



Evaluating the role of Alexander Technique in Exercise Participation
for Cancer Survivors.

by

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Declaration

I declare that the work presented in this thesis has not been submitted for any degree or diploma at this, or any other, institute/university and that the work described herein is my own unless stated otherwise.

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Abstract

The aim of the project is to create a community based alexander technique and exercise program for cancer patients to be able to help cancer patients in their recovery. The program should improve cancer patient's strength, flexibility and balance while reducing exhaustion and anxiety. This will result in an improvement in their cardiopulmonary fitness level and increase in the overall health and wellbeing. The study will try to evaluate the role played by alexander technique in compliance and participation in an exercise program for cancer patients.

We had 11 participants, female patients, ages 42 to 67, previously diagnosed and completed treatment for breast cancer and each of them had a personalized test in the subsequent areas: Strength Training, Balance Training and Flexibility. They were given a one to one exercise program at a level appropriate to the cancer diagnosis and physical condition. The exercise program consisted of one day supervised resistance exercise session in the gym and home based flexibility and balance exercises to do daily. The program was delivered in collaboration with Row to Recovery program, a community based initiative that contributed for their aerobic training. After 5 weeks on the program, 7 participants and their rowing coach, assisted to weekly Alexander Technique lessons besides continuing their exercise program. The lessons were practice based lessons where the participants learnt to improve their cognitive function and balance. It helped them to build awareness about the importance of exercise, properly done, in rehabilitation and recovery. The 11 women were measured at the beginning of the program, on week 6th on the program (at the start of the Alexander Technique lessons) and the final week, 12th week on the program. The results demonstrate the effectiveness of the exercise program in improving strength, flexibility, balance and quality of life.

Introduction

Research has demonstrated the efficacy of exercise training in aiding cancer recovery (Irwin, 2012). For example, physical and cardiorespiratory fitness, muscular strength, endurance and flexibility are all beneficial for the health during and after cancer treatment, especially after (Irwin, 2012). Weight gain and cachexia are usual post-treatment symptoms and they are due to hormonal changes which can be counteracted with correct post-treatment diet and exercise. As suggested by Irwin (2012), exercise improves quality of life, reduces fatigue, nausea and diarrhoea, increases functional capacity and psychological wellbeing and self-esteem. She also suggests that exercise decreases the risk of recurrence of certain types of cancer and decreases the risk of chronic diseases. Irwin identifies relaxation breathing, aerobic exercise, strength training, stretching and balance training as the main constituents of exercise.

With regards to breast cancer, physical activity after diagnosis is associated with an improvement outcome in breast cancer patients. A large-scale study by Holmes et al. (2005) suggests that women who engaged in moderate exercise, walking at a pace of 2 to 2.9 mph, 180-300 minutes per week, after a breast cancer diagnosis, had 40-50% less chance of breast cancer recurrence and decrease in mortality compared to less active women. A study by Ibrahim et al. (2011) shows how post-diagnosis physical activity reduces breast cancer deaths by 34%. The literature suggests that appropriate exercise should be a promoted for aiding recovery in cancer patients. A systematic review by Singh et al. (2018) shows the overwhelmingly positive impact of exercise on fitness level, quality of life, fatigue, strength, depression, anxiety, waist circumference and body mass index. Heywood et al. (2018), reported similar positive effects of exercise, as well as improvements for sleep quality in advanced cancer patients. However, the effects of exercise on pain and survival rates are unclear. Other strategies by Heywood et al., suggested that a change in behavioural patterns (smoking, diet) would be beneficial for cancer patients. Besides the previous suggestions, Chlebowski (2013) counsels that breast cancer patients should avoid weight changes and increment or maintain a moderate exercise, as weight-gain and obesity is very common after chemotherapy (Stefani et al., 2017). Therefore, weight management is very relevant for post-treatment cancer patients as augmented fat mass has been linked to inflammation and higher amounts of cancer recurrence (Stefani et al., 2017). Carers should address nutrition education for cancer patients,

giving them at least a three-day dietary menu administered by a nutritionist. According to the Irish Cancer Society, over 100 studies show that post-menopausal women who are weighty or obese are more likely to develop breast cancer and scientists attribute 7-15% of breast cancers in developed countries to obesity. Another study by O'Brien & Sandler (2018) shows how obesity reduces the risk of breast cancer risk in pre-menopausal women. Nevertheless, a proper diet weight management is very beneficial for increasing fitness and overall wellbeing.

In recent years, unconventional medicine has gained popularity between cancer patients. Molassiotis et al. (2005) show how 44.7% of the 282 breast cancer patients from 11 countries in Europe, used complementary and unconventional medicine since they were diagnosed of cancer. The use of unconventional medicine in breast cancer patients is surely increasing. It would be interesting to know which therapies are preferred by women so that carers could educate patients (Lengacher et al.,2004). Another study done in Portland, Oregon, showed how 367 out of 551 women combined their breast cancer treatment with one or more alternative medicine therapies, that caused improved their quality of life according to the patients. The use of unconventional medicine compliments existing health system (Henderson *et al.*,2004) for cancer patients undergoing regular treatment. As the study by Stefani et al. (2017) indicates the importance of a home-based exercise program for cancer patients including instruction on posture, movement, flexibility, segment strength and whole body strength. As an study by McKean et al. (2010) shows, plenty of people have poor biomechanics or movement patterns as when they go into squatting, a curved lumbar spine might be the proper movement to do when squatting. Resistance exercises are important to keep muscle strength but usually, the general public is not familiar with the body mechanics that are necessary in order to use the free weights or weight machines in the gym. The movements to lift the weights are quite different to the daily activities and the majority of cancer patients are 50+ years; for example, in this program, only 3 out of the 11 patients are under 50. Educating the cancer patients about posture, movement of the hip joints, and spinal stability and neuromuscular re-education, ergo the Alexander Technique, may increase the general strength. Older adults should be able to exercise and move safely, avoiding falls and potential problems such as lordosis, cervical spine and poor range of motion. The patients should be able to progress in aerobic activities and as well as increase resistance workloads which is what we are trying to do in this program to get the best outcome.

The **Alexander Technique**, named after its creator Frederick Matthias Alexander (20 January

1869 – 10 October 1955), is a re-educational practice. It has been described as ‘the technique under all techniques’ (Batson 1999). Alexander suggested that bad posture and movement would have a negative impact on self-awareness, cognitive function and health. A proper use of the body, the minimum use of muscle tension for any task, would support overall physical well-being. The technique can also be used as a mental training technique. Alexander created the technique in the 1890’s. Employed as a Shakespearean actor, he suffered professional setbacks because he became hoarse whenever he would go on stage. The doctors at the time would not give him a solution for it and he realised it had to be something he was doing to himself on stage that caused the hoarseness as his voice functioned normally at other times. Therefore, he stayed years in front of several mirrors observing himself. He realised that while reciting, he would pull his head back and down, compress into his larynx, damaging his vocal chords and causing hoarseness. Besides the hoarseness, the pulling of his head back and down would create other health problems such as back pain and breathing problems among others. There is evidence suggesting the Alexander Technique may be helpful for long-term back pain (Yardley et al., 2010) long-term neck pain and may help people cope with Parkinson disease (Cohen et al., 2015).

In 1973, Nobel prize-winner for Medicine on “discoveries in the field of the organization and occurrence of individual and social behavioural patterns in the animal world”, Nicolaas Tinbergen devoted half of his speech to the Alexander Technique. Nicolaas stated: “There is no doubt that it often does have profound and beneficial effects. . . both in the mental and somatic sphere”. Nicolaas Tinbergen suggests that the correct performance of the many movements is checked by the brain, the illustrating the fundamental basis of the Alexander Technique. In his book ‘Freedom to change’, Jones (1997) provides scientific support for F.M. Alexander’s discoveries.

Alexander Technique lessons are used to treat back pain while doing normal life activities (Yardley et al., 2009). As Hamel et al. (2016) published, Alexander Technique users walk in a manner associated with a younger person’s way of moving. It has been stated that there’s a need for further research to assess the potential role of the Alexander Technique in improving an older person’s posture while aging, thus improving exercise performance in older adults. The Alexander Technique is not a therapy or treatment; it is an educational process where the student learns about self-care and if practiced well, it should improve balance, movement, mood and self confidence in the student. Participants find the learning of the Alexander

Technique enjoyable and are able to use it in everyday activities whether waiting in the queue for the bus, brushing their teeth or running. As Glover et al. (2018) suggest, use of the Alexander Technique helps older people with fear of falling (Glover et al.,2018) too. Further, an article by Cacciatore et al. (2011) suggests the Alexander Technique is a method that may connect the dynamic modulation of postural tone, consciously modifying the postural habits of the practitioner. The Alexander Technique teacher gives diverse instructions for the student to elongate the spine through movement. Posture is not fixed, instead there is always some dynamic movement in it to avoid excessive muscular tension. The Alexander Technique usually refers to postural tension along the head, neck and back and its influence on postural tone. The mentioned article shows how Alexander Technique teachers have less resistance to axial rotation than control subjects illustrating that posture can be altered through training. Another study by Cacciatore et al. (2014) measures the body kinematics and kinetics in Alexander Technique teachers and healthy adults (not alexander teachers) rising from a chair. The Alexander Technique teachers made smooth movements while the control subjects' movements were deemed to be rough, using more momentum than position. It is critical that people complete the sitting 'exercise' in the easiest and more conscious way because it is an activity undergone several times daily. If subjects are not able to sit correctly, it is likely that a work out in the gym may not be efficient or even safe. A third study by Cacciatore et al. (2006), shows a person who was evaluated monthly for 4 months before having Alexander Technique lessons and for 3 months after attending lessons. Prior to the lessons, the subject continuously had laterally uneven automatic postural reactions to changes. After Alexander Technique lessons, the size and unevenness of the reactions were lessened. The balance improved and the lower back pain almost ceased. The results of a study by Soo-Yeon et al. (2014), provide practical evidence of Alexander Technique training benefits for physical, emotional and behaviour. An evaluation by Little et al. (2009) shows how after 3 months of having Alexander Technique lessons the proprioception improved and exercise classes augmented trunk extension strength. After 6 months, the Alexander technique increased the effectiveness of group muscle activation (they were able to lift the leg straight) while exercise classes augmented group muscle thickness and the capability to contract. This suggests when combined, exercise and Alexander Technique lessons will increase muscle tone/quality, flexibility and thickness and contractile capability and it will enable connection between interference, proprioception, muscle tone, elasticity and outcome. A study by Krim (1993), shows the Alexander Technique benefits athletic performance. Several books have been written

about how Alexander Technique can improve sports performance. Steven Shaw (2006), professional swimmer and author of 'Master the Art of swimming', based his swimming training on the Alexander Technique. Malcolm Balk, professional runner and author of 'The Art of running' writes about how the technique improved his running and can improve anyone else's. Tottel (1993) elucidates the purposefulness of teaching horseback riders the Alexander Technique in order to improve their balance and body awareness. An article by Fortin et al. (2005), indicates the benefit in illustrating to the Alexander student what 'not to do' rather than showing the student what is required to 'get it right'. Hence, the Alexander Technique can be interpreted not as an additional practise, but as a method for the student to focus on what the participant is doing 'wrong' and once the participant stops doing the wrong thing, the correct way will show.

Methods and Materials

The first week of May 2019 we met the 11 participants, breast cancer female participants ages 42-67 and. Each participant was tested in terms of cardiovascular exercises, strength training, balance training and flexibility. We analysed the entire medical history which the participants gave via PARQ, including information on the type, phase and stage of cancer treatment. Once we had the medical clearance, the program started. The baseline measurements helped us to measure the progress of participants during the program. These data enable creation of bespoke workloads for optimal outcome. The following tests were done:

1. Flexibility tests: These tests measure the Range of Motion (ROM) in a joint or the ability to move a muscle or group of muscles through a ROM. Active people tend to be more flexible and so, it is vital that participants follow a program to increase flexibility and overall fitness. Proprioceptive Neuromuscular facilitation (PNF) may be one the most effective methods that improves flexibility with the least amount of post-stretching soreness. ‘The PNF technique is designed to capitalize on the neurological mechanisms in the muscle joint and the alexander technique works on this’ (Batson *et al.*,2014). Application of the PNF technique can be instructed via Alexander Technique lessons. Participants flexibility was measured using following 2 tests.

1.1. Doubled-arm Goniometer: In this test, a fixed arm holding lengthener is positioned parallel with a fixed body part and a movable arm moves along a movable body part. The axis of the goniometer is placed over the joint. The goniometer was used to measure the shoulder girdle ROM, the elbow joint ROM, the hip joint ROM and the knee joint ROM in both arms and legs. It is measured in degrees starting from zero degrees.

1.2. Sit and reach test: This test is used usually to measure the flexibility of the hamstring (semitendinosus, semimembranosus, and biceps femoris). It also measures the low back (erector spinae), buttocks, (gluteus Maximus and gluteus medius), and calf (gastrocnemius) flexibility. The Percentile Ranks and Normative Data for the Traditional Sit and Reach Test (centimetres) are in Table 1.

Participant 1,3,4 & 8 are ages 60 to 67. Participants 2,10&11 are ages 40 to 49. Participants 5,6,7&9 are ages 50 to 59.

Table 1. Flexibility percentile rank. Source: Canadian Physical guidelines.

AGE(y)	20-29		30-39		40-49		50-59		60-69	
Sex	M	F	M	F	M	F	M	F	M	F
Percentile rank										
90	39	40	37	39	34	37	35	37	32	34
80	35	37	34	36	31	33	29	34	27	31
70	33	35	31	34	27	32	26	32	23	28
60	30	33	29	32	25	30	24	29	21	27
50	28	31	26	30	22	28	22	27	19	25
40	26	29	24	28	20	26	19	26	15	23
30	23	26	21	25	17	23	15	23	13	21
20	20	23	18	22	13	21	12	20	11	20
10	15	19	14	18	9	16	9	16	8	15

2. Musculoskeletal Fitness Measurements:

Research suggests there is a significant anti-correlation between muscular fitness and mortality in patients (Irwin 2012). The American College of Sports and Medicine defines musculoskeletal fitness as the combination of muscular strength and endurance. Muscular strength refers to the biggest amount of force a muscle or group of muscles can produce during a solo contraction. Muscular endurance refers to the capacity to utilise submaximal forces repeatedly and musculoskeletal fitness was measured using the following tests.

2.1. 1Repetition Maximum Test: This test was used to evaluate the participants' vigorous

muscular strength. Each participant had to apply maximal force vigorously through a ROM in a well-ordered manner while maintaining a proper technique. It is need to say here the participants did not have enough training about body mechanics while using the machines in the gym. It should be suggested that a bit of education about how to sit or stand in each of the machines could have brought even better outcome from this test. Anyhow, the participant's fitness level was evaluated by measuring the 1RM value of the following exercises: Leg extension, Chest press, Shoulder Press, Leg Curl, Lateral Pull Down, Seated Row, Leg Press and Squat. The participants who had lymphedema did not cover the shoulder press exercise. Their 1RM was predicted based in their 5RM and using the following equation by Brzycki, M. (1993). Strength testing - Predicting a one-rep max from a reps-to fatigue. Journal of Physical Education, Recreation and Dance 64 (1), 88-90. It was measured in kilograms.

$$1\text{-RM} = (\text{weight lifted}) / [1.0278 - (\text{repetitions} \times 0.0278)]$$

2.2. Handgrip and back and leg strength test: Isometric strength and endurance was evaluated using an isometric dynamometer. This evaluated the strength in the handgrip and back and legs. It was measured in kilograms. Table 2 shows the age and sex based norms for combined handgrip test.

Table 2. Isometric dynamometer measurement classification. Source: Canadian Physical guidelines.

AGE	15-19		20-29		30-39		40-49		50-59		60-69	
Classification	Kg		Kg		Kg		Kg		Kg		Kg	
SEX	M	F	M	F	M	F	M	F	M	F	M	F
Excellent	>=108	>=68	>=115	>=70	>=115	>=71	>=108	>=69	>=101	>=61	>=100	>=54
Very good	98-107	60-67	104-114	63-69	104-114	63-70	97-107	61-68	92-100	54-60	91-99	48-53
Good	90-97	53-59	95-103	58-62	95-103	58-62	88-96	54-60	84-91	49-53	84-90	45-47
Fair	79-89	48-52	84-94	52-59	84-94	51-57	80-87	49-53	76-83	45-48	73-83	41-44
Needs	<=78	<=47	<=83	<=51	<=83	<=50	<=79	<=48	<=75	<=44	<=72	<=40

improvement												
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2.3. Sit to stand test: This measurement evaluates the functional lower extremity strength. The participants were asked to sit and stand up as many times as they were able to during 30 seconds of time. They would start sitting down with the feet flat on the floor, shoulder width apart and the back straight. The arms crossed at the wrist and placed at their chest.

3. Balance test:

The participants were asked to stand on one leg without allowing the legs to touch each other while looking straight to the front with the eyes open. It was timed and repeated with the eyes closed for both legs.

12 WEEK EXERCISE PROGRAMME

The exercise program consisted of 12 weeks and each phase consisted of 6 weeks, with one weekly guided exercise session at the gym (<https://nuigalway.kingfisherclub.com/about-kingfisher-nuigalway/>) and a follow-up evaluation at the end of each phase. Hence, at the end of the first phase, after 6 weeks in the program, the participants were tested and their workout programmes were tailored for most of the exercise types. The goal was to establish a long term exercise program for each participant.

The table below (Table 4) summarises the broad outline of exercise that was recommended to the participants based on the table of exercises that the American College of Sports and Medicine recommends for patients recovering from cancer.

Table 4. Exercise Programme for cancer patients.

Frequency	Intensity	Time	Type	Resistance	Flexibility	Considerations
3-5 days a week.	Moderate(40-59%HRR or Vo2R);64-75%HRmaxRPE12-13)to Vigorous(60-89%Vo2R;76-95%HRmax;RPE(14-17)	75 min of moderate or 150 of moderate ex per week.	Prolonged rhythmic activities using large muscle groups like walking, cycling, swimming, etc.	2 days per week. At least 1 set of 8-12 reps. Free weights, resistance machines or weight bearing functional tasks like sit to stand targeting all major muscle groups.	Daily. Move through ROM as tolerated. 10-30secs hold for static stretching. Stretching or ROM for all major muscle groups. Address specific areas of joint or muscle restriction that may have resulted from treatment with steroids, radiation or surgery.	Patients with cancer often deal with the debilitating effects of treatment (chemotherapy and radiation) with side effects such as extreme fatigue, anaemia and ataxia. Adjustments to exercise should be made based on signs and symptoms on days following treatment. For some patients swimming may be contraindicated.

