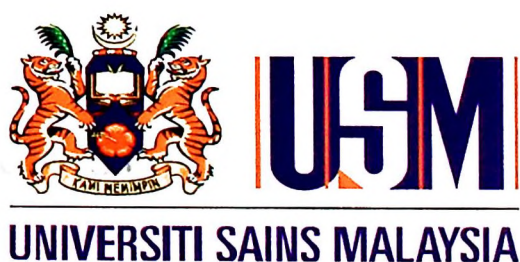


**THE EFFICACY OF RELAXATION THERAPY AS
ADJUNCTIVE THERAPY ON PHYSICAL FUNCTION,
SYMPTOMS AND MEDICATION INTAKE IN PATIENTS WITH
KNEE OSTEOARTHRITIS**

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ABBREVIATIONS

GIR	- Guided imagery relaxation
OA	- Osteoarthritis
KOOS	- Knee injury and Osteoarthritis Outcome Score
ANCOVA	- Analysis of covariance
ANOVA	- Analysis of variance
COPCORD	- Community Oriented Program for the Control of Rheumatic Disease
CPPD	- Calcium pyrophosphate dehydrate disease
NHANES	- National Health and Nutrition Survey
ACR	- American College of Rheumatology
MRI	- Magnetic Radiologic Imaging
WHO	- World Health Organization
NSAIDs	- Non-steroidal Anti-inflammatory Drugs
EULAR	- European League Association of Rheumatologist
RCT	- Randomized Control Trial
COX 2	- Cyclooxygenase 2
SYSADOA	- Symptomatic Slow Acting Drugs for Osteoarthritis
TKR	- Total Knee Replacement
ROM	- Range of movement
CES-D	- Center for Epidemiologic Studies Depression scale
WOMAC	- Western Ontario and Mc Master University Osteoarthritis index
PMR	- Progressive muscle relaxation
APRT	- Abbreviated Progressive Relaxation Technique
GI	- Guided imagery
SF-36	- Short Form Health Survey – 36

DASS 21	- Depression, Anxiety and Stress 21 scale
QOL	Quality of life
NKLR	- National Knee Ligament Surgery
ADL	- Activity of daily living
IPSO	- Ibuprofen, Paracetamol study in osteoarthritis
CRF	- Case report form
SD	- Standard deviation
BMI	- Body Mass Index

ABSTRAK

KESAN TERAPI RELAKSASI SEBAGAI TERAPI TAMBAHAN KE ATAS SIMPTOM DAN FUNGSI FIZIKAL DI KALANGAN PESAKIT OSTEOATRITIS SENDI LUTUT

Pengenalan

Osteoarthritis adalah penyakit yang paling kerap berlaku di kalangan warga tua. Di samping penggunaan ubat-ubatan untuk merawat penyakit ini, terapi psikoterapi seperti Terapi Relaksasi berpandukan Imej telah menunjukkan kekurangan dari segi stress dan kesakitan di dalam kebanyakan penyakit kronik.

Objektif

Tujuan kajian ini adalah untuk menentukan keberkesanan terapi relaksasi sebagai terapi tambahan ke atas simptom, fungsi fizikal dan skor pengambilan ubat analgesia pesakit osteoarthritis pada sendi lutut.

Metodologi

Ini merupakan kajian rawak untuk perbandingan diantara kumpulan terapi relaksasi dan kumpulan kawalan di kalangan pesakit osteoarthritis sendi lutut untuk menentukan keberkesanannya dari segi mengurangkan kesakitan, simptom dan fungsi fizikal. Enam puluh pesakit telah didaftarkan di dalam kajian ini. Soal selidik sendi lutut KOOS (Knee Injury and Osteoarthritis Outcome) telah digunakan untuk mengukur tahap kesakitan, simptom, sukan dan rekreasi, dan kualiti kehidupan yang berkaitan dengan kesihatan dikalangan pesakit-pesakit ini. Di dalam rawatan ini, pesakit perlu mendengar MP3 yang telah direkod dengan terapi relaksasi selama dua belas minit sekurang-kurangnya sekali sehari selama 8 minggu. Skor pengambilan ubat analgesia juga dikira sepanjang kajian untuk melihat perbezaan diantara kumpulan terapi

dan kumpulan kawalan. Analisis ANCOVA digunakan untuk menentukan perbezaan diantara dua kumpulan in di akhir tempoh kajian.

