

CHAPTER II

LITERATURE REVIEW

This research focuses to study the results of the musical therapeutic exercise program in orthopedic patients ward, Krabi hospital. By this study the researcher reviewed literature as follows:

1. The concept of therapeutic exercise
2. The concept of important and the benefit of therapeutic exercise in orthopedic patients
3. The concept of music therapy

1. The Concept of Therapeutic Exercise

Therapeutic exercise mean is the movement of some or all parts of body in order to gain effect of treatment, reducing a symptom of sickness or increasing physical strength. (Wongpat, 2000 : 161)

Types of doing exercises

Doing exercise can be classified as follows. (Boonnark, 1996 : 131-132)

1. It can be classified by the person who exerts his strength as follows :
 - 1.1 Active refers to the patients who by themselves do exercise, and usually in case of those without fixed joint.

- 1.2 Passive refers to the patients who keep still and let the therapist or equipment help to move their joints. This kind of exercise is applied with those with normal range of joint motion.
 - 1.3 Active-assistive refers to the patients who do exercises as much as they can and then getting help from others to help.
 - 1.4 Passive stretching : Let the patients relax their muscles as much as possible, then apply an external force to help stretch out the stiff joint. So this kind of exercise is for increasing the range of motion.
2. It can be classified by patterns of contraction
- 2.1 Isometric or Static refers to the exercise with the same measure of muscular tissue but higher in tensor. It can be seen that there is no movement of joint and of weight resistance because of the same measure of all muscular tissue.
 - 2.2 Isotonic or Dynamic refers to the exercise with changing Measure of muscular tissue and joint motion. In this type of exercise, the weight resistance is static (often misunderstood that the tensor was static), but the speed of joint motion may not be static
 - 2.3 Isokinetic or same motion refers to the exercise with regular velocity of joint motion but weight resistance may not be static through the movement. Is the exercise is applied with the external force that is done by staff or the equipments, we call it “resistive exercise” with the purpose to increase strength and firmness of muscles.

3. It can be classified by length of muscular tissue
 - 3.1 Concentric. The muscular tissue will be shortening while at positive work, such as, when lifting something up from the ground or climbing up the stairs.
 - 3.2 Eccentric. The muscular tissue will be lengthening while at negative work, for instance, when putting something down on the floor or coming down the stairs. Both Concentric and Eccentric exercise can be found both in Isotonic and Isokinetic exercises.
 - 3.3 Plyometric. In this type of exercise, the whole pieces of muscle is quickly prestretched before shortening like the concentric. The quick prestretch of all kind of muscle including viscoelastic muscle, when prestretched suddenly and then shortened abruptly, provide extra force.

Advantages of doing exercise (Pongprapai, 2003)

What do we gain from taking exercise?

1. Increasing blood circulation especial heart.
2. Adjusting the level of fat by increasing HDL and decreasing LDL.
3. Adjusting sugar level in blood, minimizing the risk of diabetes and the high blood pressure.
4. Increasing strength and firmness of tendon, muscle, bone and joint.
5. Controlling weight and decreasing fat in the body.
6. Reducing stress, anxiety, and sadness.
7. Improving waste eliminating system.

8. Minimizing the sickness and death from heart or brain arteriostenosis, hypertension, obesity, diabetes, osteoporosis.
9. Providing a better sleep.

Therapeutic exercise is a part of rehabilitation. (Goodgold 1988)

It can be classified into different items as follows: (cited in Cheewaket, 1996 : 92 – 93)

1. Exercise for mobility is an exercise done in order to improve every part of body mobilization as well as original stage. It is for the patients whose muscle structure was destroyed, that the injury can be classified as follows :
 - 1.1. Passive range of motion exercise (PROM) is the exercise done by physiotherapist or trained patients or patients' relatives in order to make joint mobilize by proving full range of motion to prevent stiffness. External force must be used to the motion because the muscles proving movement are paralyzed, not being able to shorten the elastic tissue such as the patients in the case of injury in spinal marrow or brain nerve.
 - 1.2. Active-assistive range of motion exercise (AAROM) is partially helped by physiotherapist or patients' relatives or patients themselves by applying the other strong arm to help the injured arm move in full range. The patients must tense their muscles in full strength in order to move first before helping. It is the way to stimulate the weak muscles come back to work and gaining the

range of joint motion. It is applied to the patients with weak muscle (at the level 1 – 2) cause by nerves that was damaged or the muscles that are put in the cast for a long time without any exercise and the pain happening while in the exercise.

- 1.3. Active range of motion exercise (AROM) is the patients' exercise supervised by physiotherapist. The muscle providing movement must resist against the world gravity. It is the way to higher the muscle activity in order to gain range of motion back such as in the case of the patients with partially injured nerve vessel, polio patients, the patients who just come out of the plaster cast.