Most of the participants were already enrolled in the rowing program which consists of 2 rowing sessions per week, each session lasting for 1 to 1.5 hours. These rowing sessions constitute intensive aerobic training. They were advised to do 2 days of resistance training and each of the participants were given an individualised resistance exercise and flexibility exercise program. The flexibility exercises were designed for daily home-based workouts. These exercises were very similar for all of the participants. The participants with lymphedema were asked to avoid some of the exercises and given alternative exercises.

During the first guided session at the gym, most of the participants were having problems to perform the exercises using their bodies correctly without hurting themselves. Therefore, Alexander Technique sessions were added as part of their program right after the second

assessment on week 6, during the second phase in the program. Sports and Alexander Technique come together, it is a way to do non injury exercise. No matter if you are a beginner or an athlete, the mind and body awareness will help you to have a better performance. During the Alexander Technique lessons the students will learn about their cognitive function and somatic, gaining in balance and proprioception skills as well as kinaesthetic awareness (Soo-Yeon *et al.*,2014). It often happens that people ‘cheat’ while doing exercises. ‘Cheating’ means participants would tighten their lower back and jaw and also tighten their hand grip while executing the leg curls in the machines at the gym. This might be because the weight to lift is too heavy a weight for their present capability. They might complete the exercise without achieving a full range of movement either, reducing beneficial effect of the exercise and more likely to experience pain. An Alexander Technique teacher should be a good example, particularly for those engaged in sporting activities to encourage a good technique above all and explain the risks of poor/harmful technique. However, is not easily done due to the participants’ pre-existing habits, competitive nature of sports and the participants’ misunderstanding of what ‘good posture’ is.

The goal of the Alexander Technique lessons was to teach the participants where they habitually retained tension over some muscles due to their incorrect understanding of ‘good posture’ (Garlick et al., 1990). The aim was the gradually increase the understanding of the participants regarding the damage caused to muscles and joints due to repetition of incorrect movements. Knowledge and application of the Alexander Technique during gym exercises, walking or even sitting at a laptop, should help participants to be more aware of how they are using their body. The Alexander Technique gives users new tools to use their bodies in a better way, enabling better movement during any daily activity. Plenty of personal trainers and athletes have applied the Alexander Technique to their exercise routine to get better results and avoid injuries. At the gym, there are many distractions (noise, the TV screens, the rest of the people exercising) and so it is easy to lose one’s own body awareness and enjoyment of the exercise. This makes the gyms more of a health hazard than a help to health and wellbeing. Training in a conscious way will maximise the return on the exercises and will bring fitness with long term benefits. To exercise using the Alexander Technique, participants should be aware of how they are using their body, especially about the relationship between head, neck and back. Over-tensing and compression of the spine can bring all sorts of problems. Alexander

Technique teaches how to move the spine, joints and limbs in a well co-ordinated and free way (Cacciatore et al.,2014). It improves proprioception, awareness of the position and movement of the body, and kinaesthetic awareness, as well as the ability to be aware of one's own body parts (e.g., muscles, tendons, joints), posture, shifting of weight and movement of the body through space. Poor proprioception increases the chances of injury and therefore, it is best to increase proprioception before working out in the gym. The Alexander Technique teaches basic anatomy of major joints and muscles that will help to avoid injury. Over time, the Alexander student gains increased awareness and when the time is right the participant will increase the workload for better outcomes. The Alexander Technique will help with the breathing too and helps with use of breath during work out.

ALEXANDER TECHNIQUE LESSONS

The lessons were held after the participants completed the second assessment on week 6 through the program during the last phase of the program. The 11 participants were invited but only 7 of them and their rowing coach attended the Alexander Technique lessons. There were 5 Alexander Technique lessons, one each week, each lasting an hour and a half.

Due to lack of funding and time limitation, the lessons only ran for the last 5 weeks of the 12-week programme. Unfortunately, this is a small sample which provides only a partial measurable outcome of the potential benefits of Alexander Technique lessons to exercise programmes for cancer patients. More research ought to be carried out to provide more solid quantitative data on the role of the Alexander Technique in exercise for cancer patients and also for the general public. Both Alexander Technique teachers who imparted lessons to the patients for this project are fully qualified AT teachers and worked on a volunteer basis. They are the author of this thesis, Alazne Larrinaga and Olive Rossiter (who is also a former professional athlete - Irish National Volley Ball Team).

FIRST LESSON

- 'Body and Mind Unity'
- 'Habit'
- 'Semi-supine'.

The ‘body and mind unity’ can be explained as how thoughts affect the physical body. This has been a big subject in different scientific articles. An article by Ives et al. (2000) from the Physician and Sports medicine journal, defines the mind-body techniques as the mind-body connection of thoughts, emotions, attitudes and behaviours affecting physiologic function. They outline the scientific evidence that exists for five mind-body therapies, including the Alexander Technique. As Eller Daryn (1994) states, there is a big difference between her experience from exercise classes either to build muscle or reduce weight, to her exploration of mind-body fitness techniques such as Alexander Technique, where she finds the harmony, bigger joyfulness and less mental stress.

‘Habits’ are actions we do without thinking and can (and do) affect the self (Milius 2001). These habits can be harmless or harmful, leading us to back pain, knee pain, etc. If we are aware of what we are doing at any moment, if we are conscious during our activities, we might be able to avoid 90% of the pain we suffer (Jones 1997). A research by McClean et al. (2015) shows, how Alexander Technique lessons could be used in pain management. The discoveries suggest that Alexander Technique lessons might help improve self-efficacy for those who will commit to practice it and in turn may have an influence on health service utilisation levels, which would have a positive economic impact as well as increasing quality of life in society. The concept of ‘habit’ (Jones 1997), the answer to any stimuli, was demonstrated using a couple of simple exercises.

Exercises

1. The participants, were asked to cross their arms in their habitual way (right hand above left arm and left hand below right arm or vice versa) and right after they had to do it the other way around. This led to plenty of confusion and laugh. 100% of the ladies (5 out of 5) couldn’t make it without further instruction and felt really awkward once they crossed the arms in the non-habitual way. Good posture will feel strange at the beginning, especially if people are not used to it. When people ask which is the right/correct way of doing an activity, let’s say walking, the answer is always the way you are consciously doing it. Therefore, there is not only one correct way for walking for every person. The correct way of doing it is the one that you are conscious of, even if you walk with your hands that would be correct.
2. Semi-supine or Constructive Rest: During this exercise, the participants lay down on a flat surface, with the belly up and the knees bent towards the ceiling, with a couple of books or a pillow under the head. This is vital for maintaining a healthy spine. This position (Fig 1) gives

the best support and rest for the back and it is the posture where the spine is elongated in the biggest length.

Fig 1. Person in semisupine position.

Source:<https://alexandertechnique.co.uk/learning-it/semi-supine>



While the participants were in this position, in contact with the floor, they were asked to notice the back of the head, the two shoulder blades, the back of the hips and the feet on the floor. The attention was brought back to these points each time the mind started to wander. Some verbal directions/instructions/thoughts, such as, ‘to allow the whole body weight to land on the ground’ by ‘allowing gravity to do its job’, the thought of ‘nothing to do’, the thought of the ‘left shoulder going away from the right shoulder’ and vice versa, the ‘left hip going away from the right shoulder’ and vice versa and the releasing of the tension in different areas of their body helped participants with the exercise. This was done with the help of the hands on of the two Alexander technique teachers who were in the room working with the participants. The ‘hands on’ is used to make the person laying down aware kinaesthetically of where different parts of their bodies are in space (Jones, 1997 page 155), making the participants kinaesthetically aware. Participants lay down for 20 minutes at a time. Directions were given on how to stand up in the easiest way, effortless way. While participants stood up, the 2 Alexander Technique teachers put hands on their heads which helped them to notice where their heads where in space, in relation to the environment and in relation to their bodies. This is a dynamic relationship and not static since the head always has the potential for movement. This is to illustrate that the Alexander Technique can be applied anytime, anywhere regardless of the activity of the participant, not only laying down.

Homework:

Laying down exercise, 20 minutes a day, noticing different parts of the body retaining tension without knowing it. A podcast can be used to follow up some instructions. If the mind wanders while doing the exercise, the participants were asked to be kind and just bring back their

thoughts into the present moment. The aim not being to achieve concentration, but a general awareness. Example: if a hunter concentrates in one spot and then on another, chances are the bird will rise somewhere else and the hunter will miss it while concentrating. Instead the true hunter, will take the whole landscape with their gaze and would be prepared for whatever happens (Jones 1997 page 40).

SECOND LESSON

- How to sit
- Concepts of 'Primary Control'
- 'Inhibition' and 'direction'
- 'Non doing' versus 'end-gaining'
- goal oriented.

Two new participants who were not able to attend the previous week were present and a brief explanation of the first lesson was given. One participant shared how she was already sleeping better. However, two of the participants explained why they had had trouble doing the semi-supine exercise at home, on their own, whereas during the lesson, with the teacher's hands on, they had no problem. This led to an explanation about the learning process of the Alexander Technique, which is the same as learning any new activity (to play an instrument, learn a new language or play tennis); it takes time and lots of repetition and practice. Besides this, there are lots of new concepts such as the 'non doing' which is a very difficult thing to do, especially when all the education is lead to non-stop doing, producing. In the Alexander Technique, when we say 'non doing' it means to do as much as it is necessary for that activity but not more. Hence, when the participants are laying down, they do not need to hold any tension in any part of the body because it is laying down. However, they were still holding lots of tension and this made them not to be able to stay on the ground for 20 minutes. Not only that, the brain was telling them that they should not be there doing nothing and this is the biggest problem, the brain is arguing with their body which causes even more tension.

Rudolf Magnus, German neurologist, 1873-1927 worked on the neurology of mammalian posture. He discovered the location (in the brain stem) of the main nervous centres for the postural reflexes. He named the integrating function of this part of the nervous system the *zentralapparat* (central apparatus), a concept which has been linked to Alexander's 'Primary Control'. One of Rudolf's studies explains how the reflexes tend to return the body to "neutral"

in between voluntary movements to achieve something. The appropriate “allowing”, ‘letting go’, of the righting reflexes seems to be part of the Alexander Technique’s so called ‘non-doing’. Most of the educational system directs students to do; to be productive; not to be lazy. Therefore, our bodies are used to do, to be productive and that it is very difficult to stop. Our muscles have learned “to do”; to over-tense; to do different tasks that do not need so much effort or so much muscular tension. Therefore, when participants are laying down, do not need to hold to anything, no muscle effort is required to drop their weight towards the ground. However, most of the participants noticed parts of their body which were not in contact with the ground, and this meant they were holding tension.

The ‘non end-gaining’ is another principle of the Alexander Technique. It means to wait, stick to the ‘means whereby’ (these are the ‘directions’ the teacher verbally gives while doing the semi-supine or laying down exercise, also the ones the students will continue to give to themselves doing any other activity) and not to concentrate on the end or the goal to be reached (Jones 1997 p21).

2 pictures of the same child at the age of 2 and at the age of 15 were showed to the participants.

There were 2 questions:

1. What was the difference in the posture of the boy?
2. What did they think happened to the child regarding his posture sitting?

The participants agreed lots of school desk hours happened between those 13 years. Another picture of an x-ray of an adult sitting in front of the computer was showed. There was lots of discussion about the question ‘how to avoid sitting in a harmful way?’. Research shows how Alexander Technique users sit down and up in a more balanced way than regular people (Cacciatore *et al.*, 2014). A demonstration about the different amount of tension in the shoulders of a person while sitting down with the shoulders raised up or instead with the shoulders down, showed the harmful habits that people have. There is no need to raise the shoulders while sitting down but the participants realised they would do it by habit, not consciously. This habit would bring lots of pain in the neck and back besides they are wasting lots of energy using their body in a wrong way. These harmful habits can be avoided by practicing the semi-supine because the semi-supine exercise will make the Alexander Technique user aware of his/her habits.

Exercises:

1. Semi-supine/laying down exercise for 20 minutes and they were all delighted. After the laying down, they could feel their bodies lighter, due to the letting go of the unwanted tension

in the muscles. They said their minds were calmer and they were more conscious of where, in which muscles and body parts they were holding tension.

2. Sitting down in the chair. Several studies have demonstrated how the Alexander Technique can help with back pain while sitting (Cacciatore et al,2006). The ladies were instructed about the main joints that take part in this habitual exercise, going from standing to sitting. 5 out of 5 did not know where the hip joints were located in their body. When they were asked to point to their hip joints, they all pointed out to the iliac crest. Often people think they have a joint there and they bent at the level of the L4/L5 vertebrae's and this causes the so called bulging discs. The participants were delighted to learn where their hip joints were as well as their ischium's (sit bones) were. Starting from a standing position, once they bent from the hips, the knees would bend and they could reach the chair. Once they were sitting, they were asked to notice their sitting bones, putting their hands under their gluts on the chair. From here, they would allow all their weight to go down towards the chair and the only thing going up was the head. They learned how to move forwards and backwards in the chair without slouching (neither in the back or the front of the upper body), rocking in their rounded ischium's. The participants realised this would be very helpful while writing in the computer, eating or reaching the weight machines while doing the resistance exercises or rowing. Sitting down exercise is the same movement as squatting but without a chair. If you do a little squat, that is the posture for playing golf.

While sitting down, the 'inhibition' concept was described. Alexander F.M. (1920) created the idea of inhibition as a way of stopping the habitual answer/reaction after the stimuli comes. A person will be able to choose the conscious answer to any stimuli if using inhibition. The person is capable to give the new directions/answer (means-whereby, non harmful directions) if wanted. As George Bernard Shaw (26 July 1856 – 2 November 1950), Irish playwright, critic, polemicist and political activist said, 'by applying the inhibitory control to the use of his hands, F.M. Alexander worked directly with the reflexes where an osteopath corrected lesions'. An article by Batson et al. 2014 suggests that 'the Alexander Technique students will be trained to pause and quiet (inhibit) the mental distractions before initiating the movement'. The resting interval can be very brief, such as milliseconds once they are trained specially. On another article, Batson (1990) shows, 'pausing or stopping in the case of F.M. Alexander's concept of inhibition, implies a more active use of awareness in everyday activity'. The inhibition manages the physiological and cognitive coordination of the nervous system, balancing thought and action. In the Alexander Technique, 'inhibition' means a process where conscious

awareness can be increased to notice the firing of harmful habituated reflexes (Magnus 1923) which can be avoided. These habitual reflexes fire in the milliseconds before action, they are neuromuscular reflex shapes that prepare the entire body for movement. The ‘inhibition’, the brief stop at the moment before the reflex kicks, helps the person to recognize and avoid unwanted reflex neuromuscular shapes that can be harmful for good posture. Stopping the wrong way will open a new road for a better self-organised coordination. Despite the fact that the participants are used to sitting down in one way; the habitual way; they were asked to do it in the conscious way, using inhibition and direction. Choosing to bend from the hip joints and knees and not creating any excessive tension (such as arching their lower back, raising their shoulders or pulling their heads back). It can take time to learn to use inhibition and direction (means-whereby) but it will prevent occurrence of back problems. The participants enjoyed the idea of being able to sit down or stand up on their own (without any external help) from the chair at the age of 100 years. Results Pictures 7 to 12.

Homework.

To notice the way they were sitting during the week, specially while rowing since it is part of their aerobic training programme. Continue doing the semi-supine exercise daily, 20 minutes a day, if possible.

THIRD LESSON

- How to Stand
- Head, neck and back relationship
- ‘Faulty Sensory Appreciation’.

The participants shared that they found the new way of sitting, doing it consciously, was a way of working out their abdominal muscles while sitting. Choosing to sit down on the ischiums and being conscious of using the correct muscles to do the task, rowing was a new experience. They were able to prevent upper body slouching while rowing, instead rocking forward and backwards on the sit bones.

Exercises:

1.The participants’ laydown for 20 minutes while the 2 AT teachers put hands on them and verbal instructions were given.

2.Standing. It is part of our daily life, and certainly we stand up during some exercises too. F.M. Alexander had this idea of the 'Primary Control', which is the relationship between the head, neck and back as early as 1912. However, it was not until Rudolf Magnus (1873-1927) who was professor of pharmacology at the University of Utrecht, that anything was published scientifically about this head, neck and back relationship. Rudolf Magnus and his colleagues published over 300 papers on the postural reflexes culminating in the *Körperstellung* (Magnus 1923). F.M Alexander had first described the concept of "Primary Control" in "An Unrecognized Principle in Human Behaviour," a lecture delivered in February 1925 before the London Child Study Society. He cited John Dewey (1859 – 1952) who was an American philosopher, psychologist, and education reformer whose ideas have been influential in education and social reform, saying to him after having read the manuscript of his 1923 book 'Constructive Conscious Control of the Individual' how well his procedures applied the five thousand year-old Chinese philosophy of 'Non-doing'. Alexander first proposed to use the concept of 'Central Control' to describe the technique he had developed and later he used the term 'Primary Control'. He claimed that Magnus had worked to explain the scientific significance of that 'control'. The direction of the head and neck were of primary importance. Magnus found, as Alexander, that if one establishes correct direction using Primary Control, the control of the rest of the body follows easily. In 1925, Alexander's medical client Macleod Yearsley declared that Magnus' findings correspond to Alexander's. Alexander wrote the 'The Use of the Self' (1931) and the Athletic Training is one of several sections of this book. There he explains the conscious self-training that every athlete goes through until the unconscious mastery is reached. The Alexander Technique teaches how to do any exercise consciously and in the easiest way to avoid injury, becoming automatic in the practised student.

Standing, as an activity (Jones, 1997), is not a fixed process and therefore there will be movement, even if tiny. A demonstration of how to stand up by having the feet 12 inches apart, with one leg 45 degrees behind the other one, shows how one can manage to put 60% of our weight in the back foot, making standing a bit easier. A little bit of anatomy was taught, showing the weight of the head, around 4.5kg (a kettlebell was used to demonstrate) and how it is positioned at the top of the little spine. It is very important to keep the head in the right place. Moving the head forward, backwards, to the right or to the left affects the balance of the body. The atlanto-occipital joint, which is where the spine meets the head (occiput), is the most important joint according to the Alexander Technique (Primary control). Keeping that joint free of mining thoughts and maintaining the correct relationship between the head, neck and back is the main principle in F.M. Alexander's discoveries. As professional swimmer Steven

Shaw explains, his method of swimming was developed by applying the principles of the Alexander Technique, whereby the relationship between head, neck, and back is responsible for the body's overall coordination (Shaw 2006). The participants found the new way of standing helpful. It could be used at any time, queuing in the bank, performing on stage or waiting for a friend. A little exercise against the wall was given to reduce occurrence of pain in case the new way of standing was not enough.