Keputusan

Enam puluh pesakit telah didaftarkan di dalam kajian ini. Walau bagaimanapun, hanya 59 orang pesakit berjaya menamatkan kajian ini (98.3%). Min (SD) umur untuk pesakit- pesakit ini adalah 52.2(7.08). Terdapat perbezaan yang signifikan dari segi kesakitan ($p<0.004$), aktiviti kehidupan seharian ($p<0.02$), sukan dan rekreasi ($p<0.005$) dan kualiti kehidupan ($p<0.01$) di kalangan pesakit yang mengambil terapi relaksasi berbanding kumpulan kawalan. Skor analgesia kumpulan terapi juga adalah lebih rendah berbanding kumpulan kawalan tetapi ia tidak mencapai perbezaan yang signifikan.

Kesimpulan

Terapi relaksasi berpandukan imej telah menunjukkan kesan yang positif dikalangan pesakit osteoarthritis sendi lutut. Kajian ini menunjukkan kesan yang signifikan dalam mengurangkan kesakitan, meningkatkan aktiviti harian dan juga kualiti kehidupan.

ABSTRACT

THE EFFICACY OF RELAXATION THERAPY AS ADJUNCTIVE THERAPY ON SYMPTOMS, PHYSICAL FUNCTION AND MEDICATION INTAKE IN PATIENTS WITH KNEE OSTEOARTHRITIS

Background

Osteoarthritis is the commonest arthritis especially in the elderly. Despite the usage of pharmacotherapy in managing this disease, psychological therapy such as Guided Imagery Relaxation (GIR) has been shown to reduce stress and pain in various types of chronic diseases.

Objective

The objective of our study is to determine the efficacy of relaxation therapy as adjunctive therapy on symptoms, physical functions and analgesic consumption in patients with primary knee osteoarthritis.

Methods :

A randomized controlled trial with two arm parallel comparative study for relaxation therapy versus control among patient with knee osteoarthritis was carried out to see the its efficacy in improving pain, symptoms and physical function. Sixty knee osteoarthritic patients were recruited for this study. Knee injury and Osteoarthritis Outcome Score (KOOS) was used to measure pain, symptoms, sports and recreational, activity of daily living and health related quality of live scores among these patients. Analgesic consumption was calculated throughout the intervention period to see the difference between intervention and control groups. The treatment consists of listening to 12 minutes MP3 with prerecorded Guided Imagery with Relaxation Therapy at least once per day for the duration of 8 weeks. ANCOVA test was used

to compare the score differences between intervention and control groups after the intervention.

Results

A total of sixty patients enrolled into the study however only 59 patients completed the study (98.3%). The mean age of the patients is 52.2(7.08). There were significant improvements of pain ($p<0.004$), activity of daily living ($p<0.02$), sport score ($p<0.005$), and quality of life score ($p<0.01$) in intervention group compared to control group. The analgesic score was lower in the intervention group, however it was not statistically significant.

Conclusion

Guided imagery with Relaxation therapy has shown positive effects in managing patients with knee osteoarthritis. This intervention has significantly reduced pain, improved activity of daily living and also health related quality of life. This result justifies further investigations of Guided imagery with Relaxation therapy as self-management in patients with knee osteoarthritis.

CHAPTER 1 : LITERATURE REVIEW

1.1 EPIDEMIOLOGY OF OSTEOARTHRITIS

Osteoarthritis is the commonest type of arthritis found worldwide and being managed by various discipline ranging from general practitioner or primary care physician to orthopedic surgeon(1). Osteoarthritis also one of the commonest cause of disability among older patient especially those with knee and hip osteoarthritis(2).