2. Neuromuscular coordination is the exercise to stimulate the paralyzed muscles caused by lost brain control in case of the patients whose brain artery breaks, constricts or injures, causing cerebral hemiplegia ; not be able to move their arms and legs. The physiotherapists or activity therapists have been trained specially to apply the principles of neurophysiology especially the application of reflexes in order to stimulate the paralyzed muscles to tense and to move the joints. Later, having been drilled for a while, the patient can move their arms and legs in consonance with other parts of body.

3. Exercise for strength and endurance : The exercise applied with the parents with well – joined fracture or other patients in general in order to preserve muscle strength and endurance and to be as well as before

- 3.1 Isometric exercise or to tense is the exercise without joint motion in case of the patients with broken tibia and got his leg in cast from toe to thigh, so their knee and ankle cannot move. It is necessary to practice to tense muscles while being in cast such as muscles to move ankle and toe; quadriceps and hamstring by the patients keeping muscles tensing for 5 seconds, counting 1 to 5 slowly in order to create metabolic stress ; muscle' function that needs oxygen. This comes to Kreb' s cycle that the stimulating muscles is effective, if the period of flexing is less than that, may be, 1 – 2 seconds, the muscles will use up power from glycogen ; the muscles' enzyme does not need to work, that means, it fails to recover the muscles' function as earlier stage. Besides, shortening muscles help circulation of vein and blood plasma and help decrease swelling in limp.
- 3.2 Isotonic exercise or to tense and move is the exercise of muscles and to make the joints move. It is an active range of motion exercise ; prevent stiffness of joints and promote blood circulation.
- 3.3 Progressive resistive exercise (PRE) is the exercise by gradually increasing weight resistant or times of taking exercise such as a patient with broken thigh bone that was in internal traction, after the broken bone is joined, the patient is able to stretch his knee and lift the three kilogram weight resistant attached to his ankle and is added the weight resistant bit by bit until equal to the other leg. This is done in order to strengthen the power of muscles, and to

make them more endurable, have the patient do them more ; from lifting 50 times of 10 kilogram resistant to 100 times of 10 kilogram weight resistant.

- 3.4 Isokenetic exercise is the exercise to strengthen muscle by applying a machine well-known as Cybex that provides regulation of every range of joint motion. It is suitable for easy – recovered muscle especially the injured sport person.

For the treatment by therapeutic exercise, we have choose the right type of exercise for the most favorable result, otherwise, it makes the patients become worse. So before rehabilitation, it is necessary to gain all important information in order to make a treatment plan properly as follows: (Pajaree, 1999 : 594- 595)

Patients' information

From the patients and orthopedist, as the following :

- Information about injury; fracture, treatment, traction equipment, operative result and injury of other systems.
- Problems in helping themselves after fractures
- Original patients' health record; Ability level in doing routine work, type of work, skill, duty and responsibility of family member, other external factors including economic and social economic.

Physical Exam

It composes :

- checking vital signs, consciousness, mental health, treatment participation.
- checking respiratory system, heart system, blood circulation and Neuro – system.
- checking specific symptom such as firmness of fracture, range of motion, and strength of muscles.

Assessment the Ability Level

In assessing the ability of patients who participate in the therapeutic exercise program, the strength of muscles must be done by dividing into 6 levels as follows :

- Level 0 (Zero) refers to the muscles that cannot be contracted such as Paralyzed.
- Level 1 (Trace) refers to the muscles with a little contracting ability.
- Level 2 (Poor) refers to the muscles with some contracting ability when against the gravity.
- Level 3 (Fair) refers to the muscles with contraction able to against the gravity.
- Level 4 (Good) refers to the muscles with contraction able to against the gravity and external weight resistant.
- Level 5 (Normal) refers to the muscles with contraction and normal function.

The physiotherapist can be classified roughly as follows :

- Level 0 – 1 Providing the physiotherapy at passive movement.
- Level 1 – 2 Providing the physiotherapy at assistive active movement.
- Level 2 – 3 Providing the physiotherapy at free active movement.
- Level 3 – 4 Providing the physiotherapy at resistive active movement.

Cautions of therapeutic exercise

1. Exercise postures should not be too difficult and overdone.
2. Temporarily stop when pain continuously.
3. Do not take exercise on the infected or inflamed spot or only static exercise.
4. Do not do overload exercise with the patients with hypertension, heart disease and provide intensive care.
5. Do not do passive movement or resistive movement at the fractures that are not well – joined especially do not do rotation and force passive movement.