One of the participants, had difficulties keeping the head up, on top of the spine, while walking because of being afraid of tripping into something and she would pull her head forward and down to avoid falling. Putting the head forward and down, was causing lower back pain. There is no need to tilt the head forward and down to see what it is in front of us. Actually, it is enough to use the muscles around the eyes. Once the participant applied this direction, the head was up, poised on top of the spine and the lower back pain was gone.

Homework

- Continuing to do the semi-supine exercise and observe the way they habitually stand
- It was recommended the use of a mirror to avoid the 'faulty sensory appreciation' paradigm, where the person thinks she/he is doing something (the way they stand for example) and instead is doing something else.

FOURTH LESSON

- Breathing.

The participants demonstrate the new way of standing to the ones who were not present the previous week.

One of the participants suffers from asthma so the breathing session was very important. There are plenty of activities that exacerbate asthmatic symptoms such as exercise and emotions (stress or laughter). Asthmatic symptoms can bring issues like fatigue, underperformance, stress, anxiety or depression among others. The National Health Service, UK, suggests the Alexander Technique teaches improved posture and movement which can help to diminish and avoid problems caused by harmful habits. There is some evidence that breathing exercises can moderate symptoms and diminish the need for reliever medicines in asthmatics. Well-designed controlled trials are required to claim that Alexander Technique can have a positive outcome

on the symptoms of chronic asthma and help people with asthma to diminish medication (Dennis *et al.*, 2012). As Rhodes et al. (1995) explain, the Alexander Technique emphasises the significance of decompressing and widening of the torso (good for swimming) and suggests it can also improve breathing.

Exercises:

1. The participants lay down for 20 minutes while the 2 AT teachers put hands on them (directions) and gave verbal directions about breathing and posture.

2. The class was broken into pairs. Each pair put hands on each other, on the chest, belly and on the side of the ribcage, in order to count their breaths per minute with the help of a stopwatch. They wrote down the amount of breaths their partners took in one minute. Results are shown in Table 5. A picture of an x-ray of the lungs showed their dimension. None of the participants knew the lungs took so much space in the body, not even the participant with medical training. The diaphragm is located under the ribcage and it moves up and down, massaging the intestines provide we do not interfere with the breathing. Failure to fully empty the lungs leaves a paucity of space for inhalation of new oxygen. There are plenty of books, articles and studies about Alexander technique and breathing. Alexander F.M. suffered from asthma, causing the hoarseness that initiated the development of the whole technique. He realised that while acting, he compressed his larynx, damaging his vocal cords to the point of not being able to speak. It was due to his posture and bad habits that Alexander was interfering with his breathing. To combat this, he developed a new procedure, the ‘Whispered Ah’. There are 5 steps in this exercise and it should start with the student consciously avoiding the shortening of the neck muscles and the axis of the head.

1. Allow the tongue to rest in the bottom of the mouth and place the tip of the tongue in the back of the lower teeth.

2. Think about something funny to smile so that all the muscles around the mouth soft/release. and free the passages leading to the throat.

3. Open the mouth by letting the lower jaw move forward and down (allowing gravity to do most of the work) and not by tilting/pulling the head back.

4. When the next exhalation comes, make a whispered ‘ah’ sound (as in “father”); a sound

chosen because it was not associated with ordinary bad habits of vocalization). The amount of air exhaled has to be normal, not trying to empty the lungs fully, no forcing it.

5. Close the lips and allow the air to come in through the nose, no effort needed, it will happen naturally.

The exercise should be repeated 4-5 times a day to optimise results. The participants instantly felt they were calmer and they started to yawn, which meant the muscles around the mouth were releasing. This is a great exercise in inhibition (stop and think what answer to give in front of an stimuli) and non end-gaining. Results are shown in Table 5.

Homework

- Continue doing the semi-supine 20 minutes a day
- Continue learning about the different habits such as holding tension in different parts of the body.
- Do the whispered 'ah' exercise 5 times a day, repeating it just 5 times. This can be done while driving, shopping or even doing the semi-supine.

FIFTH LESSON

- Squatting,
- Faulty Sensory Appreciation
- Exercise.

Exercises:

1. The participants lay down for 20 minutes and followed the verbal and 'hands on' instructions from the AT teacher. They learned how to stand up from the ground in an easy way:
 - a. First kneeling on both knees and then lifting one leg,
 - b. placing one foot on the ground
 - c. Once supported by the foot on the ground, follow the head 'forward and up' (This is one of the AT's main directions)
 - d. stand up

Using this method, there is no need to push with their hands against the leg with the foot

on the ground. This action is counter-productive to the intention of rising.

2. Squatting. The main joints that take part in the squatting are the atlanto-occipital joint at the end of the spine, where the spine meets the head and the hip joints. The upper body covers all the area from the hip-joints to the atlanto-occipital joint. The spine is long and the back is wide and we do not want to interfere with it, especially when we go into movement (in this case, squatting). The participants observed one another squatting and could appreciate how they would shorten the spine while they were going into squatting in their habitual way. Often, people pull in their lower back and pull back their head when they go into squatting (or sitting since it is the same movement). Doing so, they shorten the length of their spine while compressing into the vertebrae and this can result in bulging discs and all sorts of back and neck pain. The participants learnt how to squat, bending from the hip joints, knees and ankles, keeping a long spine while thinking about dropping their chin and nose a little bit and the head going forward and up. These directions avoided the pulling of the head back; a very common movement that interferes with efficient body functioning. The pulling back of the head may bring harmful consequences such as shortening of the spine. Results are shown in Pictures 1 to 6 .

The participants filled out the following questionnaire (fig 2) and they signed a consent too:

Fig 2. Questionnaire and consent.

REACT AND ALEXANDER TECHNIQUE QUESTIONNAIRE. WEEK 5
 Student: 19234566
 Msc, Exercise Physiology and its application to therapy.
 Date: 25/07/2019

Please answer the following short questionnaire:

NAME AND SURNAME:

1. How hard is it to do the exercises in your program? Tick the box.

Exercise type	Easy/no effort-problem	Not that easy	normal	A bit hard	Very hard
Aerobic					
Resistance (weights)					
Flexibility					

2. Did you find the Alexander Technique lessons beneficial to your exercise programme? If so how? Tick the boxes as appropriate.

Exercise type	Posture	Mind set	Breathing	Calmer	Others
Aerobic					
Resistance (weights)					
Flexibility					

3. Please give a short testimonial. (ex: how you find the lessons, are they useful for your exercise, normal life?)

4. I consent the use of my pictures and testimonial for the use of **Aizpea Larrinaga's** Cancer Project at the **Msc** in Exercise Physiology thesis.

Signature:|

Homework

Continue doing the laying down 20 minutes a day and apply the Alexander technique concepts as much as they can.

A summary of the concepts taught during the alexander technique lessons are listed in Fig 3.

Concept	Meaning
Awareness	To be conscious of what you are doing during any activity.
Body and Mind Unity	My thoughts are connected to my body, what I think has an impact in my body.
Primary Control	Relationship between the head, neck and back.
Faulty Sensory Appreciation	I think I am doing something and I am doing another thing (use mirrors to compare)
Inhibition	Active pause to choose the best answer in front of any stimuli
Direction/Meanswhereby	The new thoughts or direction the individual gives to accomplish any action
Conscious control	The control of the body and mind use

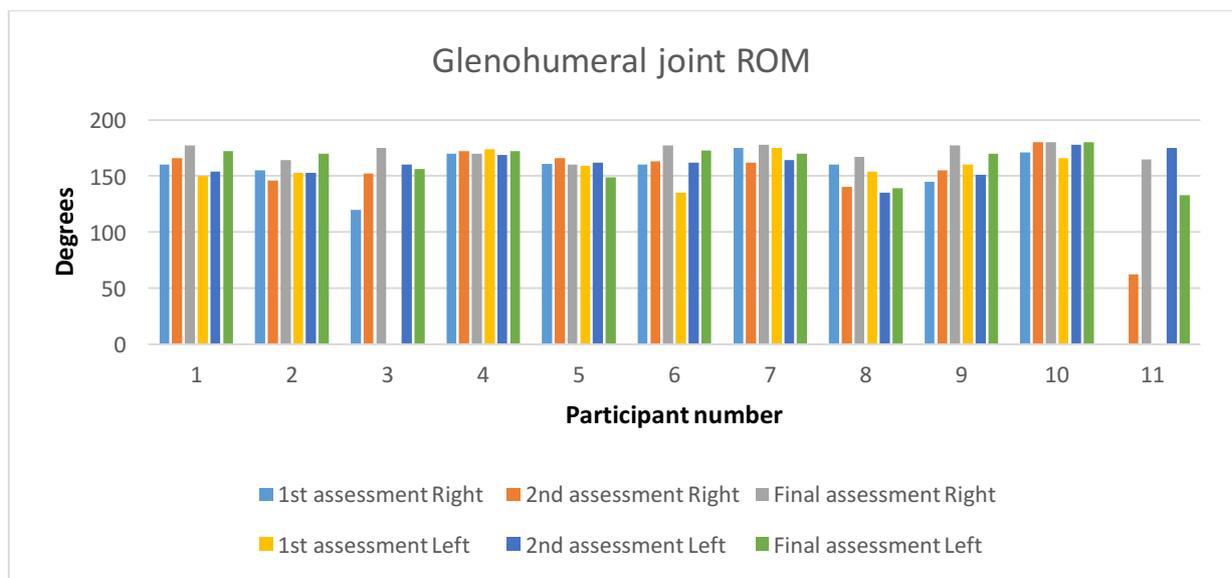
Results

We had 11 participants in the program. Participants 1 to 7 had Alexander Technique lessons after they completed the 2nd assessment. Participants 8 to 11 did not attend to any Alexander Technique lesson. Participant 1,3,4 & 8 are ages 60 to 69. Participants 2,10&11 are ages 40 to 49. Participants 5,6,7&9 are ages 50 to 59.

1.Flexibility tests:

1.1. Doubled arm Goniometer measurement: If there is more soft tissue surrounding the joint area, the measurement can be erroneous and this might have result in incorrect data during the measurements.

Chart 1

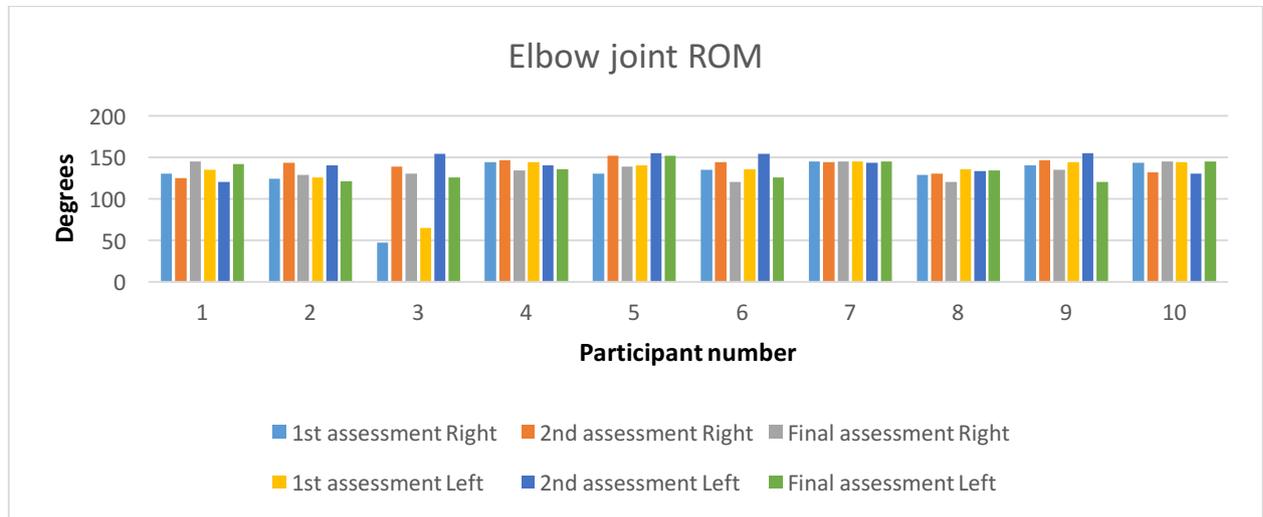


As the data in Chart 1 shows, 9 out of 11 participants, increased their Range of Motion (ROM) for their right glenohumeral joint from the 1st assessment to the final one. 2 stayed the same or decreased a little bit. 6 out of 11 increased their performance for the left ROM from the 1st assessment to the final one.

$P(T \leq t)$ two-tail=0.566928796 Right. Hence, 50% of the participants improved their flexibility for the right glenohumeral joint from the first to the final assessment.

$P(T \leq t)$ two-tail=0.566928796 Left. And the same for the left glenohumeral joint, 50% of the participants improved their flexibility from the first to the final assessment.

Chart 2

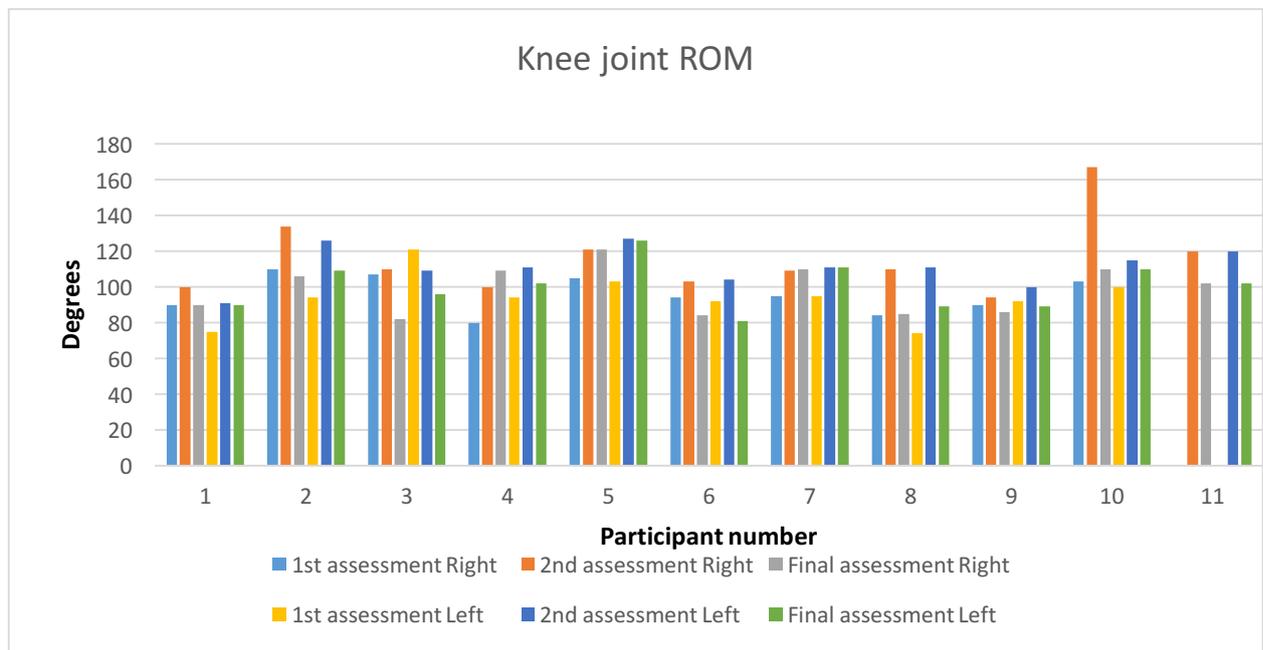


The data in Chart 2 shows that 7 out of the 11 participants increased their Right elbow ROM from the 1st assessment to the final for the right elbow. 5 out of the 11 participants decreased their Left elbow ROM, 4 increased it and 2 stayed the same from the 1st to the final assessment.

$P(T \leq t)$ two-tail= 0.002385464 Right elbow. Hence, almost 100% percent of the participants improved the flexibility for the right elbow.

$P(T \leq t)$ two-tail= 0.000397597 Left elbow. Hence, almost 100% percent of the participants improved the flexibility for the left elbow.

Chart 3

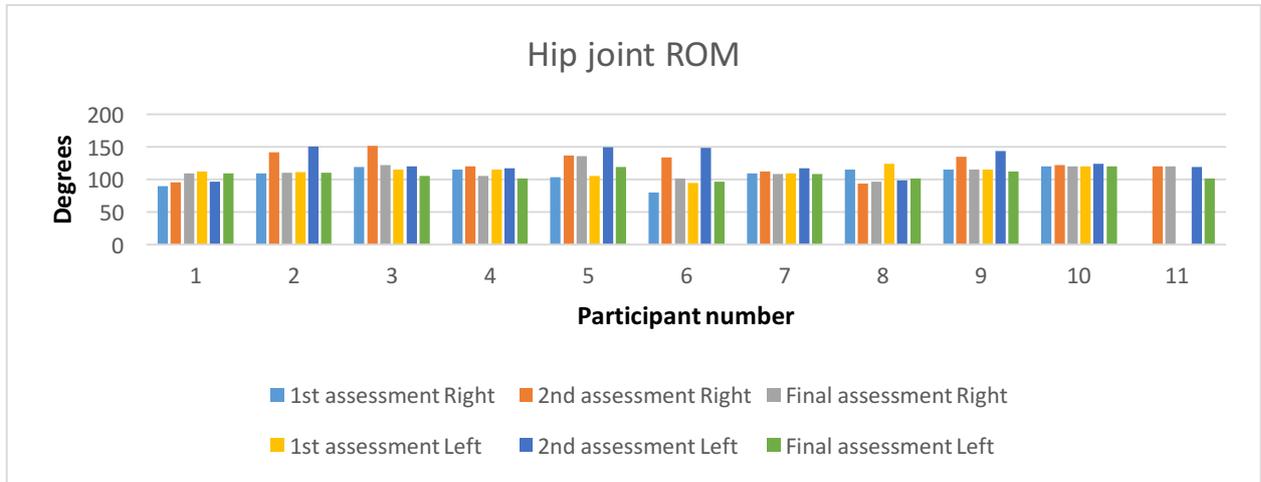


As Chart 3 shows, The ROM in the Right and Left knee joint has decreased from the 2nd to the final assessment for participants 9 to 11. Participants 1,2,4,5 & 7 have improved their ROM for the left knee joint from the 1st assessment to the final. Participants 1,4,5&7 have improved or maintained the right knee joint ROM from the 1st to the final assessment.

$P(T \leq t)$ two-tail= 0.277609807 Right knee.

$P(T \leq t)$ two-tail= 0.277609807 Left knee. Hence, 98% of the participants increased the knee joint flexibility.

Chart 4



Looking at the data in Chart 4, 9 out of 11 participants improved their Right hip ROM while 6 out of 11 improved their Left hip ROM from the 1st to the Final assessment.