A study done in Asian population showed that estimated prevalence of symptomatic knee arthritis in elderly age more than 65 years old is about 30%(2). This study found that prevalence of osteoarthritis in women was twice compared to men. In Malaysia, Community Oriented Program for the control of Rheumatic Diseases (COPCORD) study showed 9.3% of adult population complained of pain in the knee in those over 55 years old and 39% in those over 65 years(2). The exact prevalence of osteoarthritis in our population is difficult to determine as there was lack of standardized criteria in diagnosing osteoarthritis. A study done in western countries showed that radiographic evidence of osteoarthritis is present in majority by the age of 65 years and about 80% present in those age more than 75 years old(3). However, not all of them have symptoms. There were only 11% of persons more than 64 years old have the symptoms of knee osteoarthritis(3).

Framingham study was done in 1990 to see the epidemiology of osteoarthritis. From this study, it showed that the disease increased gradually with age in the entire population regardless of how osteoarthritis was defined at that time(4). In addition, the prevalence of osteoarthritis showed significantly increase with age in women but not in men, however, the trend was non-significant. Apart from that, radiographic changes and symptomatic osteoarthritis also more prevalent in women compared to men (4)

1.2 RISK FACTOR FOR OSTEOARTHRITIS

The Framingham study in 1990 was carried out to examine the relationship between obesity and osteoarthritis(4). The study showed that obesity is important risk factor for the developing of knee osteoarthritis(4).

Nowadays, obesity become major risk factor in our country contributing to many diseases such as cardiovascular diseases as well as metabolic diseases(4). In older population, obesity can lead to the development of knee osteoarthritis in weight bearing joints such as knee and also hip joint. This can directly due to increased load to both joints or also indirectly it can associated with metabolic disturbances that can give rise to systemic risk factor for osteoarthritis(4). A cohort study done by Felson *et al* have shown that weight loss can reduce the incidence of knee osteoarthritis especially in women(5).

The second risk factor is history of previous knee injury, which was established in the same study by Framingham(4). The study showed that the incidence of knee osteoarthritis increased in those who had previous knee injury compared in patients who never had knee injuries. In addition, the rate of symptomatic knee osteoarthritis was increased dramatically in those who had history of knee injury(4).

Other important risk factors include increasing in age, body mass index, (BMI) and female sex(4). Another study supported this and showed women are more at risk than in men in developing knee radiographic osteoarthritis(5). A study done in United States to see the prevalence of radiographic knee osteoarthritis in older patients age more than 60 years old has shown that 42.1% of women have knee osteoarthritic changes compared to men which was 31.2%(3). A similar study by Yoshimura *et al* found that the prevalence of radiographic knee osteoarthritis was higher among women which is 57.1% compared to men, 35.2% in Japanese population aged 60 to 69 years old(6).

Calcium pyrophosphate dehydrate crystals disease, where there is calcium deposition within the soft tissues is also found to be associated with knee osteoarthritis(4). This calcium deposition has been found in high concentration in hyaline cartilage, meniscus, synovial tissues, capsule, ligamentum flavum and also soft tissue of the hands(7). Chondrocalcinosis, is the term to describe the visibility of calcification within tissues on an imaging study. In United States, the frequency of calcium pyrophosphate dehydrate disease (CPPD) was varying between 4% to more than 25% in population within 80 years of age(7). Even though CPPD was frequently being thought to have association with pseudogout disease, however, in this study they also found that it also have some contribution for the development of osteoarthritis(7).

A cohort study by Richette *et al* from 1998 to 2008 on the epidemiology of osteoarthritis, found that prevalence of chondrocalinosis range from 7 – 10% in persons within 60 years of age(7). They noted that there was a positive association between chondrocalcinosis and osteoarthritis(7).