When to stop exercise

- Over tired and sweats
- Fast and uneasily breathing
- Dizzy, faint, nauseous
- Pulsation over 140 times / a minute (the aged) and 170 times / a minute (the normal)

2. The Concept of the Important and the Benefit of Therapeutic Exercise in Orthopedic Patients

The Providing physiotherapy is the most important for the patients with fractures. A part from the muscles by the fracture spot, the other parts must be also done especially the organs concerning with walking, in order to ;

1. Prevent disused atrophy
2. Prevent tendon and muscle contraction
3. Strengthen muscles applied to walk on crutches

The objectives of therapeutic exercise is to take care of the patients both before and after leg amputation, since taking exercise will be useful as follow : (Kemruk and et al., 2002)

1. To maintain motion of joints or to increase motions of joints when the motion can be done less than average.
2. To solve the problem of ligament stiffness affecting the motion of joints.
3. To increase blood circulation through stump.
4. To increase muscles' balance function that control motion of joints
5. To maintain and to increase power, endurance and function-coordinated of muscles.
6. To prevent muscles' disused atrophy.
7. To improve the changed posture after leg amputation.
8. To maintain and to increase active movement.
9. To promote body strength in general.

Training the patients taking exercises before operation is useful to get familiar with using crutches and to adjust them selves. This can be done through giving explanation to the patients to realize the importance of taking exercises before operation. It is found that the patients who take exercises before operation get a quick recovery and walk on crutch better than those who don't, (Wanee and et al., 1990) because joint movement stimulate blood circulation. The strength of muscles on upper body part is also important when walking on crutches. Then taking exercise right after recovery from anesthesia is very helpful to prevent contraction and to strengthen muscles by doing exercises both normal parts and leg stump. (Pantusena and Koopantawee, 2001 : 185)

Nursing to maintain joints' function

Qualifications of normal joint. Normal joint with ligament having these qualifications as follows :

1. Have motion of joints, may be, universal range of motion such as shoulder, hip joints or hinge joints such as elbow, knee.
2. Stabilization with the following factors :
 - Bone structure that can be set together.
 - Capsule and ligament structure that provide stabilized posture called static stabilizer.
 - strength of muscles and ligament affecting the strength of joint and contraction of muscles called dynamic stabilizer (Laopattarakasem, 1996 : 763)
3. Taking and transferring load from adjacent part.

Rheumatism always makes stiffness, so when severe pain relieves, the patients should be stimulated to take some exercises by passive or active range of motion of joints exercise in order to strengthen the muscles around the joints. (Pantusena, 2001 : 129)

Exercise with the case of osteoarthritis

To maintain a usual motion of joints, to prevent contract of tendon and ligament, the patients must take exercise muscle around the arthritis when the inflamed relieve and with added weight resistance at the leg

Fractures

Factors affecting restoration of damaged muscle tissue depends on :

- Severity and length of injury
- Type of tissue; different tissue gains different restoration result
- Younger people are easier to restore the injury than the aged
- The healing of the tissue restoring itself is likely to be chosen

Apart from the age and type of bone that result in joining of the broken bone, there are also other factors such as amount of blood flow to feed the broken bone, the patients taking exercise through universal motion, and muscle exercise by Isometric and Isotonic, these factors help promote blood circulation and faster bone joining. (Koopantawee, 2001 : 142)

Dislocation

After the period of limiting movement, generally about 3 weeks, the patients should be recommended to take some exercise right away starting bit by bit, and then gradually increasing until universal motion. It is to prevent stiffness.

The patients with plaster cast

The nurses have to encourage the patients to take exercise by themselves as much as possible, through taking muscle tension both those inside the plaster cast and those outside.

The patients with traction

Encourage the patients to do the same as the patients with plaster cast including effectively taking deep breathing and coughing.

External fixation

For the case in traction of phalanges, his feet have to be support upright in perpendicular to the body and to pull their ankle as needed. After the swelling is diminished, the patients must start taking exercise the adjacent joints and the muscles to prevent atrophy and stiffness.

Bone – adjusted operation

Training to take some exercise before having operation in order to do exercises after operation is vital because the patients can apply the trained exercising techniques taught by the nurse to do after operation in order to promote blood circulation, to

maintain and to improve ability in motion of joints, to keep the muscles strong and to get a quick recovery.

1. Train the patients take a deep inhale through the nose and exhale through the mouth before operation so that they can do it after in order to promote lung function, and to prevent complicating and respiratory diseases.
2. Train the patients to take joint and muscle exercise toward universal motion by themselves, providing them to take muscle tension and to lift their limb.