$P(T \leq t)$ two-tail= 0.218619436 Right hip

$P(T \leq t)$ two-tail= 0.277609807 Left hip

Hence, 98% of the participants improved the flexibility for the right and left hip from the first to the final assessment.

1.2. Sit and reach test.

Participant 1,3,4 & 8 are ages 60 to 69. Participants 2,10&11 are ages 40 to 49. Participants 5,6,7&9 are ages 50 to 59. According to Table 1, by the Final assessment the participants are in the next percentiles:

Participant 1 is at 70%; Participant 2 is at 10%; Participant 3 is at 0% but she improved a lot since the first assessment; Participant 4 is at 80%; Participant 5 is at 20%; Participant 6 is at 40%; Participant 7 is at 10%; Participant 8 N/A; Participant 9 is at 70%; Participant 10 is at 85%; Participant 11 is at 40%.

As the data shows, 4 out of the 11 participants are above the 70% percentile; 2 are 40% percentile; 1 is 20% percentile; 2 are at 10% percentile and 1 is under 10% percentile.

Chart 5



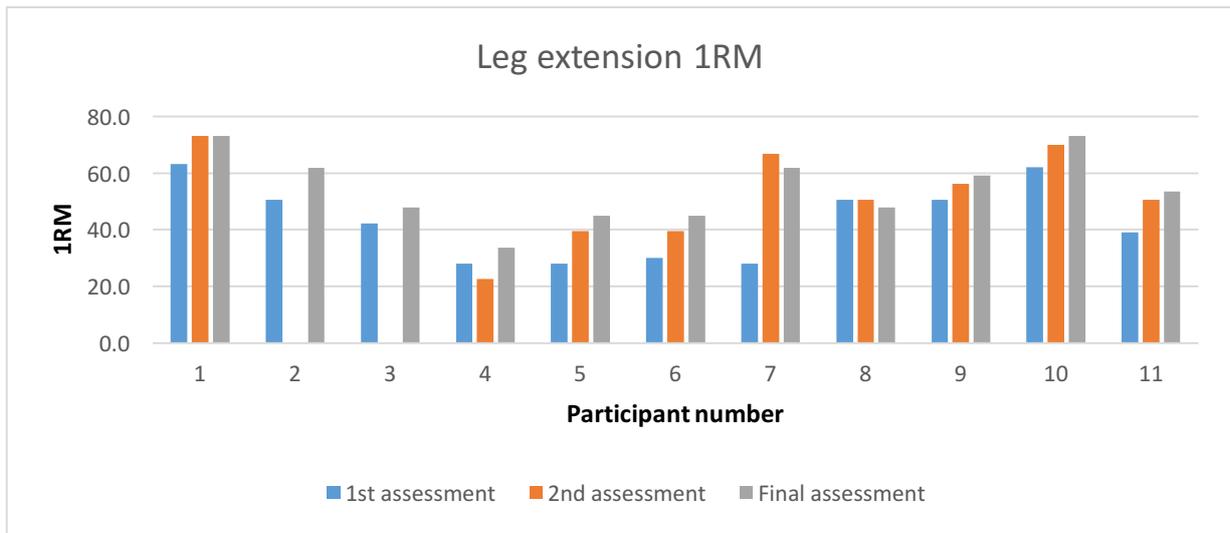
The data in Chart 5 shows that 9 out of the 11 participants improved their flexibility from the 2nd to the final assessment whereas 7 out of the 11 participants improved their flexibility from the 1st to the final assessment.

$P(T \leq t)$ two-tail = 0.596835124. Hence, 50% of the people increased their flexibility from the 1st to the final assessment.

2. Musculoskeletal Fitness Measurements:

2.1. 1Repetition Maximum Test: This test was used to assess the participants' dynamic muscular strength.

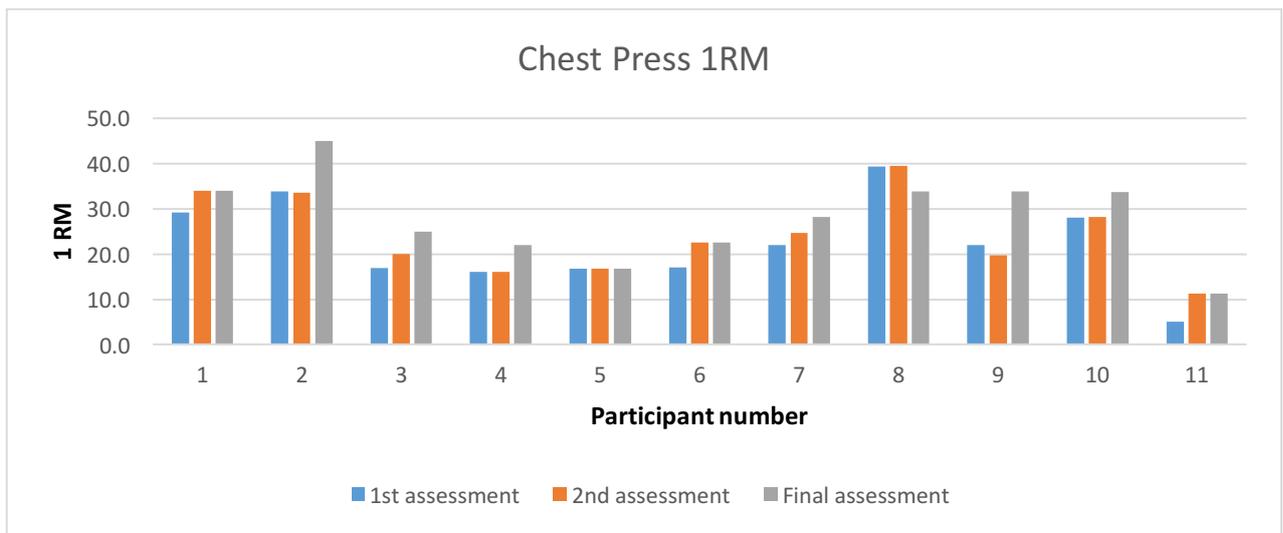
Chart 6



As can be seen from Chart 6, all the participants improved the 1RM for the leg extension from the 1st to the Final assessment. Participant 7 had a knee problem during the Final assessment. We can observe a bigger increase for participants 5, 6, 7 from the 2nd assessment to the Final assessment.

$P(T \leq t)$ two-tail = 0.21010351. Hence, 98% of the participants increased their 1RM for the leg extension.

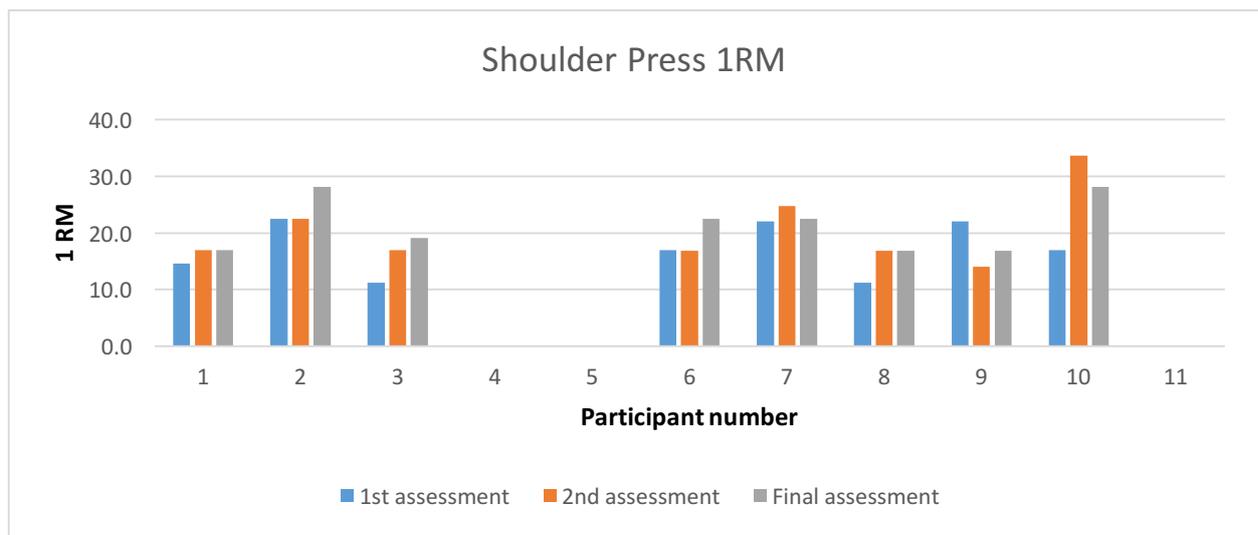
Chart 7



From Chart 7 we can appreciate there was an overall improvement from the 1st assessment to the final one, 9 out of 11 improved their strength. There was a big increase from the 2nd assessment to the Final one specially in participants 2,3,4,9&10.

$P(T \leq t)$ two-tail=0.197360236. Hence, 99% of the participants increased their 1RM for the chest press.

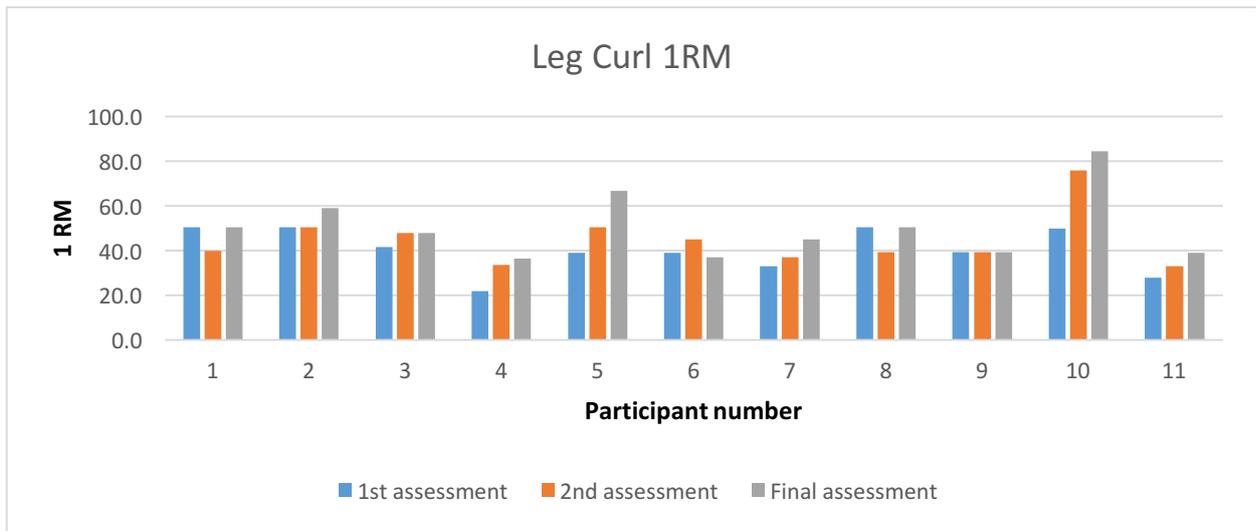
Chart 8



As data in Chart 8 shows, participants 4,5&6 did not do this exercise due to medical issues. Participants 1,2,3,6,7,9&10 improved their performance from the 2nd to the Final assessment. 7 out of 11 participants improved their performance from the 1st to the Final assessment.

$P(T \leq t)$ two-tail=0.095674731. Hence, almost 100% of the participants increased their performance for the shoulder press.

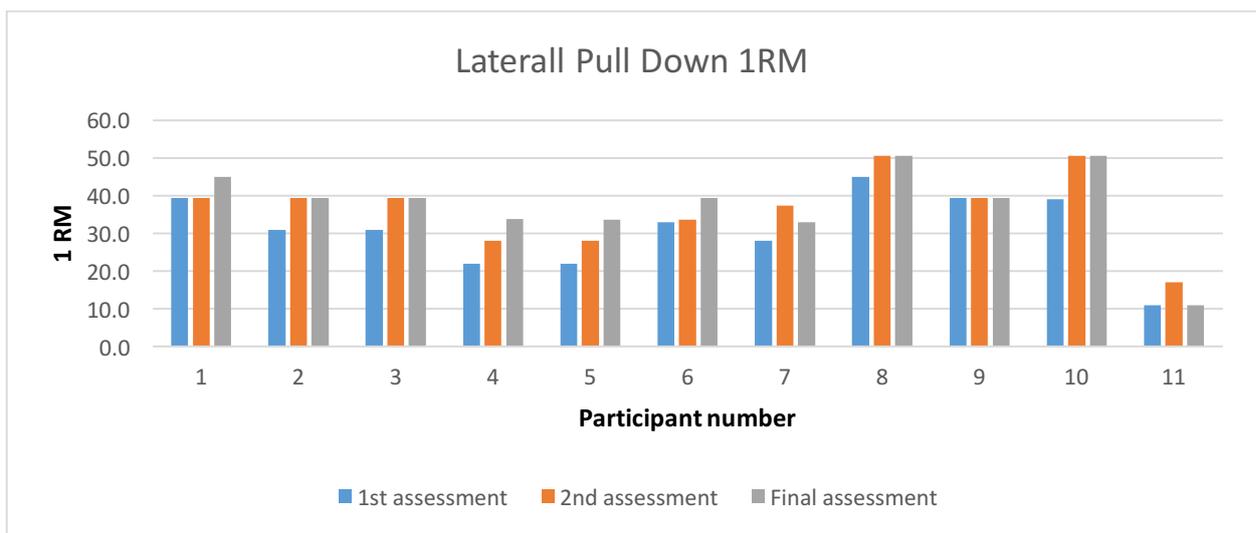
Chart 9



As shown in Chart 9, all participants improved their performance from the 1st assessment to the Final one. Participants 2 & 8 decreased their performance from the 1st assessment to the 2nd but they improved again by the Final assessment. The improvements from the 2nd assessment to the Final one are higher in participants 2 and 5.

$P(T \leq t)$ two-tail = 0.069207379. Hence, almost 100% of the participants increased the 1RM for the leg curl.

Chart 10

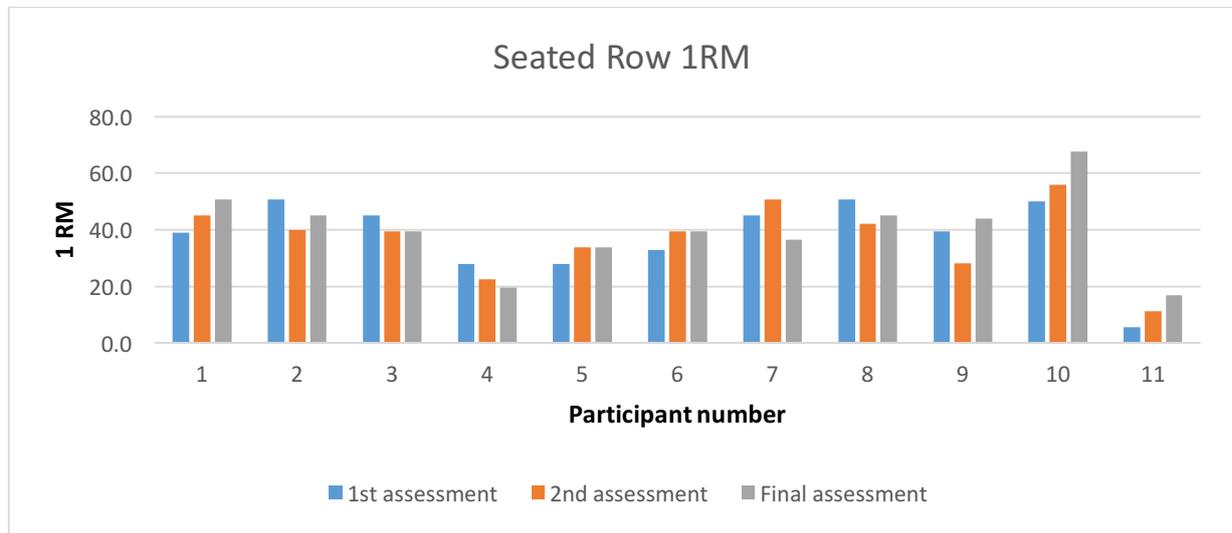


As data in Chart 10 shows, 9 out of 11 participants have improved their performance from the 1st to the Final assessment. Participants 1 to 7 have improved or maintained their performance from the 2nd to the Final assessment. Participants 8 to 11, have just maintained or decreased

performance from the 2nd to their Final assessment.

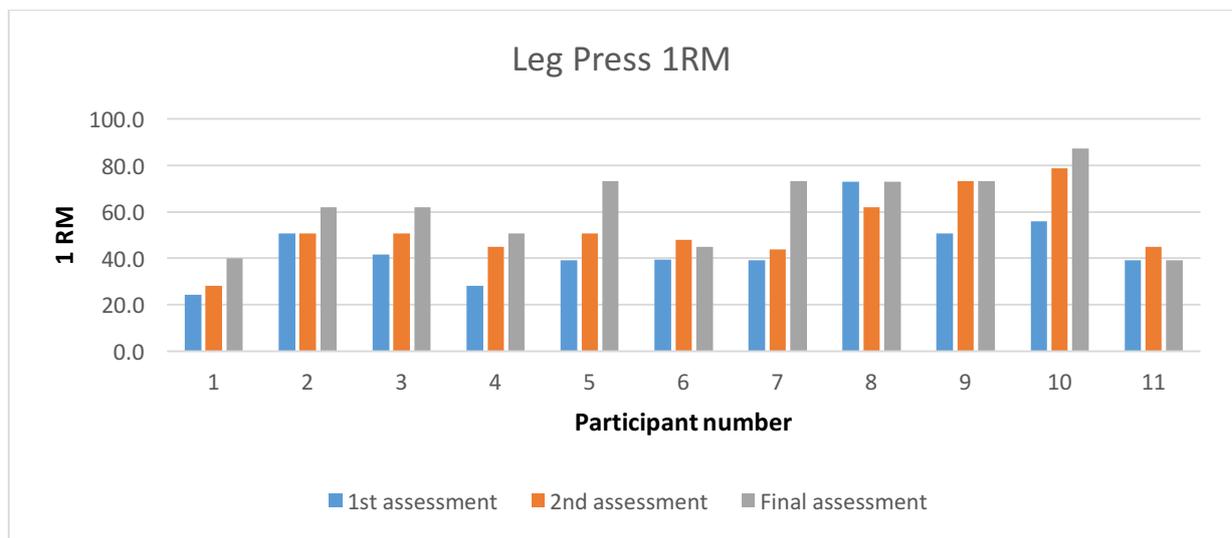
$P(T \leq t)$ two-tail = 0.001503894. Hence, almost 100% of the participants increased their performance for the lateral pull down.

Chart 11



$P(T \leq t)$ two-tail = 0.985180956. Hence, just 1% of the participants increased the 1RM for the seated row.

