitive Function	58,33±20,41	66,67±21,08	14,28
Social Function	52,78±24,53	75,00±22,97	42,10
Global Health	55,56±13,61	66,67±9,13	20,00

Table 14: Score of the EORTC QLQ - C30 evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

With the exception of the Physical Function, the results of the EORTC QLQ-C30 Functional questionnaire (Tab. 14) show a positive trend for all the variables evaluated. This improvement is particularly evident for Emotional Function (+ 80%) and Social Function (+ 42,10%), with an increase in Global Health equal to 20%. All the data, in line with the other groups, indicate an improvement in the Quality of Life of patients from a cognitive, emotional and social point of view after their participation in the DWH protocol.

FA12 Questionnaire results

Tab.15 FA12 (n=6)	Pre (M±SD)	Post (M±SD)	Result %
Physical Fatigue	44,45±21,77	38,89±28,10	-12,50
Emotional Fatigue	40,74±24,00	29,26±30,32	-28,18
Cognitive Fatigue	33,34±21,08	30,56±37,14	-8,34
Interference Daily Life	44,44±27,22	38,89±32,77	-12,50
Social Sequele	44,44±34,43	22,22±40,37	-50,00

Table 15: Score of the FA12 Questionnaire evaluated before (pre) and after (post) the dance protocol, reported as Mean (M) and standard deviation (SD). The result has been calculated as difference between the pre and post reported in percentage.

EORC-FA12 results (Tab. 15) also show a decrease in all the measured variables (Physical Fatigue, Emotional Fatigue, Cognitive Fatigue, Interference Daily Life, Social Sequele) indicating a lower level of fatigue after the dance protocol and thus, highlighting an improvement from the physical, cognitive and emotional point of view on the Quality of Life of the patients. In particular, Social Sequele shows a decrease of 50%, underlining, once again, the incidence of fatigue on the social life of the participants.

GENERAL CONCLUSIONS

After having analysed both the functional and psychological data recorded at the beginning and end of the Pilot Action carried out in all partner countries, we can conclude that, generally, the proposed dance protocol has had positive effects on the Global Health of the participants.

The results obtained not only highlight the feasibility and replicability of the training, but also the similarity of results in the groups implementing it. In fact, besides the decrease in the waist and hip circumference, positive effects were observed on functional parameters such as strength and functional capacity.

In particular, the most important result is about the strength of the upper limbs, which often tends to decrease in women who suffered breast cancer, especially in those with lymphedema.

Contrasting results have been registered in the flexibility and balance tests that show improvements only in some of the participating countries. This variability of results could be due to the heterogeneity of the groups in the different countries. For example, from the data recorded for the functional tests before the dance protocol, Italian women started from higher values especially for Fullerton, unlike other countries. The fact that this data has not worsened after the dance classes leads us to suppose that DWH protocol also has effects on the balance, counteracting the consequences of the illness such as sedentary lifestyle or simply aging.

The results regarding the flexibility parameter indicate how the DWH protocol should be implemented with specific exercises for shoulder joint mobility since not all the countries have registered positive effects, while this physical capacity tends to decrease in patients with breast cancer, consequently worsening their overall functionality.

As the analysis of the functional results show, dance which is usually considered a purely playful activity aimed simply at having fun and socialization, can significantly contribute to the improvement of the quality of life once introduced in an adapted protocol such as DWH. It can lead to functional adaptations in patients comparable to those achievable through protocols of physical activity carried out at moderate intensity.

The positive effects on the quality of life of the patients are also evident in the analysis of the results of the psychological tests that show a positive trend of the Emotional Function, Cognitive Function and Social Function in all the groups tested. There were slight deteriorations related to the Functional Function (Lithuania and UK) and Role Function (Lithuania) which however did not prevent the improvement of Global Health observable in all the groups that implemented the protocol.

DWH also enabled the decrease of the influence that fatigue has on patients at emotional level. In the Italian and UK groups, the effects related to the fatigue evidently decreased on all the other variables analysed (Physical Fatigue, Cognitive Fatigue, Interference Daily Life, Social Sequele) in accordance with the improvement in the quality of life already detected by the EORTC questionnaire - QLQ-30.

Only the Dutch group deviates evidently from this trend, as in this group, the fatigue on a cognitive level and the effects it has on social and everyday life increased.

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