After operation

Encourage the patients to take exercise to move every joints, to take muscle tension only with the operation limb 1 day after operation. For the pain 24 hours after operation, the patients should be encouraged to move as soon as possible with the first 24 hours in order to help blood flow and encourage them to take effective breathing and coughing when becoming stronger after the first day of the operation.

3. The Concept of Music Therapy

Definition of music therapy

Music therapy is the systematic application of music in the treatment of the physiological and psychosocial aspects of an illness or disability. It focuses on the acquisition of nonmusical skills and behaviors as determined by a board certified music therapist through systematic assessment and treatment planning.

Music Therapy in Hospital

Hospitalization can result not only in physical stress from invasive treatments and therapies, but emotional stress as well from unexpected news, unfamiliar environments, inability to conduct normal activities and lack of control. Music therapy in the medical setting provides patients a familiar and positive way to cope with their hospitalization. Through successful music experience, patients can regain a sense of control, independence, and confidence. Music can be a medium of communication and a strategy for refocusing attention during painful procedures or long treatments such as hemodialysis, and a source of emotional support. Music is clinically recognized to influence biological responses such as heart rate, blood pressure, respiration rate, cardiac output, muscle tone, papillary responses, skin responses, the immune system, and endorphin production. Music can entrain the body to calm or to accelerate depending on what type of music is used. Sedative music can lower anxiety, pain, tension and stress levels resulting in less use of anesthetics and pain medication, a shorter recovery period, higher patient compliance and higher patient and family satisfaction. Stimulative music can be a source of motivation both physically and psychologically and becomes a positive reinforcement during physical therapy and rehabilitation. In summary, Music therapy can contribute significantly to medical care providing psychological and physical comfort to patients with various needs.

From the study of the result of Music Therapy from the past to the present, it can be concluded that music provide positive result for both physical and psychological as follow : (Pomniran, 1985).

1. Decrease stress; Music Therapy automatically helps reduce nerve system function and return the body to normal conditional sooner
2. Decrease severe anxiety; Music Therapy helps create emotional imagination and then reduce anxiety
3. Help patients to concentrate, to detract from threatening stimulants
4. Decrease muscle tensor
5. Feel easy
6. Decrease tiredness and get a better sleep

Smolen, D. Topp, R. and Singer, L. (2002) studied The Effect of Self-Selected Music During Colonoscopy on Anxiety, Heart Rate, and Blood Pressure found that music therapy has the potential to reduce physiological indicators of anxiety and the need for sedation among individuals undergoing a colonoscopy.

Good, M. et al. (2002) studied Relaxation and Music Reduce Pain After Gynecologic Surgery found that patients who received the interventions plus patient-controlled analgesia (PCA) had less pain than controls who used PCA alone.

Land based therapeutic exercise was shown to reduce pain and improve physical function for people with OA of the knee (Fransen, S. McConnel, S and Bell, M. 2002)

Ratasuwan (1982). Studied effects of planned exercise in abdominal distention and gas pain in patients with abdominal surgery to found that the patients in the

experimental group suffer from gas pain less than the control group at a statistically significant level of 0.05

Singhsame and Keawkeur. (2003) studied The Effects of exercise on Physical Fitness and Perception of Health Status of Nursing students in Boromarajonani Nursing College, Trang to found that the physical fitness on the whole in experimental group after participated were difference at a statistically significant level ($P < .05$) But in control group there were not differences. In experimental group if considered in each item found that there were differences of weight, resting pulse, systolic blood pressure, lung capacity and trunk forward flexion at a statistically significant level ($P < .05$)

Pomboonmee (1985) studied the result of exercise program effecting to physical ability of the aged and found that

1. Physical ability of the aged divided into components, that is, index of body mass and percentage of fat under skin at 4 spots, activeness, spinal flexibility and lung capacity increase after participating the exercise program at a statistically significant level of 0.0005, but resting pulse without any differences.
2. Scores of the aged physical ability after taking exercise program are higher than before the program at a statistically significant level of 0.0005.

From the abovementioned review literature, it is obvious that taking exercises of orthopedic patients is important and helpful to rehabilitate the patients' body to normal

condition and physical function as earlier stage. Moreover, the therapeutic exercise can shorten the patients' stay in the hospital and save the cost expenses of both the hospital and the patients. As a result, the researcher is interested in studying **“The musical therapeutic exercise program in orthopedic patients”** in order to increase effectiveness in healing patients. And the application of music and song is done in order to encourage the patients to be active and to feel happy taking exercise. The research has so far realized that music and song has the potential directly to pulsation, blood pressure and muscle induction. And also, favorite song, whatsoever, when heard, help to relieve nervous and brain disorder. (Robtisnaitangdan XBN, 1993)