Chart 12



As can be seen in Chart 12, participants 1 to 7, had a bigger improvement from 2nd assessment to the Final one than from the 1st assessment to the 2nd. The improvements for participants 9

to 12 were not as high as participants 1 to 8 from the 2nd assessment to the Final.

$P(T \leq t)$ two-tail = 0.511820188. Hence, 50% of the participants improved the 1RM for the leg press exercise.

Chart 13

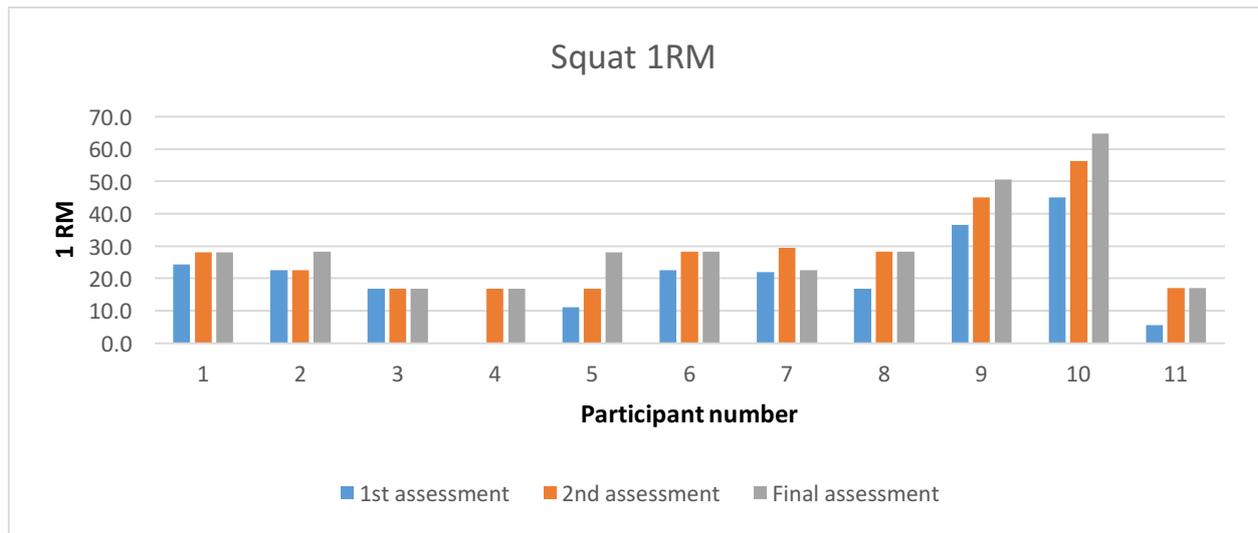
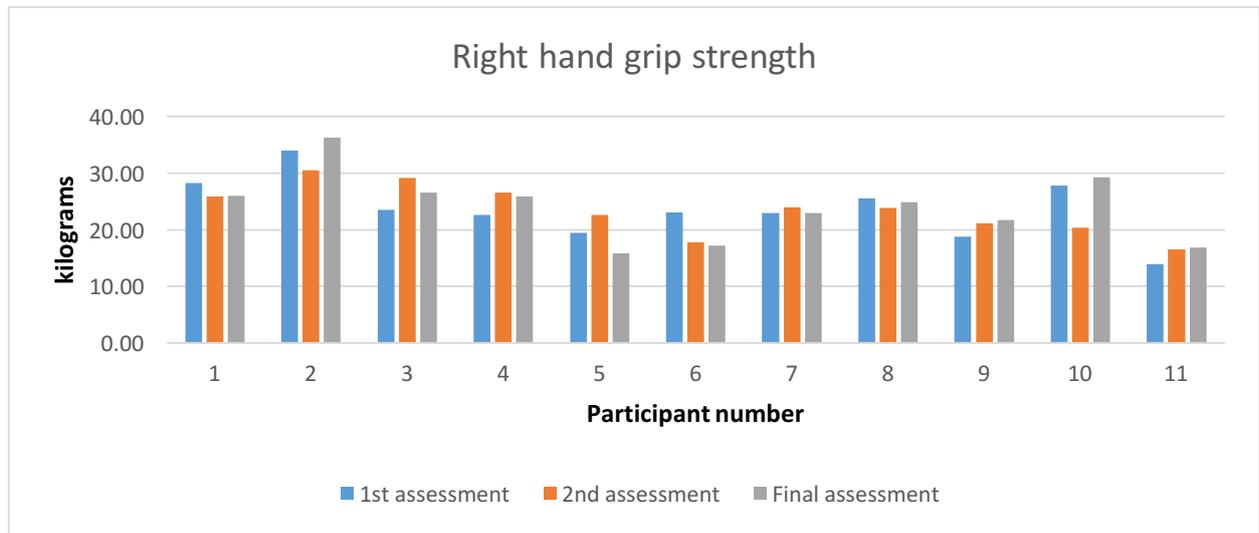


Chart 13 shows that 10 out of 11 of the participants improved their strength while squatting from the 1st assessment to the Final one.

$P(T \leq t)$ two-tail = 3.8282E-06. Hence almost 100% of the participants improved the performance for the squat.

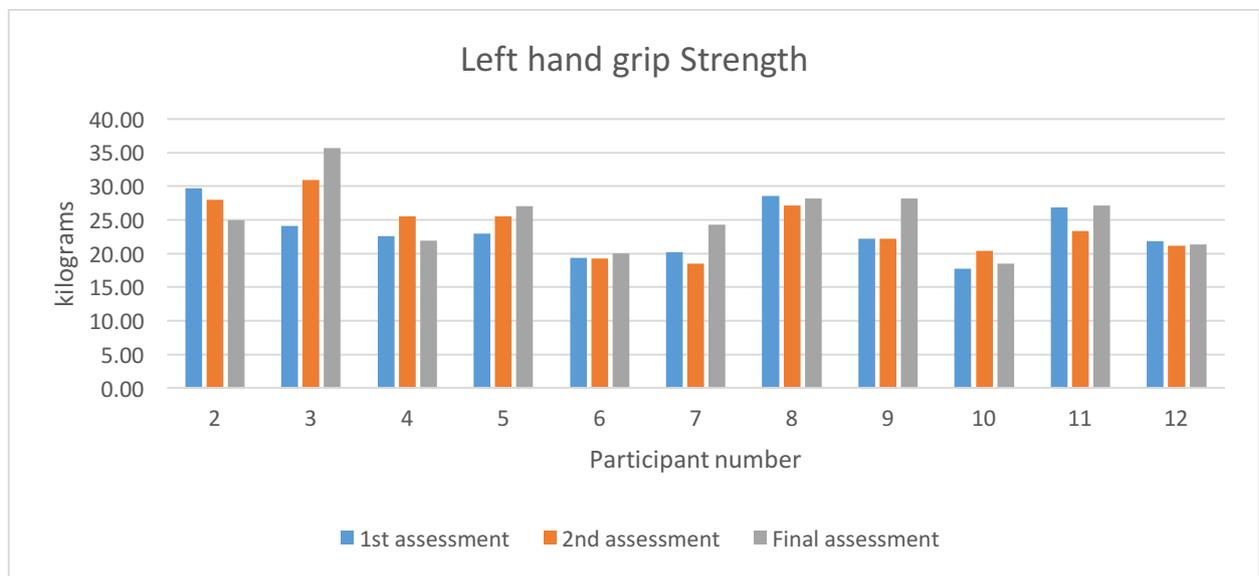
2.2 Handgrip and back and leg strength test: Isometric strength and endurance can be assessed using an isometric dynamometer, which can assess strength in the handgrip and back and legs.

Chart 14



$P(T \leq t)$ two-tail = 0.900367292. Just 1% of the participants improved the performance for the right hand grip.

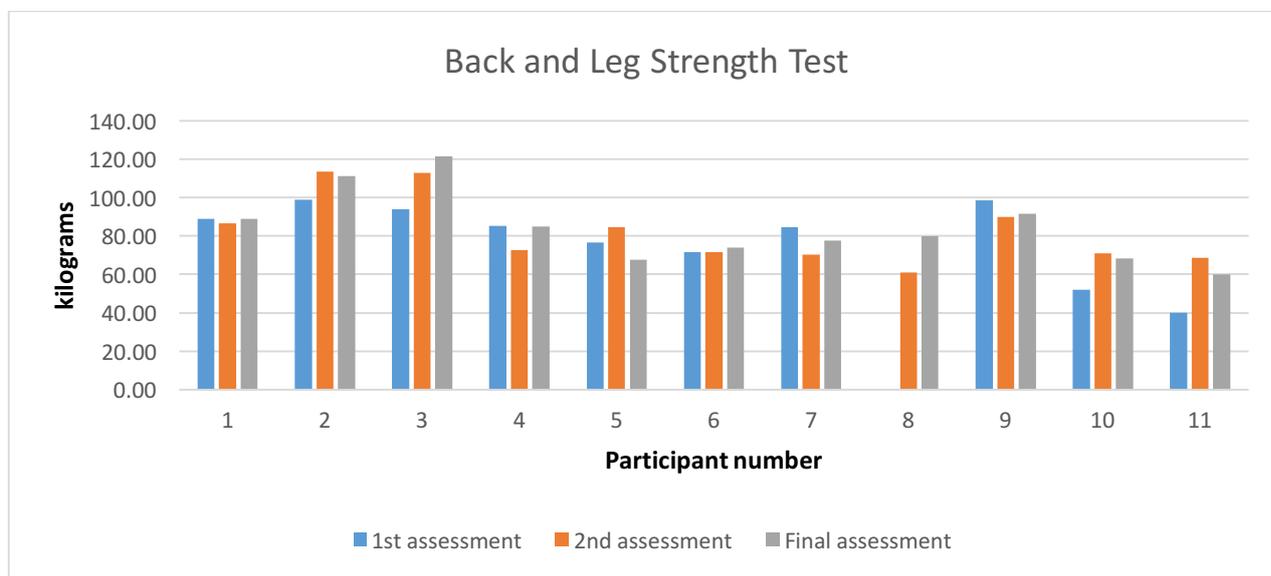
Chart 15



As can be seen in Chart 14, 6 out of 11 participants increased the Right hand grip strength whereas looking at data in Chart 15, 6 out of 11 improved the Left hand grip strength from the 1st to the final assessment. 7 out of 11 participants improved the Left hand grip strength from the 2nd to the Final assessment.

$P(T \leq t)$ two-tail = 0.310909814. Hence, 70% of the participants improved their performance for the left hand grip.

Chart 16

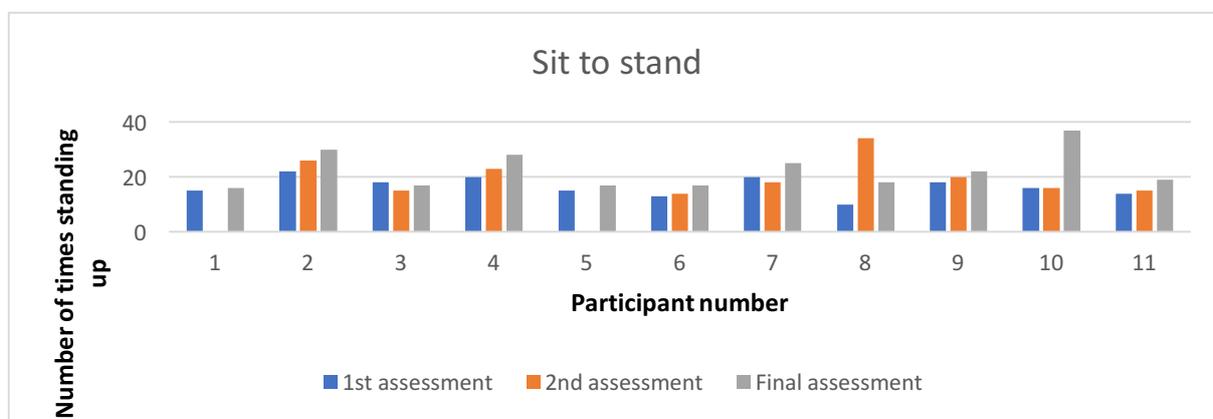


It can be seen from data in Chart 16 that 5 out of 11 participants improved their back and leg strength from the 1st to the Final assessment. On the other hand, 7 out of 11 participants improved their performance from the 2nd to the Final assessment.

$P(T \leq t)$ two-tail = 0.55540445. Hence 50% of the participants improved their performance for the back and leg strength.

2.3. Sit to stand test: It is a measurement that evaluates functional lower extremity strength.

Chart 17



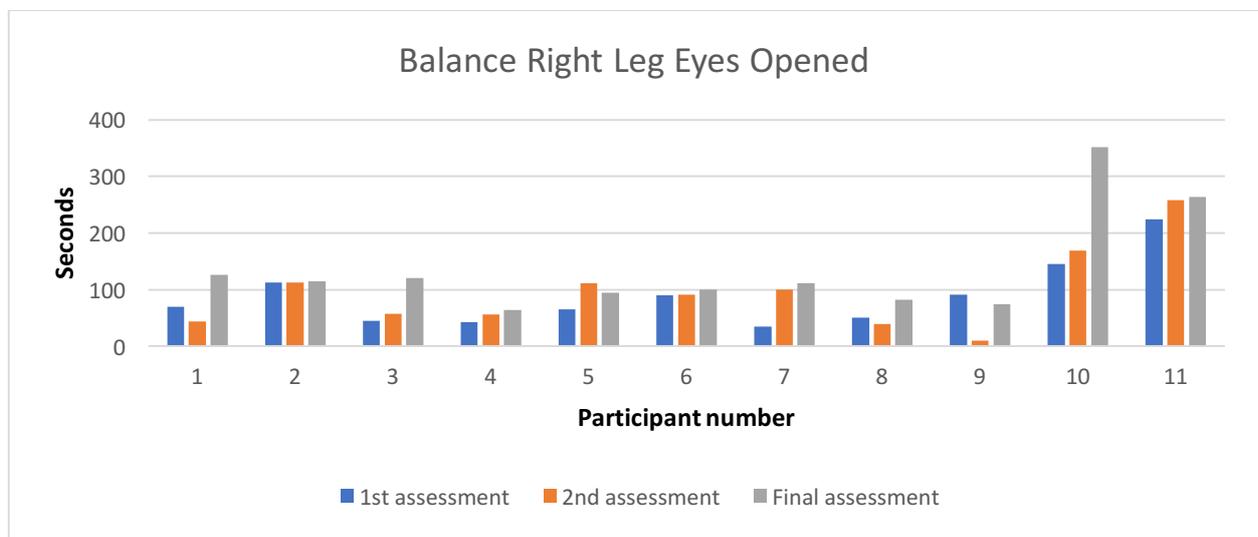
As Chart 17 shows, all participants improved their lower extremity strength from the 1st

assessment to the Final. Participant 8 had a knee issue for the final assessment. It is significant to see the improvements from the 2nd to the final assessment is clearly higher.

$P(T \leq t)$ two-tail = 0.01930647. Hence, almost 100% of the participants improved the performance for the sit to stand exercise.

3. Balance test: The patients were asked to stand on one leg without letting the legs to touch each other. Looking at the front with the eyes open.

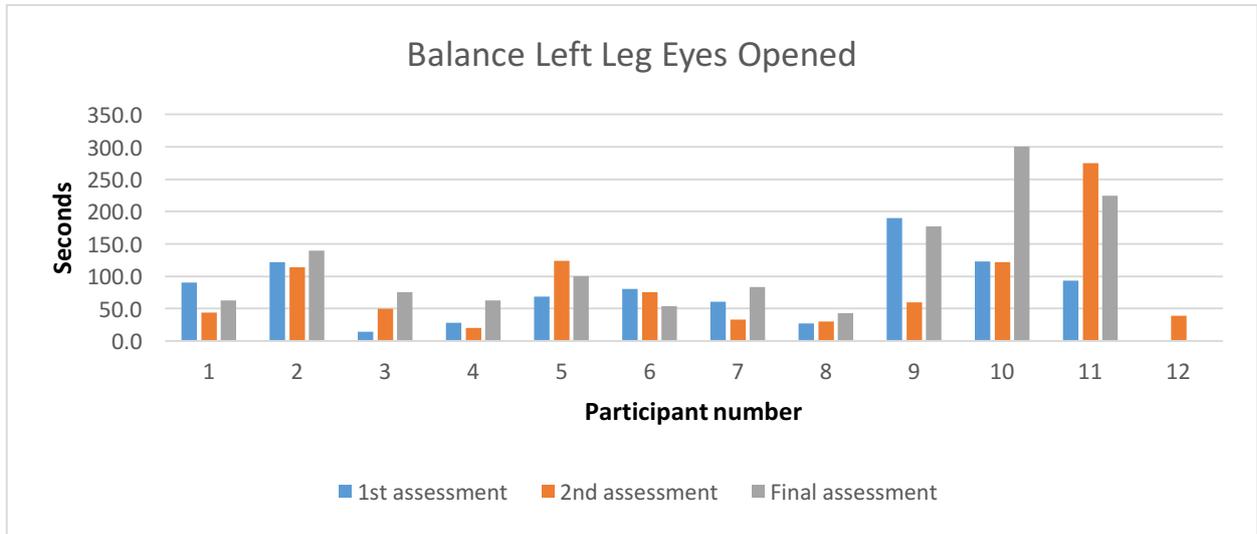
Chart 18



It can be seen from data in Chart 18 that all participants improved the Balance in the Right Leg with their eyes opened from the 1st assessment to the Final.

$P(T \leq t)$ two-tail = 0.142522925. Hence, 99% of the participants improved the performance for the balance in the right leg with the eyes closed.