The other risk factor that has been studied for the development of osteoarthritis was repetitive or overuse of the joint in some population(8). The data obtained from First National Health and Nutrition Survey (NHANES) showed that there was an association between knee bending and occupational physical labor with the concurrent of knee osteoarthritis. The study found that jobs that required physical labor and knee bending have a higher rate of knee osteoarthritis for both men and women who presumably had worked with the same job for many years(8). The data showed that persons who required knee bending had over 12 times odds of knee osteoarthritis(8). But, for the physical labor that strongly associated with concurrent osteoarthritis in both sexes, is only in persons at the age between 55 to 64 years old only. For younger workers, they found no association between osteoarthritis with either job related physical stress or knee bending(8).

1.3 PATHOPHYSIOLOGY OF OSTEOARTHRITIS

American College of Rheumatology has defined osteoarthritis as a heterogeneous group of conditions that can give rise to symptomatic joint symptoms and signs that associated with defective integrity of articular cartilage(9). At the same time it also has related changes in the underlying bone and also joints margins(9). Even though articular cartilage was found poorly innervated however, symptomatic osteoarthritis which is commonly presents with painful joints usually origin from such defect(9).

For the aetiology of osteoarthritis, daily stresses that applied to the joints especially those weight bearing joints, for instance ankle, knee and hip plays an important role for the development of this arthritis(10). Many studies found that alterations in degenerative changes in osteoarthritis primarily begin in the articular cartilage, specifically as a result from excessive loading of healthy joint or it also can be due to relatively normal loading but has previously disturbed joint(10). Changes that first occurs in this joint pathology is probably biomechanical stress that feeds back onto the subchondral bone and the cartilage surface and lead to changes happen in the tissues(10). When these joints injured, there is an attempt to repair the joint where anti- inflammatory response with cellular infiltrate and fibroblastic response with the formation of fibrocartilage(10).

Cartilage defects worsen as the disease progress over the years(11). A study done to see the natural history of cartilage defect among osteoarthritic patient over 2 years using Magnetic Radiologic Imaging (MRI) showed that the progression of cartilage defect was associated with increasing age and also baseline tibial bone area(11). Even though female gender was found to be strongly associated with progression of cartilage defect, but after adjusting knee alignment, it seems was no longer significant(11). In this study also showed that the cartilage defects in osteoarthritic patients will progress over years in both symptomatic and as well in asymptomatic patients(11).

However, in other study done by Ding *et al* in 2006, showed that 33% of cartilage defect progressively worsening and about 37% of patients improved in their cartilage defect(12). In addition, this study also consistent with other study that suggest cartilage repair occurs among osteoarthritis patients as evidence by regression of cartilage defects especially in patient who had more severe lesion(11). Even though these two studies suggested possibility of cartilage repair, it also possible that the observation of improvement of cartilage defect might be part due to measurement error, as this observation must be done in at least two consecutive MRI images(12).

When the damage to the joint continues, there will be further damage to the biomechanical disturbance which is muscle wasting that due to combination of joint disuse and as well as effusion related neurogenic feedback mechanism(12). As the consequences, other definitive changes occur which are subchondral bony sclerosis, osteophytic proliferation and cartilage loss(12). These all changes can be seen in the classic X-ray appearance. The synovial fluid that aspirate from osteoarthritic joints often have macrophages that infiltrate with some lymphocytes. It is uncommon for this fluid to have predominant polymorphonuclear response in the absence of concomitant disease such as crystal shedding, inflammatory joint disease or sepsis(12).

1.4 DIAGNOSIS OF OSTEOARTHRITIS

Patients usually come to see physicians when they feel pain at the affected joint. Typically, pain usually worsened by usage of affected joint and will relieve with rest. However, in severe form of osteoarthritis, pain also felt during rest and nocturnal pain(13). Commonly, patient with osteoarthritis will experience morning stiffness lasting less than 30 minutes which is difference from patient with active rheumatoid arthritis which has morning stiffness that last more than 45 minutes(13). In osteoarthritis of the hip, patients may experience gait problems

and instability, pain at the area of buttock, groin and thigh, knee osteoarthritis usually feel instability when descending from stairs and stepping of curbs(13).

In physical examination, patients with osteoarthritis commonly will have bony enlargement at the affected joints, limitation in range of movement, crepitus and pain while moving the joint and sometimes physicians might feel malalignment and joint deformity as well(13). Crepitus, which is common in patient with knee osteoarthritis, usually felt during passive range of movement and is due to two irregular surfaces of opposing cartilage touching each other(13). Before confirm the diagnosis of knee osteoarthritis, other knee disorders such as periarticular disorders, such as infrapatellar or prepatellar bursitis must be ruled out(13).

Knee osteoarthritis can be classified as primary or secondary in origin. For primary osteoarthritis, usually the cause is unknown origin or idiopathic(13). It also includes generalized osteoarthritis, where knee osteoarthritis is associated with Heberden's nodes and polyarticular arthritis, mostly occurred in hand, with female preponderance and also high prevalence in first degree relatives(13). For the secondary cause of osteoarthritis, it usually caused by other medical disorder such as metabolic (acromegaly, haemochromatosis), anatomic (slipped femoral epiphysis, congenital dislocation of the hip, hypermobility syndromes, avascular necrosis), traumatic (major joint trauma, joint surgery) and also inflammatory cause (rheumatoid arthritis, psoriatic arthritis and septic arthritis)(1).

From Malaysian Clinical Practice Guideline of Osteoarthritis 2002, adapted from American College of Rheumatology, the diagnosis of knee osteoarthritis, the person must have pain in the knee for most days of the prior month, and plus 1 of the following ; the age must be more than 50 years old, morning stiffness must be less than 30 minutes and also presence of crepitus on active movement and presence of osteophytes on the radiograph(9).

Before the development of this criteria, the diagnosis of osteoarthritis usually based on radiographic criteria. World Health Organization (WHO) has accepted Kellgren-Lawrence grading scale for diagnosis of knee osteoarthritis(14). In this criteria, Grade 1 was define as doubtful narrowing of joint space and possible osteophytic lipping. For Grade 2, plain radiograph showed definite osteophytes, definite narrowing of joint space(14). Grade 3 was define as moderate multiple osteophytes, definite narrowing of joints space, some sclerosis and possible deformity of bone contour where else and Grade 4 was define as presence large osteophytes, marked narrowing of joints space, severe sclerosis and define deformity of bone contour(14).

The subcommittee on Osteoarthritis was formed in 1981 by Diagnostic and Therapeutic Criteria Committee to develop the criteria for the classification of osteoarthritis(15). The initial objectives for the development of this committee were to clarify and standardize the diagnosis and clinical classification of osteoarthritis with regard to promote the consistency when interpretation of the research concerning osteoarthritis(15). For the above reason, the committee agreed to define osteoarthritis as a heterogeneous group of conditions that give rise to joint symptoms and signs which associated with defective integrity of articular cartilage in addition to changes in the underlying bone at the joint margins. Even though the articular cartilage was poorly innervated but the clinical symptoms which often include pain was thought to arise from such defect(9, 15)

1.5MANAGEMENT OF OSTEOARTHRITIS

Osteoarthritis of the knee can be very distressing and also can be disabling to most elderly patients with regard to lower extremities functioning because it involves a large weight bearing joints. When the disease become symptomatic as it cause pain and impaired daily functioning, this patients usually will restrict their activities as well(16). The main objectives in treating

patients with knee osteoarthritis are: 1) to educate the patient regarding osteoarthritis and also its management, 2) to alleviate current pain, 3) to improve daily function and also decrease the disability, and 4) to prevent or retard the progression of the disease and its consequences(16).

The treatment for knee osteoarthritis must be individualized, taking into account some factors such as age, co morbidity and the presence of acute inflammation(16). The physicians must use holistic approach in decision making in the daily clinical practice. Factors that must take into accounts in treating patient with knee osteoarthritis are 1) knee risk factors that include obesity, adverse mechanical factors, physical activity, 2) general risk factors such as age, comorbidity and polypharmacy, 3) level of pain intensity and their disability, 4) sign of inflammation for example, knee effusion and 5) location and also degree of structural damage(16).

Even though osteoarthritis always described as progressive disease and there was no cure for the disease,individualized treatment programs should be available to help the patients to relief pain and stiffness and also to improve or maintain their functional status(17). There are several studies that have been done in managing osteoarthritis either non pharmacological or pharmacological treatment modalities and also surgical management.

For non-pharmacological management of knee osteoarthritis, various modalities have been proposed to minimize pain and also to maintain physical function in these patients. For instance, exercise, footwear including soles have been studied to see the effectiveness in managing knee osteoarthritis(18). Other than that, usage of walking stick that can reduce burden to the weight bearing joints also can improve pain in this particular patients(18). For any chronic diseases, education and provision should form an integral part in managing the disease. It is medical personnel obligation to educate the patients about the details of the disease, its investigations and also the management(18). There were several large RCTs demonstrated the benefits and efficacy of different education technique to reduce pain and also

increasing coping skills in patients with knee osteoarthritis. However, it only have minimal impact on daily function in these patients(18).

For the pharmacological management of osteoarthritis, the medication can be categorized into five main groups ; 1) Acetaminophen, 2) Non-steroidal anti inflammatory drugs (NSAIDs), 3) Intraarticular corticosteroid, 4) Topical analgesic (eg , capsaicin, voltaren) and 5) intraarticular hyaluronic acid(16).

For the first group of medication that have been studied, which is simple analgesic in treating osteoarthritis, the most common and widely used is Acetaminophen. A study done by European League Association of Rheumatologist (EULAR) recommended that the first choice of analgesic for knee osteoarthritis is Paracetamol(16). If the patients claimed that they responded well to Paracetamol, this drug can be continues in a long period(16).

Another study done by Hochberg in 1995 was shown that Acetaminophen is effective simple analgesic to reduce pain in osteoarthritic patient when compared to placebo with the dosage of 4 g per day(17). Apart from that there was an evidence that in many patients, Acetaminophen was comparable to ibuprofen in controlling pain for knee osteoarthritis(19) and can be taken over the long term. In the published guidelines, paracetamol is also recommended as the initial treatment for knee osteoarthritis as there are no drugs interactions or contraindications of the usage of paracetamol in the elderly(17).

Second choice of analgesic that has been suggested by EULAR is Non-steroidal anti-inflammatory drugs. NSAIDs are the preferred choice of analgesic for knee osteoarthritis if the patient not respond to Paracetamol. It also recommended in patients with synovitis as well(18).

A few trials have been done between the efficacy of paracetamol and NSAIDs. In these studies, they showed that generally, but not exclusively NSAIDs have better efficacy than paracetamol but increased gastrointestinal side effects(20). However one RCT done in 2005, comparing

paracetamol and naproxen in 178 patients over 2 years suggested that naproxen has better reduction in pain than paracetamol, as patient in naproxen group less likely to discontinue treatment due to lack of response(20).

In patients who are not tolerating oral NSAIDs or unwilling to take it, topical NSAIDs are useful for substitute of oral NSAIDs. A meta-analysis review regarding the efficacy of topical non steroidal anti-inflammatory drugs done in 2004 using showed positive result compared to placebo(21). However, this result was found only at 2 weeks and trials lasting for four weeks showed no benefit(21).

There was a speculation that cyclooxygenase 2 (COX 2) selective agents such as celecoxib are more beneficial than conventional NSAIDs. Several large trials were done comparing COX 2 inhibitor, conventional NSAIDs and also placebo(22). From this study, they have concluded that conventional NSAIDs are more superior than placebo and have a similar efficacy with COX 2 inhibitors but in patients taking COX 2 inhibitors, there was a reduction up to 50% in perforation, ulcers and bleeding(22).

Other than oral and topical analgesic, the other modalities that available and have been studied for the treatment of knee osteoarthritis, intra articular injection of long acting steroid also available to treat acute exacerbation of knee pain especially if the pain associated with effusion(18). However, the effects of this intra articular injection was relatively short lived compared to oral medications. One RCT that was done in 1995 concluded that intra articular steroid was more effective compared to placebo for pain relief that lasted for 7 days in patients with knee osteoarthritis but not all whom had effusions(23).

Apart from oral or topical analgesic and intra articular injection, there was also an evidence that symptomatic slow –acting drugs for osteoarthritis (SYSADOA) which include glucosamine sulphate, chondroitin sulphate, diacerein and also hyaluronic acid are beneficial in

treating knee osteoarthritis but more studies using standardized methodology are required(18). A meta-analysis was done to see the efficacy of glucosamine sulphate and also chondroitin in managing knee osteoarthritis was shown that these two drugs have moderate to large effects on improving pain and disability among these patients. These drugs also are safe and associated with only few side effects.(24).

Another RCT was done to compare the effect of glucosamine sulphate and ibuprofen which this trial was conducted over four weeks period(25). From this trial, it showed that ibuprofen was more effective at improving pain scores within the first two weeks of starting treatment but after two weeks, patients treating with glucosamine showed no difference in decreasing pain scores with NSAIDs group(25).

In patients who failed medical therapy for knee osteoarthritis, surgical intervention has to be considered. Total knee replacement (TKR) was well established its effectiveness as intervention in those who are severely incapacitated from knee osteoarthritis. A systemic review have concluded that TKR was effective and safe in reducing pain, improving quality of life and as well as improved function(26). The indications for TKR as agreed among orthopedic surgeons as carried out by a survey were the patient who had severe daily pain despite taking medication and also plain radiograph evidence of intraarticular disease(26).

There are various studies done for non-pharmacological treatment for knee osteoarthritis. A pilot study done to see the efficacy of physiotherapy program suggested that, majority of the patients with knee OA of 1 to 25 years duration subjectively improved their function or at least functionally unchanged after participating for six months duration in short term out-patient physiotherapy(27). Three outcome variables were assessed in this studies ; functional improvement in stair climbing, level walking and also standing up reported by patients to see their knee strength, range of motion and pain(27).

The modality that was applied by physiotherapist includes movement aimed at extending range of motion and strengthening muscles which was well tolerated by the patients(27). The choice of exercises and treatment by treating physiotherapist in this study seems clinically valid that related to the degree of muscle weakness and knee range of motion deficits, reported by the interviewed patients and was expected to improve functions(27).

The beneficial result from physiotherapy clearly contrasts with pharmacological approaches which may not always prove the efficacy and also may increase mortality rates, suppress proteoglycan synthesis and cause rapid joint degeneration(27). This study also suggested that individualized exercises prescribed for knee OA patients generally provided reasonable improvements in stair climbing, level walking and standing for up to six months(27).

Rehabilitation program also widely used in non-pharmacological management in osteoarthritis. Specific goals for rehabilitation program is for pain controlled, for both acute and chronic pain, maintaining strength and range of motion, thus can preserve function and prevent pain and disability, providing supportive measures such as adaptive or mobility equipment, increasing aerobic capacity and decreasing fatigue, and lastly, education and appropriate behavioral adaptive strategies(28).

Previous study suggested that patient with knee OA should rest and reduce physical activity to minimize pain, however, this approach was no longer applied as there is no beneficial outcome for the patient(28). Range of motion (ROM) strengthening and aerobic exercise has shown to be effective which include increasing or maintain joint motion, increase strength and endurance of periarticular muscle, increase aerobic capacity, assisting weight loss and also improve functional capacity in activity of daily living(28). This study, which is a 2-year exercise

program was done to maintain and improve muscle around the knee ROM and locomotor function(28). Patients in exercise group was consistently better at reducing pain at 6, 12 and 18 months. At 24 months, 48% of the participants in exercise group who completed the program, differed significantly from the non exercise group(28).

Even though available evidence for short-term effects of exercise treatment for knee OA is beneficial, however the number of study is limited and more research is needed in the future. At present, we as medical practitioner should recommend exercise to all patients with mild to moderate disease(28). Having said that, the clinician have to select an appropriate exercise routine that meets the strength, balance, flexibility and aerobic need for patients(28).

1.6IMPACT OF KNEE OSTEOARTHRITIS TO THE PATIENTS

In a study done by N Belo *et al* to see the factors that associated with persistent knee symptom, they found that age more than 60 years old usually had persistent knee pain compared to younger age(29). Other than that, low or moderate education level, comorbidity of the skeletal system, presence of pain in bilateral knee, history of traumatic or non- traumatic knee symptoms, duration of pain that last more than 3 months, and also having crepitus on the passive extension of the knee have the tendency experiencing persistent knee pain compared to those without above factors(29). Belo *et al* also found that subjects suffering knee pain feared from movement was independently predicted persistent in their symptoms following baseline measures(29).

In a study done by Riddle and colleagues in 2011, to see the relationship between depression symptoms among osteoarthritis patients using Center for Epidemiologic Studies Depression Scale (CES-D) and pain score as well as physical function using Western Ontario and Mc Master Universities Osteoarthritis Index (WOMAC) scale found that depression was highly

significant ($P < 0.001$) for predicting changes in WOMAC Pain and Function score in 1 to 2 years. From this study, they found that WOMAC pain score of depressed person (using CES – D) scores increased by 0.59 points each year and WOMAC Disability score increased by 2 points each year compared to non –depressed persons(30). However, this study illustrate that patients must have depressive symptoms for multiple years to produce a significant impact on future pain and disability(30).

1.7RELAXATION THERAPY

The first progressive muscle relaxation therapy (PMR) was introduced in 1938 by Jacobson(31). This technique also referred as the “minimal method”. It is a series of technique involving cycles of tension and release in 50 different muscle groups(32). The technique that was introduced by Jacobson aimed to increase awareness of muscular tension in the human body and also learning to release the same(32). This relaxation technique was expanded to more extensive used in several physical and also psychobehavioral problems. For instance, current literature provides more evidence the efficacy of progressive muscle relaxation therapy for non-pharmacological management of physical problems such as nausea, vomiting and also chronic pain(33). Other than that, this therapy also showed its efficacy as adjunct therapy in psychobehavioral problems such as depression, anxiety and sleep difficulties(34).

The original protocol of muscle relaxation therapy was produced by Bernstein and Borkovec in 1979 called Abbreviated Progressive Relaxation Technique (APRT)(35). This procedure grouped the muscles as follows ; feet, legs and thighs, upper back and chest, lower back and stomach, shoulders and neck, arms and hands, mouth and jaws, and eyes and forehead(35). Both dominant and non-dominant sides of the body were activated simultaneously. The action

of each muscle was repeated twice i.e conscious tension (5 seconds) followed by tension release for 10 seconds(35).

Individualized Guided Imagery (GI) scripts was a type of muscle relaxation therapy which lasts between 9 to 12 minutes were created for participants. The content of guided imagery usually prefers scenery or places using information obtained during initial session. Participants were guided to create a place in their mind using their sense of touch, sound, smell, sight and taste as well(35). Furthermore, guided imagery script incorporated suggestive phrases regarding transforming the pain and tension into other form of object or creative energy and also increasing participants sense of control over the pain. Personalized audio recordings also were provided to participants to ease home practice(35).

1.8PROPOSED MECHANISM ON HOW GUIDED IMAGERY AND PROGRESSIVE RELAXATION THERAPY CAN REDUCE PAIN AND IMPROVE MOBILITY

A study done by Moore *et al* in 2000 suggested that guided imagery create a flow of thoughts in the individual's attention that focus on imagined visual, tactile, auditory and also olfactory sensations. This process will refocusing that person's attention on these imagined sensations results in specific psychological and physiological response, for instance relaxation in their mind and body as well(36).

For instance, guided imagery can initiate cognitive process which is active coping or diverting on focus attention(37). Other than that, guided imagery also may result in reduction on autonomic nervous system response, as studied by Herbert *et al*(38). In addition, guided imagery also block transmission of painful stimuli through higher brain centers. For mobility difficulties, several studies have proposed two mechanisms on how guided imagery can