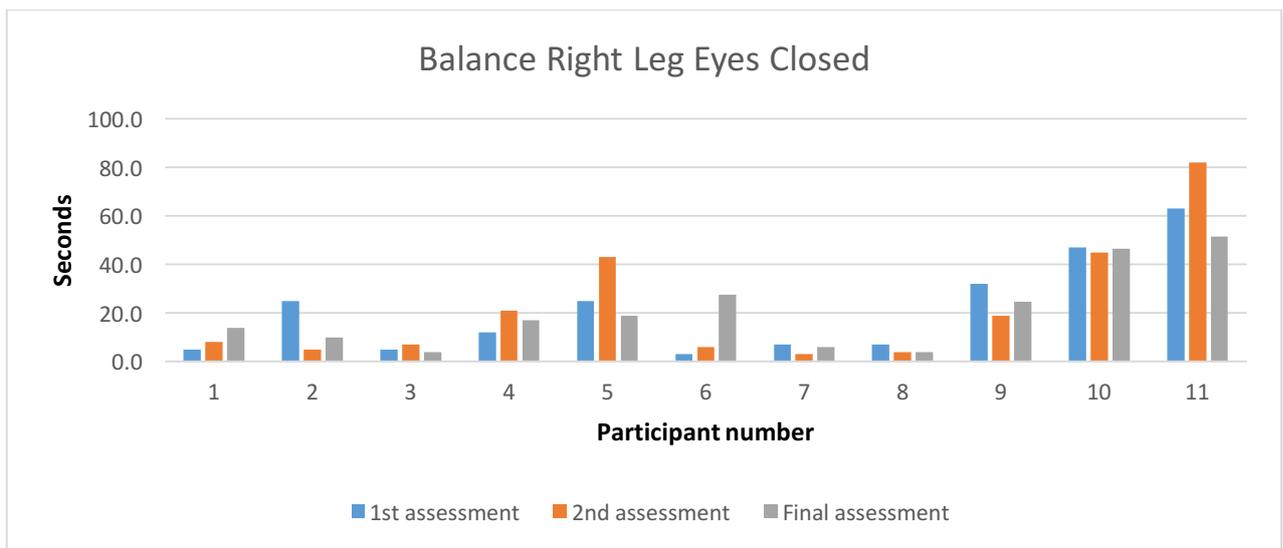
Chart 19



It can be seen from data in Chart 19 that all the participants improved the Balance in the Left Leg with their eyes opened from the 1st assessment to the Final.

$P(T \leq t)$ two-tail = 0.199527038. Hence, 99% of the participants improved the balance in the left leg with their eyes closed.

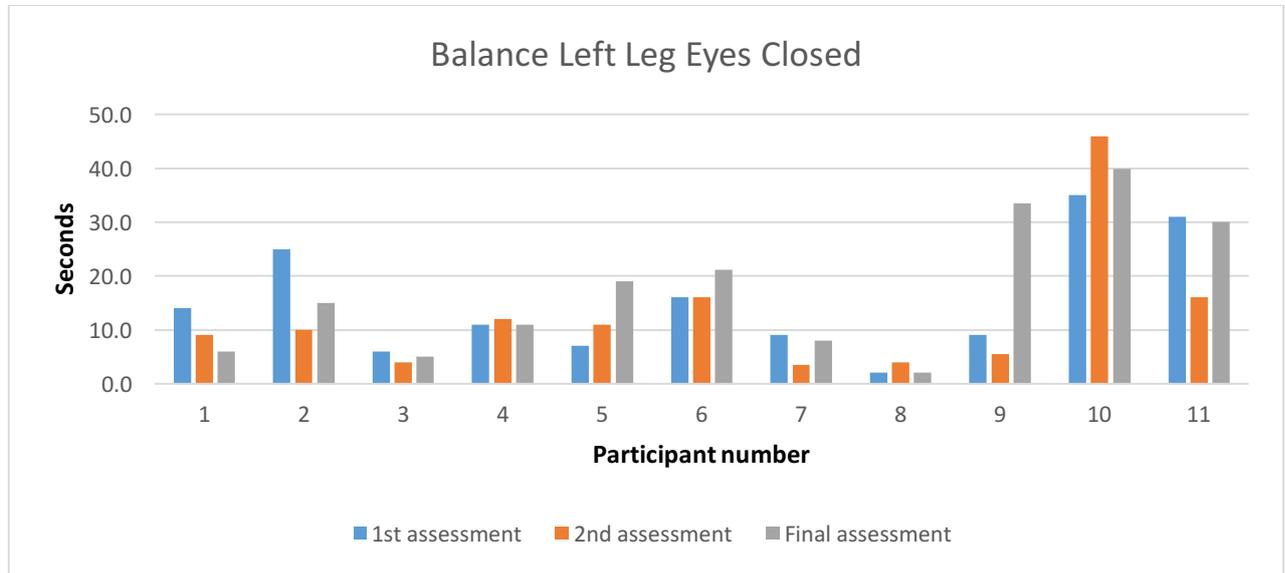
Chart 20



It is apparent from Chart 20 that very few participants improved their performance with the eyes closed for right leg balance test.

$P(T \leq t)$ two-tail= 0.934101017. Just 1% of the participants improved the balance for the right leg with the eyes closed.

Chart 21

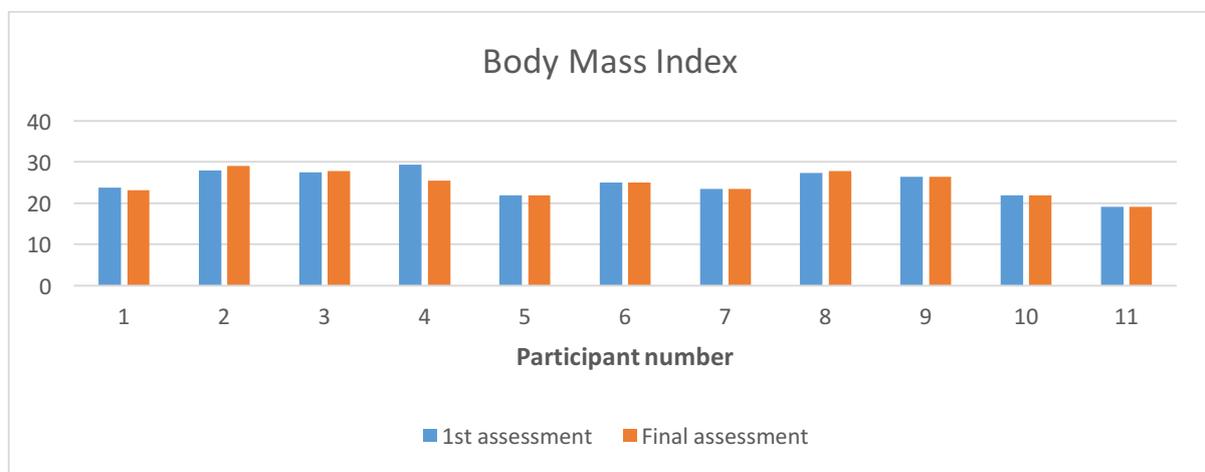


Data in Chart 21 shows that 7 out of 11 participants improved their performance from the 2nd assessment to the Final for the eyes closed left leg balance test whereas 4 out of 11 participants improved their performance from the 1st to the Final assessment.

$P(T \leq t)$ two-tail= 0.645910099. Just 40% of the participants improved the balance for the left leg with the eyes closed.

4. Body composition:

Chart 25



It can be seen from the data in Chart 25 that 5 out of 11 participants are at over the value of 25. This is considered overweight. As Stefani et al. (2017) suggest, patients diagnosed with cancer tend to have a better recovery after treatment when they add diet and exercise to the recovery program. This will improve cardiorespiratory fitness, strength, mobility, neuromuscular integrity and psycho-social wellbeing. At this program the participants will have access to nutritional information too.

$P(T \leq t)$ two-tail = 0.855273813. Only 20% of the participants improved the value of BMI during the program.

RESULTS FROM ALEXANDER TECHNIQUE LESSONS

A qualitative assessment done using the questionnaire.

1. Posture Improvement.

1.1 Squatting.

The participants who attended AT lessons, 1 to 7, learnt how to squat without shortening the spine. The results are in Pictures 1 to 6.

Before the alexander technique directions of how to squat, most of the participants pulled the head back which shortens the neck area and would pull in the lower back as well. All this pulling would shorten the spine at the end and at the bottom of the spine causing lots of harm and pain at the back. Therefore, during the alexander technique lessons the participants learnt how to squat without pulling the head back, so that the spine lengthens in the neck area and not pulling the lower back in so that the back lengthens and widens avoiding any injury or harm. Squatting this way the participant will not be hurting in any joint, it will be really easy to do and the exercise will be fun and easy. The squatting exercise was done lifting a weight and most of the participants were holding the weight too far from the body. This will unbalance the whole body and it will be harder to complete exercise causing pain in the lower back and arms. Holding the weight closer to the body will help with balance and proper posture will be easier to achieve making the body mechanics work better.

Pic 1 shows the participant 1 before the alexander technique directions of how to squat. She is pulling the head back, which shortens the neck area and pulling in the lower back while squatting. Pic 2 shows participant 1 is squatting after the alexander technique explanation on

how to squat, not pulling the head back so that the spine lengthens in the neck area and not pulling the lower back in so that the back lengthens and widens.

Pic 1



Pic 2



Pic 3 shows how participant 3 is pulling the head back while squatting which shortens the neck area of the spine, this was her habitual way of squatting. After the alexander technique explanation of how to squat, Pic 4 shows participant 3 squatting without pulling the head back and not pulling in the lower back, her spine is not compromised and she can stay there for longer.

Pic 3



Pic 4



Pic 5 shows participant 7 is pulling the head back while squatting, shortening her neck area which shortens the spine and can cause lots of pain. She is also holding the weight, the kettle bell too far away from her body. In picture 6 we can observe participant 7 after listening to the

instructions of not pulling the head back, so that her spine does not shorten. Also she is already holding the weight closer to her body which is going to avoid some back pain too.

Pic 5



Pic 6



1.2 Sitting:

During the second week of the alexander technique lessons, the participants learnt how to sit and the results were obvious. The results are in Pictures 7 to 10.

As we can appreciate in Picture 7, participant number 5 sitting her habitual way. Her head is falling forward towards the notebook while she is writing so that she can not stop herself from slouching and giving her a big 'c' curve in the upper back. They would be shortening their back/spine causing lots of harm. Participant number 5 was complaining about neck pain and The alexander technique new way of sitting, using consciousness of sitting on top of the sit bones and awareness of letting the head go forward and up so that there is no shortening in the front or the back of the spine, will help avoid that pain. All participants posture improved with the new directions for sitting.

Picture 7



Picture 8



Looking at Picture 9, we can see how participant number 3 was sitting in her habitual way. The head is falling forward and she is slouching while shortening the length in the front of the upper body. In picture 10, the participant is thinking about the alexander technique directions of allowing the head to go forward and up, and finding her sit bones for sitting on the chair so that her back straightens and widens and her front is elongating.

Picture 9



Picture 10



The same directions can be used while sitting on the ground. In picture 11, participant 1 is using a yoga block to help her to find better her sit bones while sitting in the yogi posture. Instead, in picture 18, the same participant is using a forward sloping wedge besides the yoga block to sit down on the yoga pose and she is lengthening even more in the front and in the

back. As the alexander technique demonstrates, using a forward sloping wedge or having a forward sloping surface to sit on helps posture. Participant’s neck is longer in the front specially in picture 12 and her head is not collapsing so that does not cause any strain in the neck area and the participant can stay in that posture for a longer period of time.

Picture 11



Picture 12

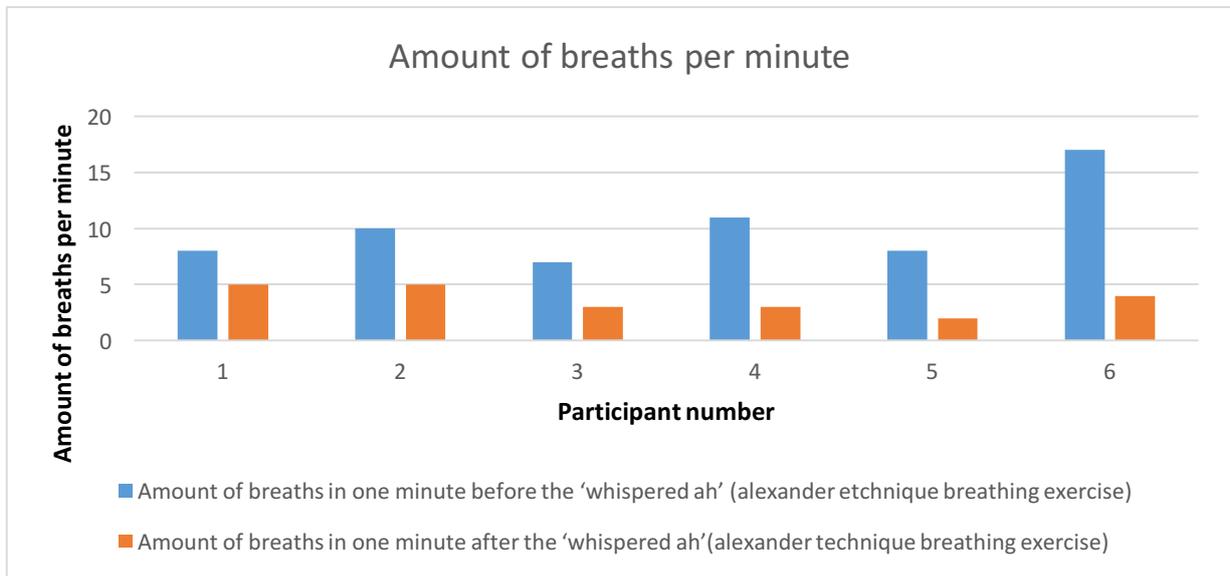


3. Breathing. Results of the breaths taken in one minute before and after the ‘whispered ah’, alexander technique exercise for breathing. One of the 7 participants was not present that day.

Table 5. Breathing count in one minute.

Participant	Amount of breaths in one minute before the ‘whispered ah’ (alexander technique exercise)	Amount of breaths in one minute after the ‘whispered ah’(alexander technique exercise)
1	8	5
2	10	5
3	7	3
4	11	3
5	8	2
6	17	4

Chart 26



It can be seen from the data in Chart 26 that the amount of breaths per minute went down for all the participants. The most surprising aspect of the data is in the 4 participants whose amount of breaths lowered to less than half, or even less than a third after the exercise.

This breathing exercise can be used at moments of stress, people who have asthma, people who are doing either balance, flexibility or resistance exercises can benefit from it. Breathing is the process of respiration, during which air is inhaled into the lungs through the mouth or nose due to muscle contraction and then exhaled due to muscle relaxation.

The consequences of breathing inefficiently could be dangerous for the health. It will also influence the Vo2max, the maximum or optimum rate at which the heart, lungs, and muscles can effectively use oxygen during exercise, used as a way of measuring a person's individual aerobic capacity. As an article by Hanamaru et al. (2015) demonstrates, how respiratory muscle work in females affected the VO2max. Therefore, it is vital that the participants learn how to breath and how to use their breathing mechanism. This is what they learn during the alexander technique lessons, the efficiency of breathing.

4. Mental changes.

During the last week of the alexander technique lessons, last week of the programme, the participants filled out questionnaire in Fig 2 and they signed a consent too. The results for the

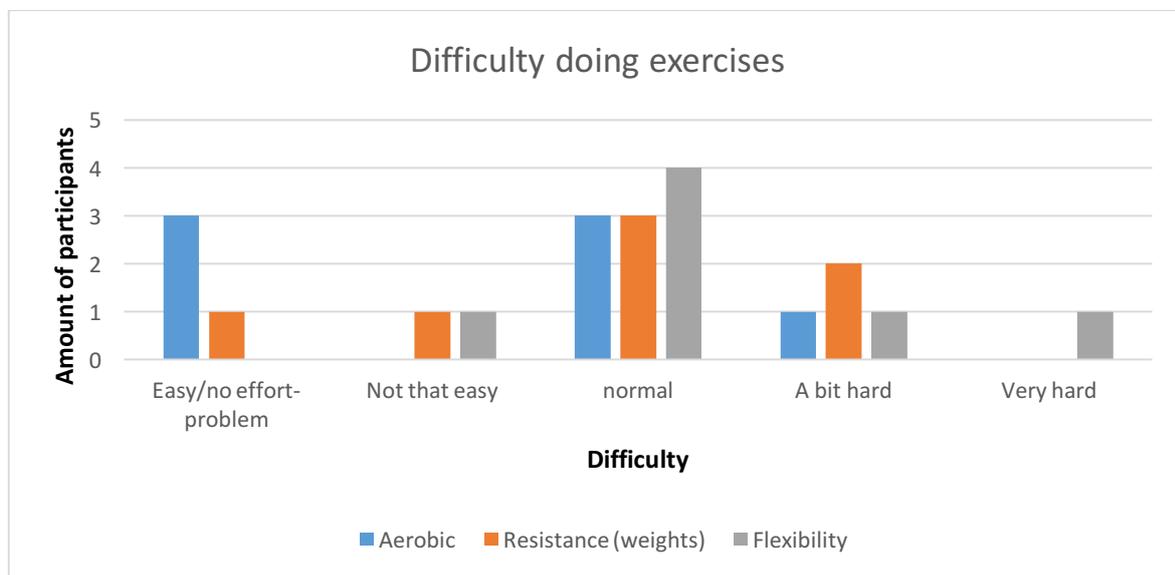
questionnaire are detailed in Chart 27 and Chart 28.

Table 2

1.How hard is it to do the exercises in your program? Tick the box.

Exercise type	Easy/no effort-problem	Not that easy	that normal	A bit hard	Very hard
Aerobic	3		3	1	
Resistance (weights)	1	1	3	2	
Flexibility		1	4	1	1

Chart 27



This section of the questionnaire required respondents to give information on the question in Table 2, ‘how hard did you find doing the exercises?’. As Chart 27 shows, 3 out of 7 of the participants found it easy to do the aerobic exercises, 3 found it normal and 1 found it a bit hard. The resistance exercises were easy for 1 of the participants, not that easy for another one, 3 found it normal and 2 found them a bit hard. Regarding the flexibility exercises, 1 found them

not that easy, 4 found them normal, 1 found it a bit hard and 1 found them very hard. It is apparent from this chart that the participants had more difficulty doing the flexibility exercises. However, as the results for the ‘Sit and reach test’ have suggested in Chart 5, the participants who attended alexander technique lessons improved their flexibility more from the second to the final assessment, after they attended to alexander technique lessons. However, more research has to be done in order to argue this.

Table 3

2. Did you find the Alexander Technique lessons beneficial to your exercise programme? If so how? Tick the boxes as appropriate.

Exercise type	Posture	Mind set	Breathing	Calmer	Others
Aerobic	4	4	7	4	
Resistance (weights)	6	3	4	3	
Flexibility	5	4	3	4	

Chart 28

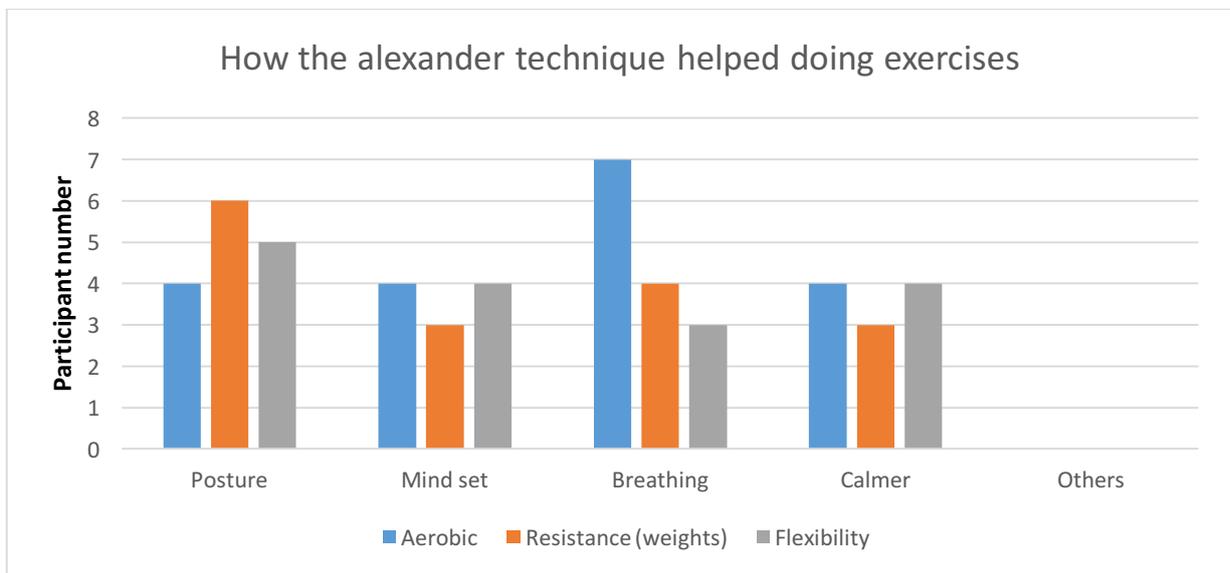


Table 3 shows the results for question 2, ‘how did the alexander technique lessons help with the exercises?’. The most surprising aspect of the data is shown in Chart 28 which reveals how 100% of the participants, 7 out of 7, found the Alexander Technique very helpful with their

breathing during aerobic exercise. More research needs to be done on alexander technique and breathing (Dennis *et al.*, 2012). The results also show how 90% of the participants, 6 out of 7, found the alexander technique very helpful with their Posture during Resistance exercises. The Alexander technique should be used as injury prevention for Resistance exercises. Looking at data in Chart 28, it can also be seen that 80% of the participants, 5 out of 7, found the alexander technique very helpful while doing the flexibility exercises. 4 out of 7 participants found the alexander technique lessons helped them with their mind set and being calmer.

Figures 2 to 7 show the results for the last question in the questionnaire: 'Please give a short testimonial. (ex: how you find the lessons, are they useful for your exercise, normal life?)'. One out of the seven participants did not have the chance to write a testimonial. As the compiled data shows, the overall response to this question was very positive. Most of the participants found the lessons very useful for several reasons. The alexander technique lessons helped them to improve their posture and with this, they could move better and breath better which is very useful for exercising and altogether will improve their health. They found the flexibility exercises were easier with using the new directions learnt with the alexander technique. The resistance exercises were not as hard with a better posture and breathing patterns. The habitual damaging way of squatting, arching their back while doing the exercise therefore hurting their back could be avoided. The tightening of the jaw while weight lifting would be avoided too and with this the rest of the muscle tightening that comes with tightening the jaw. There was lots of grabbing hard the treadmill or rowing machine and all this extra effort could be lowered and therefore lots of energy could be saved. Breathing out while pushing the weight, so that working together with the breathing would make the weight lifting much easier. The anatomy knowledge gained during the lessons helped them in everyday activities such as sitting at their desktop at work or walking. They felt calmer and their mood improved after each lesson. The lessons made some of them sleep better too which would improve their rest and overall wellbeing. Being more aware of what they are doing made them more conscious of their habits and they are free to change them. After the lessons the participants were empowered.

Fig 2

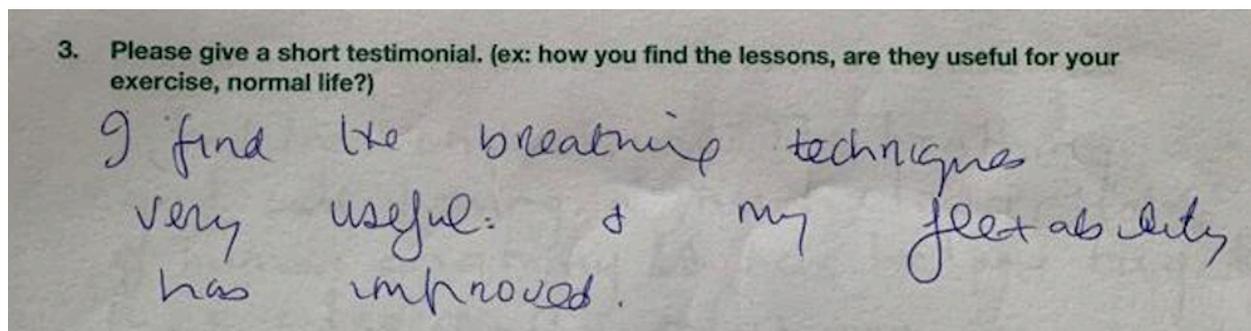


Fig 3

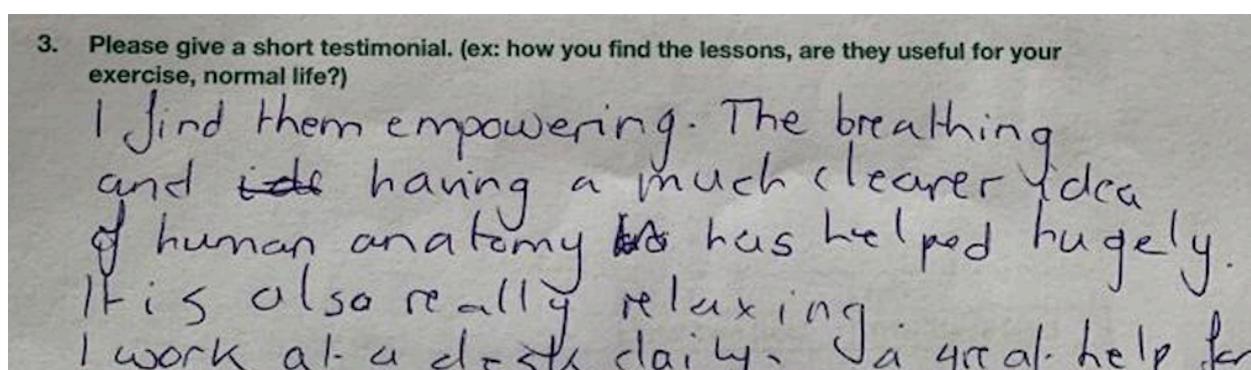


Fig 4

3. Please give a short testimonial. (ex: how you find the lessons, are they useful for your exercise, normal life?)

Unfortunately I was only able to attend 2 sessions, but found both if them very informative and useful. I practised the "lying down" several times and found I was calmer and more relaxed after it, I also feel it may have contributed to improved sleep. I am now more aware of how I sit and the correct way to do it. Yes I will continue to practice what I learned and feel it will be very valuable to me in daily life going forward.

Fig 5

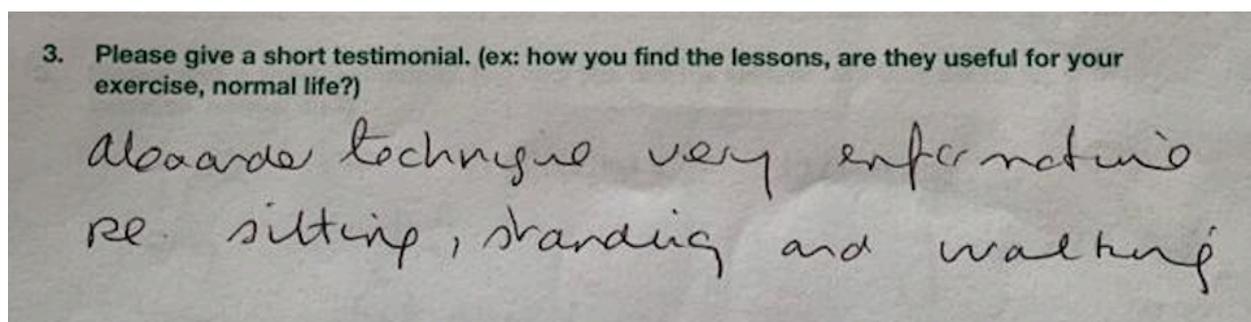


Fig 6

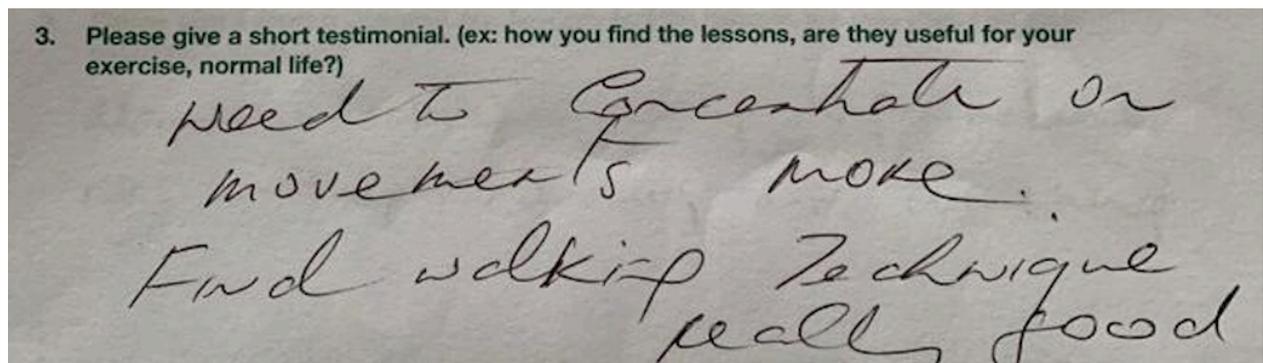
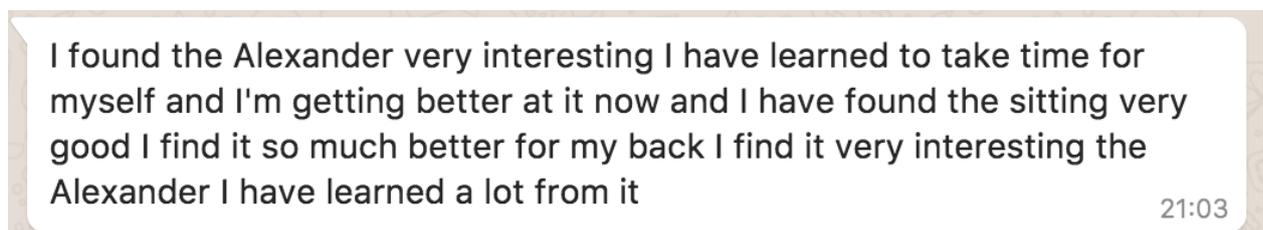


Fig 7



This project indicates that there have been measurable improvements in patients who have availed of the Alexander Technique lessons, as it will be explored below. It also suggests that an exercise programme that integrates AT lessons presents qualitative benefits regarding the general patients' attitude towards exercise. More research is required to see how the alexander technique could help to women with breast cancer.

Discussion

The aim of this project is to help cancer patients in their recovery by helping them to increase strength, improve mobility and balance and reduce fatigue, stress, depression and any other negative symptoms caused by cancer disease and treatment. This is done by offering an exercise programme that integrates Alexander Technique lessons with the patient's routine.

Data in Charts 6 to 17, indicate that strength exercises have helped the participants to improve their strength levels for different group of muscles following a 12-week exercise programme. The charts show two main patterns, some of the subjects experienced a more significant

improvement in the first phase of the exercise programme while for others the second phase resulted more beneficial. Each individual is very different from the other so the progress has been different. There has been an overall improvement from the first assessment to the final one for certain muscle groups, for example, as can be seen in Chart 6 for the leg extension test. This overall pattern is the same for the squatting test and the lower extremity strength test. In the cases of chest press, shoulder press, leg curl, lateral pull down and leg press test, the overall improvement is clear from the first assessment to the final one. However, it has been observed that some of the participants showed higher improvement from the second assessment to the final. 7 out of 11 participants improved the Left hand grip strength from the 2nd to the final assessment. This was the period when participants 1 to 7 had integrated Alexander Technique lessons to their exercises programme. Data in chart 16 suggests that 5 out of 11 participants may have improved their back and leg strength from the 1st to the final assessment and that 7 out of 11 participants improved their performance from the 2nd to the final assessment. This is an exploratory study that indicates that Alexander Technique lessons may have a positive effect to exercise programmes, however, due to the size of the group of participants and to the scale of the project, the potential benefits of the Alexander Technique lessons can not be ascertained here. While the Alexander Technique may help qualitatively cancer patients in participating in exercise programmes, a more thorough, controlled research ought to be carried out to determine and quantify the potential measurable benefits of the Alexander Technique for exercise and strength.

In Charts 1 to 5, it can be seen how flexibility has improved for most of the participants in some major joints. The improvement is very localised and in some cases it has occurred in the left side while the right has remained the same or the other way around. As data in Chart 1 shows, 9 out of 11 participants, increased their (ROM) for their right glenohumeral joint from the 1st assessment to the final one while 6 out of 11 increased their performance for the left ROM from the 1st assessment to the final one and the same happened for the hip (Chart 4). Chart 2 shows that 7 out of the 11 participants increased their right elbow ROM from the 1st assessment to the final for the right elbow and 5 out of the 11 participants decreased their Left elbow ROM. As Chart 3 shows, The ROM in the right and left knee joint has decreased from the 2nd to the final assessment for participants 9 to 11. Participants 1, 2, 4, 5 & 7 have improved their ROM for the left knee joint from the 1st assessment to the final. Participants 1, 4, 5 & 7 have improved or maintained the right knee joint ROM from the 1st to the final assessment. Regarding balance tests, it can be seen from data in Charts 18 and 19, that all participants improved the Balance in the right and left Leg with their eyes opened from the 1st assessment

to the Final. Chart 20 shows that very few participants improved their performance with their eyes closed for right leg balance test whereas data in Chart 21 shows that 4 out of 11 participants improved their performance from the 1st to the Final assessment. Instead, 7 out of 11 participants improved their performance from the 2nd assessment to the Final for the eyes closed left leg balance.

The data gathered in this project (for example improved flexibility among Alexander Technique participants in Chart 5 and improved performance in Chart 20 and 21) seem to indicate that individuals that had Alexander Technique lessons with their exercise had a larger measurable increment in some tests. Unfortunately, the sample data gathered in this study is too small to be used statistically. While these findings may support that Alexander Technique lessons combined with exercise programmes can be beneficial, further research data is needed. Future potential studies may require larger groups of participants, for a longer period of time, subject to more lessons in order to quantify potential measurable differences between control groups and study groups before and after Alexander Technique lessons. Furthermore, an appropriate methodology would need to be implemented with regards to the variable measured. This would mean a more rigorous approach in which both control and study groups are subject to the same exercise programme, with the only variable being the Alexander Technique lessons.

Besides the suggested quantitative changes, qualitative changes have also been registered among the participants who have been attending Alexander Technique lessons. Looking at Chart 28, the Alexander Technique helped the participants in their exercise performance. The main improvement is in Breathing (100%) followed by Posture (90%) in particular during Resistance exercises.

Several educators such as John Dewey, the American educational philosopher and long-term associate of F M Alexander advocated a 'learning by doing' approach for young children, and is widely considered one of the key thinkers in the field of progressive education. Dewey was also a champion of the Alexander Technique as a means of developing the individual's capacity to learn. Research suggests that Alexander Technique teachers raise themselves from a chair with much better coordination than non Alexander Technique teachers. However, more studies are necessary to understand the degree in which the Alexander Technique helps with the sit to stand coordination (Cacciatore *et al.*,2011). Other educators such as Esther Miltiadous, professional personal trainer, children educational therapist, and alexander technique teacher, believes that the Alexander Technique should be part of physical education in schools. That

would prevent many injuries (Miltiadous 2019). The Alexander technique should be used as injury prevention for Resistance exercises especially because of the use of weights and machines. The risk of injury is quite high since participants will not be used to this kind of weight lifting activity at the beginning. The education of how to use the machinery at the gym together with the use of the body should be a main concern for health and safety purposes. Chart 28 also shows that 80% of the participants (5 out of 7) found the Alexander Technique very helpful while doing the flexibility exercises. The Mayo Clinic has recommended the Alexander Technique as a health-enhancing practice. (Mayo clinic and British journal: <https://www.witoldfitzsimon.com/benefits-of-the-alexander-technique/>). Among the many benefits of the Alexander Technique, the freer joints and ease of movement are listed which is connected to a greater flexibility. As the National Health Services, UK (NHS) believes **‘The Alexander technique teaches improved posture and movement, which is believed to help reduce and prevent problems caused by unhelpful habits’**. **Posture is a very important part of any activity and it should be considered during exercise. The Alexander Technique can help with learning how to do any exercise with greater ease and avoid any harm. It will be a process of conscious direction and primary control and the individual might have to do what feels wrong but will gain the best result.**

100% of the participants, 7 out of 7, found the Alexander Technique very helpful with their breathing during aerobic exercise and this would help with the oxygen management during exercise. The change in the rate of breathing per minute is quite dramatic all participants were able to lower it of as much as half or even a third of their habitual rate after learning the ‘whispered ah’, a breathing exercise used in the Alexander Technique. The way people breathe may make a big difference on the exercise level. It could help people with asthma or breathing problems too. However, more research needs to be done on Alexander Technique and on the symptoms of chronic asthma and thereby how it could help people with asthma to reduce their medication (12 Dennis *et al.*,2012). The new way of breathing made participants feel calmer. Therefore, participants felt less stressed, less anxious while breathing in the new way and this helped with any activity they had to accomplish. The new way of breathing, the ‘whispered ah’, can be practiced at any time and this is very practical, they do not need to find extra time to practice it.

Throughout the program, planning and progression depended on patient’s participation and feedback. Looking at data in Chart 28, the mental changes have been clear for all participants

attending Alexander Technique lessons. According to a questionnaire that the participants filled out voluntarily, it can be seen how the way they exercised was completely different after having Alexander Technique lessons. In general, the participants did not seem to be depressed or in a bad mood but time was an issue. Giving them exercises they can use in their normal life is key. Everything that was taught during the Alexander Technique lessons can be applied at any time in normal life without adding extra tasks, but instead learning how to perform day-to-day tasks in an easier way. It could be exercising, ironing, driving, walking or any other activity they could think about. An article by Fortin et al. (2005), shows how the emphasis should be placed not on what new things the student needs to learn or do to get it right, but on what the students needs not to do. This means the Alexander Technique is not adding more work to do, instead is looking at what we need to stop doing so that the correct way comes by itself. For example, we may project our knees inwards while running, which does not benefit our exercise, so the subject would need to just think about not sending the knees towards each other. This new way of thinking will lead the subject to adopt a more efficient running posture reducing the risk of injury. As Batson et al. (2014) claim, there is a need to do simple and everyday activities when applying the principles of somatic education as we do in the Alexander Technique lessons, to incorporate it in our somas as a way of life integral to everything we do. It will take time to change but it should be worth it.

Regarding the mental changes, most of the participants felt calmer, slept better, improved their rest and overall wellbeing and the mood improved after each lesson. It was good that the lessons were held in a group since it was clear that the participants preferred a social environment, which had a positive influence on their attitude. The benefits of Alexander Technique group lessons are also cognitive, which give the students the opportunity to learn from each other through observation. People often learn by copying or by seeing their own habits in another person. It is sometimes difficult to see our own habits whereas we can see them in others and then realise how to avoid 'mistakes'. This does not mean everything we do is wrong, only the things that do harm ourselves and can be avoided are worth change. Once you know what you are doing, you are mindful of your movements, you will be able to get control of your body and do any exercise or activity in a better and easier way. The behavioural change plays a big part in Alexander Technique lessons since it is the participant that will have to make changes for themselves. The more you exercise, the bigger impact it will have in your cardiovascular fitness level, strength level, flexibility and mood. As argued by Staring (2015), the body and mind can be trained to come back to balance while giving conscious/reasoned directions.

However, whenever we try the new directions, often the old habitual ways of moving will come into play. Therefore, more lessons in the Alexander Technique will instruct as further and will help ingrain the new directions into everyday movements. Due to limited funding and to the nature of the project it has only been possible to have 5 Alexander Technique lessons for an hour and a half each. The qualitative value of the Alexander Technique lessons emerged from the sense of community created among the participants and their improved attitude towards exercise. One of the problems of the Alexander Technique is in fact the marketing strategy that has been implemented in the past has converted it into an elitist and closed practice (Staring, 2005). With this project, I attempted to introduce the Alexander Technique to a wider public, as a community based Alexander Technique and exercise programme for cancer patients. Quantitatively, further studies with larger groups would need to be carried out in order to gather an appropriate amount of data that has statistical validity. I hope this project will inspire further research on the measurable effects of the Alexander Technique to exercise programmes.

Pic 13. Participants on their first day of Alexander technique lessons.



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Appendix

1. Patients sample consent form.



The REACT Cancer Exercise Program spans all cancer diagnoses and aims to increase patient's quality of life, reduce depression, attenuate fatigue, improve cardiorespiratory performance, enhance muscular strength and endurance, and increase flexibility and balance. The program aims to help patients address the effects of chemo toxicity on their bodies. Beyond recovery from cancer treatment, the program will help cancer survivors to transition into a healthy and active lifestyle.

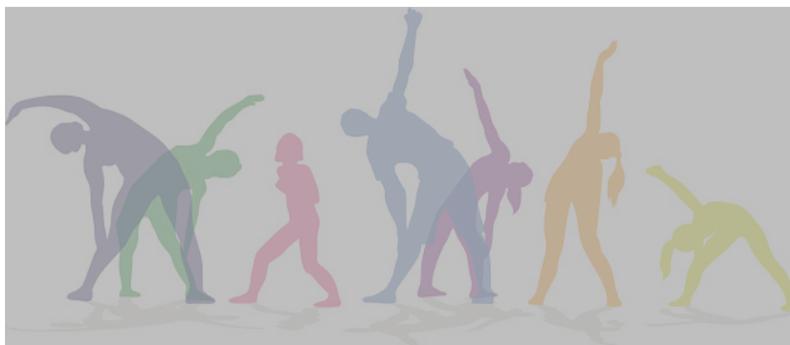
All cancer diagnoses can benefit from a cancer exercise program, recent research has overwhelmingly supported exercise to treat and prevent the negative physical and psychological side effects of cancer treatment.

Key Questions:

- Are you feeling generally **weak** or is your **fatigue** disproportionate to the activity you are doing?
 - Do you have treatment related **pain**?

- Has your cancer treatment let you with ;tingling, numbness, instability, difficulty balancing or walking in your extremities?
- Has your quality of life been affected by your cancer treatment?
- Are you struggling with depression caused by your cancer treatment? Don't worry about your fitness levels A the program is specific for oncology patients and is carried out at a lower intensity and progressed at a slower pace to safely alleviate your cancer treatment related symptoms.

WHY DO I NEED REHAB?



REACT REACT

A Cancer Exercise Program Designed for You

OUR APPROACH TO CANCER EXERCISE

We will perform an **initial evaluation** that looks at the whole person, your complete medical history, the type and phase of cancer treatment you are undergoing or whether you have completed your active treatment phases. We will obtain your medical risk assessment and consent to participate in the exercise program from your GP. During this initial evaluation, we will perform certain objective tests to set baselines for things like cardiovascular performance, strength and balance. This means that we can objectively measure your progress through the course of the program.

The Program and Plan Our core treatments are always one on one and include individually tailored tests in the following areas: • Cardiovascular Exercises • Strength Training • Balance Training • Flexibility All set at a level appropriate to your cancer diagnosis and physical condition when you enter the program.

The Goals We have developed an exercise program consisting of three main phases of exercise rehabilitation for cancer patients: **! Phase 1 – Restart:** Reduce fatigue, improve mobility and balance **! Phase 2 L Revive:** Improve cardiopulmonary fitness score, HRRMax recovery and VO2 max, Improve – muscle strength and balance **! Phase 3 Restore:** Establish a long term exercise program .

Each phase consists of 4 weeks, with one or more weekly guided exercise sessions and a follow up evaluation at the end of each phase with

Contact us: Helen Greally (Email: Helen.Greally@cancercarewest.ie Tel: 091 545000)

Ananya Gupta (Email: ananya.gupta@nuigalway.ie Tel: 091 492358)

Micheál Newell (Email: micheal.newell@nuigalway.ie Tel: 091 494313)



REACT **REACT**

A Cancer Exercise Program Designed for You

Informa4on sheet and consent to participation: Please read the information in the attached flyer and sign below if you wish to participate in the program.

I consent to participating in the exercise program and evaluation of fitness as described in the attached flyer. Name :

Contact details: Signature:

I understand that I can withdraw from this project at any ;me. I can ask the researchers about any further questions regarding this project. Thank you for your help in this matter

Dr Micheál Newell Lecturer in Medical Science and Cancer Exercise Specialist, NUIG

Dr Ananya Gupta Lecturer in Exercise Physiology, Translational Research Facility, NUIG .

2. PAR-Q.

2018 PAR-Q+

The Physical Activity Readiness Questionnaire for Everyone

The health benefits of regular physical activity are clear; more people should engage in physical activity every day of the week. Participating in physical activity is very safe for MOST people. This questionnaire will tell you whether it is necessary for you to seek further advice from your doctor OR a qualified exercise professional before becoming more physically active.

GENERAL HEALTH QUESTIONS

Please read the 7 questions below carefully and answer each one honestly: check YES or NO.	YES	NO
1) Has your doctor ever said that you have a heart condition <input type="checkbox"/> OR high blood pressure <input type="checkbox"/> ?	<input type="checkbox"/>	<input type="checkbox"/>
2) Do you feel pain in your chest at rest, during your daily activities of living, OR when you do physical activity?	<input type="checkbox"/>	<input type="checkbox"/>
3) Do you lose balance because of dizziness OR have you lost consciousness in the last 12 months? Please answer NO if your dizziness was associated with over-breathing (including during vigorous exercise).	<input type="checkbox"/>	<input type="checkbox"/>
4) Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)? PLEASE LIST CONDITION(S) HERE: _____	<input type="checkbox"/>	<input type="checkbox"/>
5) Are you currently taking prescribed medications for a chronic medical condition? PLEASE LIST CONDITION(S) AND MEDICATIONS HERE: _____	<input type="checkbox"/>	<input type="checkbox"/>
6) Do you currently have (or have had within the past 12 months) a bone, joint, or soft tissue (muscle, ligament, or tendon) problem that could be made worse by becoming more physically active? Please answer NO if you had a problem in the past, but it <i>does not limit your current ability</i> to be physically active. PLEASE LIST CONDITION(S) HERE: _____	<input type="checkbox"/>	<input type="checkbox"/>
7) Has your doctor ever said that you should only do medically supervised physical activity?	<input type="checkbox"/>	<input type="checkbox"/>

 **If you answered NO to all of the questions above, you are cleared for physical activity. Please sign the PARTICIPANT DECLARATION. You do not need to complete Pages 2 and 3.**

-  Start becoming much more physically active – start slowly and build up gradually.
-  Follow International Physical Activity Guidelines for your age (www.who.int/dietphysicalactivity/en/).
-  You may take part in a health and fitness appraisal.
-  If you are over the age of 45 yr and NOT accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.
-  If you have any further questions, contact a qualified exercise professional.

PARTICIPANT DECLARATION

If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that the community/fitness centre may retain a copy of this form for records. In these instances, it will maintain the confidentiality of the same, complying with applicable law.

NAME _____ DATE _____

SIGNATURE _____ WITNESS _____

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER _____

 **If you answered YES to one or more of the questions above, COMPLETE PAGES 2 AND 3.**

 **Delay becoming more active if:**

-  You have a temporary illness such as a cold or fever; it is best to wait until you feel better.
-  You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ at www.eparmedx.com before becoming more physically active.
-  Your health changes - answer the questions on Pages 2 and 3 of this document and/or talk to your doctor or a qualified exercise professional before continuing with any physical activity program.

2018 PAR-Q+

FOLLOW-UP QUESTIONS ABOUT YOUR MEDICAL CONDITION(S)

1. Do you have Arthritis, Osteoporosis, or Back Problems?

If the above condition(s) is/are present, answer questions 1a-1c If **NO** go to question 2

- 1a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES NO
- 1b. Do you have joint problems causing pain, a recent fracture or fracture caused by osteoporosis or cancer, displaced vertebra (e.g., spondylolisthesis), and/or spondylolysis/pars defect (a crack in the bony ring on the back of the spinal column)? YES NO
- 1c. Have you had steroid injections or taken steroid tablets regularly for more than 3 months? YES NO

2. Do you currently have Cancer of any kind?

If the above condition(s) is/are present, answer questions 2a-2b If **NO** go to question 3

- 2a. Does your cancer diagnosis include any of the following types: lung/bronchogenic, multiple myeloma (cancer of plasma cells), head, and/or neck? YES NO
- 2b. Are you currently receiving cancer therapy (such as chemotherapy or radiotherapy)? YES NO

3. Do you have a Heart or Cardiovascular Condition? This includes Coronary Artery Disease, Heart Failure, Diagnosed Abnormality of Heart Rhythm

If the above condition(s) is/are present, answer questions 3a-3d If **NO** go to question 4

- 3a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES NO
- 3b. Do you have an irregular heart beat that requires medical management? (e.g., atrial fibrillation, premature ventricular contraction) YES NO
- 3c. Do you have chronic heart failure? YES NO
- 3d. Do you have diagnosed coronary artery (cardiovascular) disease and have not participated in regular physical activity in the last 2 months? YES NO

4. Do you have High Blood Pressure?

If the above condition(s) is/are present, answer questions 4a-4b If **NO** go to question 5

- 4a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES NO
- 4b. Do you have a resting blood pressure equal to or greater than 160/90 mmHg with or without medication? (Answer **YES** if you do not know your resting blood pressure) YES NO

5. Do you have any Metabolic Conditions? This includes Type 1 Diabetes, Type 2 Diabetes, Pre-Diabetes

If the above condition(s) is/are present, answer questions 5a-5e If **NO** go to question 6

- 5a. Do you often have difficulty controlling your blood sugar levels with foods, medications, or other physician-prescribed therapies? YES NO
- 5b. Do you often suffer from signs and symptoms of low blood sugar (hypoglycemia) following exercise and/or during activities of daily living? Signs of hypoglycemia may include shakiness, nervousness, unusual irritability, abnormal sweating, dizziness or light-headedness, mental confusion, difficulty speaking, weakness, or sleepiness. YES NO
- 5c. Do you have any signs or symptoms of diabetes complications such as heart or vascular disease and/or complications affecting your eyes, kidneys, **OR** the sensation in your toes and feet? YES NO
- 5d. Do you have other metabolic conditions (such as current pregnancy-related diabetes, chronic kidney disease, or liver problems)? YES NO
- 5e. Are you planning to engage in what for you is unusually high (or vigorous) intensity exercise in the near future? YES NO

2018 PAR-Q+

- 6. Do you have any Mental Health Problems or Learning Difficulties?** *This includes Alzheimer's, Dementia, Depression, Anxiety Disorder, Eating Disorder, Psychotic Disorder, Intellectual Disability, Down Syndrome*
If the above condition(s) is/are present, answer questions 6a-6b If **NO** go to question 7
- 6a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES NO
- 6b. Do you have Down Syndrome **AND** back problems affecting nerves or muscles? YES NO
-
- 7. Do you have a Respiratory Disease?** *This includes Chronic Obstructive Pulmonary Disease, Asthma, Pulmonary High Blood Pressure*
If the above condition(s) is/are present, answer questions 7a-7d If **NO** go to question 8
- 7a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES NO
- 7b. Has your doctor ever said your blood oxygen level is low at rest or during exercise and/or that you require supplemental oxygen therapy? YES NO
- 7c. If asthmatic, do you currently have symptoms of chest tightness, wheezing, laboured breathing, consistent cough (more than 2 days/week), or have you used your rescue medication more than twice in the last week? YES NO
- 7d. Has your doctor ever said you have high blood pressure in the blood vessels of your lungs? YES NO
-
- 8. Do you have a Spinal Cord Injury?** *This includes Tetraplegia and Paraplegia*
If the above condition(s) is/are present, answer questions 8a-8c If **NO** go to question 9
- 8a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES NO
- 8b. Do you commonly exhibit low resting blood pressure significant enough to cause dizziness, light-headedness, and/or fainting? YES NO
- 8c. Has your physician indicated that you exhibit sudden bouts of high blood pressure (known as Autonomic Dysreflexia)? YES NO
-
- 9. Have you had a Stroke?** *This includes Transient Ischemic Attack (TIA) or Cerebrovascular Event*
If the above condition(s) is/are present, answer questions 9a-9c If **NO** go to question 10
- 9a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES NO
- 9b. Do you have any impairment in walking or mobility? YES NO
- 9c. Have you experienced a stroke or impairment in nerves or muscles in the past 6 months? YES NO
-
- 10. Do you have any other medical condition not listed above or do you have two or more medical conditions?**
If you have other medical conditions, answer questions 10a-10c If **NO** read the Page 4 recommendations
- 10a. Have you experienced a blackout, fainted, or lost consciousness as a result of a head injury within the last 12 months **OR** have you had a diagnosed concussion within the last 12 months? YES NO
- 10b. Do you have a medical condition that is not listed (such as epilepsy, neurological conditions, kidney problems)? YES NO
- 10c. Do you currently live with two or more medical conditions? YES NO

PLEASE LIST YOUR MEDICAL CONDITION(S)
AND ANY RELATED MEDICATIONS HERE: _____

GO to Page 4 for recommendations about your current medical condition(s) and sign the PARTICIPANT DECLARATION.

2018 PAR-Q+

✓ If you answered NO to all of the FOLLOW-UP questions (pgs. 2-3) about your medical condition, you are ready to become more physically active - sign the PARTICIPANT DECLARATION below:

- ▶ It is advised that you consult a qualified exercise professional to help you develop a safe and effective physical activity plan to meet your health needs.
- ▶ You are encouraged to start slowly and build up gradually - 20 to 60 minutes of low to moderate intensity exercise, 3-5 days per week including aerobic and muscle strengthening exercises.
- ▶ As you progress, you should aim to accumulate 150 minutes or more of moderate intensity physical activity per week.
- ▶ If you are over the age of 45 yr and **NOT** accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.

⊗ If you answered YES to one or more of the follow-up questions about your medical condition:

You should seek further information before becoming more physically active or engaging in a fitness appraisal. You should complete the specially designed online screening and exercise recommendations program - the **ePARmed-X+** at **www.eparmedx.com** and/or visit a qualified exercise professional to work through the ePARmed-X+ and for further information.

⚠ Delay becoming more active if:

- ✓ You have a temporary illness such as a cold or fever; it is best to wait until you feel better.
- ✓ You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ at **www.eparmedx.com** before becoming more physically active.
- ✓ Your health changes - talk to your doctor or qualified exercise professional before continuing with any physical activity program.

- You are encouraged to photocopy the PAR-Q+. You must use the entire questionnaire and NO changes are permitted.
- The authors, the PAR-Q+ Collaboration, partner organizations, and their agents assume no liability for persons who undertake physical activity and/or make use of the PAR-Q+ or ePARmed-X+. If in doubt after completing the questionnaire, consult your doctor prior to physical activity.

PARTICIPANT DECLARATION

- All persons who have completed the PAR-Q+ please read and sign the declaration below.
- If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that the community/fitness center may retain a copy of this form for records. In these instances, it will maintain the confidentiality of the same, complying with applicable law.

NAME _____ DATE _____

SIGNATURE _____ WITNESS _____

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER _____

For more information, please contact
www.eparmedx.com
Email: eparmedx@gmail.com

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Key References

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The PAR-Q+ was created using the evidence-based AGREE process (1) by the PAR-Q+ Collaboration chaired by Dr. Darren E. R. Warburton with Dr. Norman Gledhill, Dr. Veronica Jamnik, and Dr. Donald C. McKenzie (2). Production of this document has been made possible through financial contributions from the Public Health Agency of Canada and the BC Ministry of Health Services. The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada or the BC Ministry of Health Services.

3. Questionnaire and consent for Alexander Technique lessons.

REACT AND ALEXANDER TECHNIQUE QUESTIONNAIRE. WEEK 5

Student: 18234566

Msc Exercise Physiology and its application to therapy.

Date: 25/07/2019

Please answer the following short questionnaire:

NAME AND SURNAME:

1. How hard is it to do the exercises in your program? Tick the box.

Exercise type	Easy/no effort-problem	Not that easy	normal	A bit hard	Very hard
Aerobic					
Resistance (weights)					
Flexibility					

2. Did you find the Alexander Technique lessons beneficial to your exercise programme? If so how? Tick the boxes as appropriate.

Exercise type	Posture	Mind set	Breathing	Calmer	Others
Aerobic					
Resistance (weights)					
Flexibility					

3. Please give a short testimonial. (ex: how you find the lessons, are they useful for your exercise, normal life?)

4. I consent the use of my pictures and testimonial for the use of Alazne Larrinaga's Cancer

Project at the Msc in Exercise Physiology thesis.

Signature: