Chapter II

REVIEW OF RELATED LITERATURE

The literature related to the problem has been presented in this chapter. Review of literature has been confined to the website of www.pubmed.com.

The literature related to any problem helps the scholar to discover what is already known, which would enable the investigator to have a deep insight, clear perspective and a better understanding of the chosen problem and various factors connected with the study. So a number of books, journals, and websites were referred. In the following pages, an attempt has been made to present briefly a few of the important researches and studies conducted abroad and in India, as they have significant bearing on the present study.

The purpose of the study was to find out the effects of diet modification with and without home based exercise programme on self-reported knee pain osteoarthritis. There are numbers of studies touching the topic that has been pursued and some of the most important reviews are presented in this chapter for clear understanding.

The reviews of the literature have been classified under the following headings.

1. Studies of Diet Modification on Knee Pain Osteoarthritis.
2. Studies of Exercise and diet modification on Knee Pain Osteoarthritis.
Studies of Diet Modification on Knee Pain Osteoarthritis

Sköldstam, L., Larsson, L., & Lindström, F. D. (1979) determined the result of fasting and lacto vegetarian diet on arthritis. 16 patients with classical rheumatoid arthritis (RA) selected at random underwent fasting for 7--10 days, followed by a 9-week period on a lactovegetarian diet. 10 RA patients acted as controls, taking normal diet. Pain, stiffness, medication, and clinical and biochemical findings were recorded before fasting, on the first day after the conclusion of the fasting period, and at the end of the lactovegetarian period. After fasting, 5 of 15 patients showed objective signs of improvement, compared with only one of the controls. We conclude that fasting may produce subjective and objective improvements in RA, though of short duration, but the findings of this investigation do not indicate that lactovegetarian diet has any beneficial effects.

Beri, D., Malaviya, A. N., Shandilya, R., & Singh, R. R. (1988) discussed the effect of dietary restrictions on arthritis. Additions in five steps were made, as a possible therapeutic measure, to the diet of 27 patients with rheumatoid arthritis (RA) after a period of two weeks of a basal isocaloric diet free from pulses, cereals, milk, and non-vegetarian protein foods. The study indicates that dietary factors may influence inflammatory response in RA.

Haugen, M., Kjeldsen-Kragh, J., Nordvåg, B. Y., & Førre, O. (1991) evaluated the questionnaire-based survey in which 742 patients participated. It comprised 290 patients with rheumatoid arthritis, 51 patients with juvenile rheumatoid arthritis, 87 patients with ankylosing spondylitis, 51 patients with psoriatic arthropathy, 65 patients with primary fibromyalgia and 34 patients with osteoarthritis. Fifteen percent
of the patients with rheumatoid arthritis and ankylosing spondylitis had been through a fasting period. Less pain and stiffness were reported by 2/3 of the patients in both groups and half of the patients in both groups reported a reduced number of swollen joints.

Kjeldsen-Kragh, J., et al (1991) determined the effect of fasting followed by one year of a vegetarian diet was assessed in a randomised, single-blind controlled trial. 27 patients were allocated to a four-week stay at a health farm. After an initial 7-10 day subtotal fast, they were put on an individually adjusted gluten-free vegan diet for 3.5 months. The food was then gradually changed to a lactovegetarian diet for the remainder of the study. A control group of 26 patients stayed for four weeks at a convalescent home, but ate an ordinary diet throughout the whole study period. The benefits in the diet group were still present after one year, and evaluation of the whole course showed significant advantages for the diet group in all measured indices. This dietary regimen seems to be a useful supplement to conventional medical treatment of rheumatoid arthritis.

Panush, R. S. (1991) discussed rheumatoid arthritis and most other forms of inflammatory joint disease--systemic rheumatic diseases--remain illnesses of unknown cause for which current therapy often is inadequate. The possibility that food antigens induce or perpetuate symptoms in at least some patients is novel, rational, and exciting. Studies that relate diet with arthritis might offer the potential of identifying new therapeutic approaches for selected patients and of developing new insights into disease pathogenesis.
Darlington, L. G., & Ramsey, N. W. (1993) suggested that, at least in some patients with RA, dietary therapy may influence at least the symptoms and possibly the progression of the disease. Since dietary treatment is safe and may reduce or avoid the need for drugs, it is appealing to patients, who are increasingly anxious about potential drug toxicity. It must, however, be medically supervised to avoid misinterpretation of results, to avoid patients taking diets to extremes, with resultant malnutrition, particularly in children, and to prevent patients from persisting with ineffective diets when they should be receiving drug treatment. Medical interest in dietary treatment also ensures that patients discuss their diets with orthodox practitioners rather than being driven by our scepticism into the hands of unqualified people who may exploit patients' interest in the subject.

Diethelm, U. (1993) determined the effect of complete fasting on pain in rheumatoid arthritis is remarkable, but not fully understood. Polyunsaturated fatty-acids, especially omega-3-fatty-acids from fish oil, are significant as precursors of mediators for inflammation. In rare instances food allergy may cause or aggravate arthritis. The actual knowledge is presented in a concentrated form and some practical advice is given.

Haugen, M. A., Kjeldsen-Kragh, J., & Førre, O. (1994) evaluated the extent of food allergy/intolerance in rheumatoid arthritis; an elemental (hypoallergenic) diet was studied in a controlled, double-blind pilot study. Ten patients were allocated to an experimental group and 7 to a control group. The patients in the experimental group received an elemental diet for 3 weeks, whereas the patients in the control group received a control soup consisting of milk, meat, fish, shellfish, orange, pineapples,
tomatoes, peas and flour of wheat and corn. These results suggest that some RA patients may respond to the elimination of offending food items. However, the results do not encourage treatment with an elemental diet in unselected RA patients.

Kjeldsen-Kragh, J., Haugen, M., Borchgrevink, C. F., & Førre, O. (1994) compared the change from baseline (i.e. at the time of study entry) to the time of the follow-up examination for diet responders, diet nonresponders and controls who ate an omnivorous diet. The following variables favoured diet responders: pain score, duration of morning stiffness, Stanford Health Assessment Questionnaire index, number of tender joints, Ritchie's articular index, number of swollen joints, ESR and platelet count. The difference between the three groups was significant for all the clinical variables, except for grip strength. There was no significant difference between the groups with regard to laboratory or anthropometric variables. At the time of the follow-up examination all diet responders but only half of the diet nonresponders still followed a diet. Our findings indicate that a group of patients with rheumatoid arthritis benefit from dietary manipulations and that the improvement can be sustained through a two-year period.

Peltonen, R., et al (1994) analysed stool samples of the 53 RA patients by using direct stool sample gas-liquid chromatography of bacterial cellular fatty acids. Based on repeated clinical assessments disease improvement indices were constructed for the patients. At each time point during the intervention period the patients in the diet group were then assigned either to a group with a high improvement index (HI) or a group with a low improvement index (LI). Significant alteration in the intestinal flora was observed when the patients changed from omnivorous to vegan diet. This
finding of an association between intestinal flora and disease activity may have implications for our understanding of how diet can affect RA.

Cleland, L. G., Hill, C. L., & James, M. J. (1995) discussed the choice of diet is one way in which an individual can influence his/her own health, and it is to be expected that patients will seek their physician's expert opinion regarding dietary matters. Respect for the legitimacy of these enquiries and balanced informed discussion, which includes general advice for a prudent diet, as well as disease-specific recommendations when indicated, can be the key to a productive relationship between patients and physician. The issue of dietary advice has an impact on the management of most forms of arthritis including osteoarthritis (obesity/energy balance), gout (dietary purines, energy balance, alcohol, fluid intake) and rheumatoid arthritis (n-3 fatty acids). Food hypersensitivity appears to be a rare cause of polyarthritis, and elimination diets and fasting have little or no place in routine practice. Strategies under investigation include oral tolerization, the utility of which remains to be established.

Kavanaghi, R., Workman, E., Nash, P., Smith, M., Hazleman, B. L., & Hunter, J. O. (1995) assessed the role of elemental diet and subsequent food reintroduction in RA. Elemental diet (E028) (and a small number of foods) was given to 24 patients with definite RA in order to induce a remission and then foods were gradually introduced. Where a food was suspected of causing symptoms it was removed from the diet. Twenty-three control patients supplemented their usual diet with E028. In conclusion, this study shows that elemental diet can cause an improvement in a number of disease parameters in RA but this is not sustained by an
individualized diet. It also illustrates some of the difficulties involved in the study of diet in arthritis.

Kjeldsen-Kragh, J., Hvatum, M., Haugen, M., Førre, O., & Scott, H. (1995) compared serum antibody activity against dietary antigens in patients with rheumatoid arthritis (RA) and healthy controls, and to examine whether anti-food antibody activity fluctuated with disease activity during a trial of fasting followed by a one-year vegetarian diet. Serum IgG, IgA and IgM antibody activity against several food antigens was measured by an enzyme immunoassay. Abnormally high antibody activity was defined as values above the 90th percentile of the measurements in 30 healthy controls. Serum IgE antibody activity was measured by a radioallergosorbent test. The results indicate that a systemic humoral immune response against food items is probably not involved in the pathogenesis of RA.

Gamlin, L., & Brostoff, J. (1997) discussed the effect of fasting may be mediated by the absence of dietary fat, leading to a shortage of pro-inflammatory prostaglandins and leukotrienes.

Nenonen, M. T., Helve, T. A., Rauma, A. L., & Hänninen, O. O. (1998) tested the effects of an uncooked vegan diet, rich in lactobacilli, in rheumatoid patients randomized into diet and control groups. The intervention group experienced subjective relief of rheumatic symptoms during intervention. A return to an omnivorous diet aggravated symptoms. Half of the patients experienced adverse effects (nausea, diarrhoea) during the diet and stopped the experiment prematurely. Indicators of rheumatic disease activity did not differ statistically between groups. The results showed that an uncooked vegan diet, rich in lactobacilli, decreased
subjective symptoms of rheumatoid arthritis. Large amounts of living lactobacilli consumed daily may also have positive effects on objective measures of rheumatoid arthritis.

Fujita, A., Hashimoto, Y., Nakahara, K., Tanaka, T., Okuda, T., & Koda, M. (1999) studied 14 patients with RA who stayed in the Koda hospital for 55 days. They basically took a 1200 kcal vegan diet consisting of unpolished rice gruel, juice of raw vegetables, soya bean curd and sesame seeds, and undertook a 3-5-day fast three times. These data suggest that this combination of a low calorie vegan diet and fasting may contribute to improve OA with little undesirable effects on the patient's general conditions.

Gaby, A. R. (1999) discussed conventional treatments for OA present a number of problems, in terms of both safety and efficacy. A number of different alternative therapies have been studied, including dietary modifications, nutritional supplements, botanicals, and antibiotics. While the response to these treatments is variable and often unpredictable, some patients have shown dramatic improvement or even complete and long-lasting remission. Moreover, alternative therapies, with the exception of antibiotics, have a low incidence of adverse effects. Consideration of these treatment options has the potential to benefit many patients with OA.

Kjeldsen-Kragh, J. (1999) tested the effect of fasting for 7-10 d, then consuming an individually adjusted, gluten-free, vegan diet for 3.5 mo, and then consuming an individually adjusted lactovegetarian diet for 9 mo on patients with RA. For all clinical variables and most laboratory variables measured, the 27 patients in the fasting and vegetarian diet groups improved significantly compared with the 26
patients in the control group who followed their usual omnivorous diet throughout the study period. One year after the patients completed the trial, they were reexamined. Compared with baseline, the improvements measured were significantly greater in the vegetarians who previously benefited from the diet (diet responders) than in diet nonresponders and omnivores. The beneficial effect could not be explained by patients' psychologic characteristics, antibody activity against food antigens, or changes in concentrations of prostaglandin and leukotriene precursors. However, the fecal flora differed significantly between samples collected at time points at which there was substantial clinical improvement and time points at which there were no or only minor improvements. In summary, the results show that some patients with RA can benefit from a fasting period followed by a vegetarian diet. Thus, dietary treatment may be a valuable adjunct to the ordinary therapeutic armamentarium for RA.

Fraser, D. A., Thoen, J., Djøseland, O., Førre, O., Kjeldsen-Kragh, J. (2000) investigated the effects of either a 7-day fast or a 7-day ketogenic diet upon serum interleukin-6 (IL-6) and dehydroepiandrosterone sulphate (DHEAS) in RA patients. We measured serum concentrations of DHEAS and IL-6 in 23 RA patients with active disease, 10 of whom followed a 7-day sub-total fast and 13 of whom consumed a ketogenic diet (isoenergetic, carbohydrate < 40 g/day) for 7 days. Clinical and laboratory variables were measured at baseline, on day 7 and after re-feeding on day 21. Correlation analyses were used to assess the associations between serum IL-6, DHEAS and disease activity variables at each timepoint. In conclusion, both fasting and a ketogenic diet significantly increased serum DHEAS concentrations in RA patients. Only fasting significantly decreased serum IL-6 levels and improved disease
activity. As the increases in serum DHEAS were similar in response to both fasting and a ketogenic diet, it is unlikely that the fall in serum IL-6 or clinical improvements after fasting were directly related to increases in serum DHEAS.

Nesher, G., & Mates, M. (2000) determined the effect of dietary manipulation on the frequency and severity of PR attacks. Sixteen patients (10 males, 6 females) were diagnosed as having PR during 1994-8 in one center. All patients were instructed to make a list of the food that was consumed daily and to specify the dates of PR episodes. Data were evaluated after a period of 2-4 months in each patient. It was concluded that, in some PR patients ingestion of certain foods, specific for each case, can trigger the typical attack.

Sarzi-Puttini, P., et al (2000) evaluated the effects of a diet therapy in patients with rheumatoid arthritis (RA). Fifty RA patients entered a 24-week double-blind, randomised, controlled-study of two different dietary regimens (an experimental diet high in unsaturated fats, low in saturated fats with hypoallergenic foods vs. a control well-balanced diet). The primary end points of the study were 20% and 50% improvement in disease activity according to composite symptoms (Paulus index) of arthritis. Other end points were the other measures of disease activity at 12 and 24 weeks of diet treatment. It was concluded that, dietary manipulation, either by modifying food supplements or by reducing weight, may give some clinical benefit although no significant improvement can be observed assessing the results with a composite index.

Hafström, I., et al (2001) studied the clinical effects of a vegan diet free of gluten in OA and to quantify the levels of antibodies to key food antigens not present
in the vegan diet. Sixty-six patients with active OA were randomized to either a vegan diet free of gluten (38 patients) or a well-balanced non-vegan diet (28 patients) for 1 yr. All patients were instructed and followed-up in the same manner. They were analysed at baseline and after 3, 6 and 12 months, according to the response criteria of the American College of Rheumatology (ACR). Furthermore, levels of antibodies against gliadin and beta-lactoglobulin were assessed and radiographs of the hands and feet were performed. The data provide evidence that dietary modification may be of clinical benefit for certain OA patients, and that this benefit may be related to a reduction in immunoreactivity to food antigens eliminated by the change in diet.

Iwashige, K., et al (2004) conducted a regimen of caloric restriction combined with fasting in patients with rheumatoid arthritis, and then evaluated urinary pentosidine levels. Ten patients with rheumatoid arthritis underwent a 54-day caloric restriction program. Urinary pentosidine levels were measured and the Lansbury Index were determined by examining the clinical features, blood biochemistry and the inflammation activity of rheumatoid arthritis on days 0, 25 and 54. The study showed that under a low energy diet a reduction of disease activity in rheumatoid arthritis was accompanied with a reduction of the urinary pentosidine.

Karatay, S., eta al (2004) investigated the effect of individualized diet challenges consisting of allergenic foods, defined by the skin prick test (SPT), on tumour necrosis factor-alpha (TNF-alpha) and interleukin-1beta (IL-1beta) levels in patients with rheumatoid arthritis (RA). Twenty patients with a positive SPT response for food extracts and 20 with a negative SPT response were enrolled. None of the patients had active disease. All patients were fasted for the most common allergenic
foods for 12 days and then allocated to two groups according to SPT results. Food challenges were performed with allergenic foods in the prick-positive group (PPG) and with corn and rice in the prick-negative group (PNG) for a period of 12 days. Then, allergenic foods were excluded from the PPG patients' diet and corn and rice were removed from the PNG patients' diet. Clinical examinations were performed after fasting (baseline), at the end of the challenge phase and at the end of the re-elimination phase. Stiffness, pain, tender and swollen joint counts, health assessment questionnaire (HAQ), Ritchie’s articular index, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and serum TNF-alpha and IL-1beta levels were measured. Our results suggest that individualized dietary revisions may regulate TNF-alpha and IL-1beta levels in selected patients with RA.

Cudowska, B., & Kaczmarski, M. (2005) evaluated the diagnostic accuracy of the atopy patch test in the detection of food allergy in correlation with SPT, sIgE and positive oral food challenge to milk, in children suffering from AEDS and to assess the sensitivity and specificity of this method in dependence on the age of investigated children. 34 children (25 boys, 9 girls) aged 5 months-16 years with suspicion of milk-related AEDS were investigated. These patients were subdivided into 2 age groups: group A--20 children (<3 years), group B--14 children (>3 years). The diagnostic procedures as skin-prick tests and atopy patch test were performed. The specific IgE to cow's milk allergens were also measured. The open and blind diagnostic oral food challenge were performed to verify the results of tests. Sensitivity, specificity, positive (PPV) and negative (NPV) predictive value of APT were calculated in both age groups. APT was found to be more sensitive and specific method than SPT/sIgE in diagnosing delayed food allergy in children with AEDS. No
age correlation between positive results of APT and oral food challenge and higher specificity of APT in older children confirm its accuracy in diagnosing delayed cow's milk allergy in all age groups of children. Combined skin prick and patch testing significantly enhances identification of food allergy in children with AEDS. The outcome of the APT with food does not seem to be influenced by age of children, but because of its variability of sensitivity and specificity, a diagnosis of food allergy should be confirmed by oral food challenge.

Michalsen, A., et al (2005) evaluated whether in patients with rheumatoid arthritis (RA) or fibromyalgia (FM) a Mediterranean diet or an 8-day fasting period are associated with changes in fecal flora and whether changes in fecal flora are associated with clinical outcome. During a two-months-period 51 consecutive patients from an Integrative Medicine hospital department with an established diagnosis of RA (n = 16) or FM (n = 35) were included in the study. According to predefined clinical criteria and the subjects' choice the patients received a mostly vegetarian Mediterranean diet (n = 21; mean age 50.9 +/- 13.3 y) or participated in an intermittent modified 8-day fasting therapy (n = 30; mean age 53.7 +/- 9.4 y). Quantitative aerob and anaerob bacterial flora, stool pH and concentrations of secretory immunoglobulin A (sIgA) were analysed from stool samples at the beginning, at the end of the 2-week hospital stay and at a 3-months follow-up. Clinical outcome was assessed with the DAS 28 for RA patients and with a disease severity rating scale in FM patients. It was concluded that, neither Mediterranean diet nor fasting treatments affect the microbiologically assessed intestinal flora and sIgA levels in patients with RA and FM. The impact of dietary interventions on the human intestinal flora and the role of the fecal flora in rheumatic diseases have to be clarified with newer molecular
analysis techniques. The potential benefit of fasting treatment in RA and FM should be further tested in randomised trials.

Benito-Garcia, E., et al (2006) investigated whether patients with RA taking MTX with a higher dietary caffeine intake have a worse clinical response to MTX than those with a lower intake. Patients with RA enrolled in a prospective cohort study and currently taking MTX were divided equally into low, moderate, and high caffeine consumers. MTX clinical response was defined by the Disease Activity Score (DAS)28, Multidimensional Health Assessment Questionnaire (MDHAQ) score, and duration of morning stiffness. Regression models were used to study the relationship between caffeine intake and MTX response adjusting for age, sex, and other relevant variables at study enrollment. It was concluded that, caffeine intake among patients taking high doses of MTX for RA did not affect MTX efficacy and RA disease activity over time.

Karatay, S., et al (2006) evaluated the effect of individualized diet challenges consisting of allergen foods on disease activity in rheumatoid arthritis (RA) patients. Twenty patients with positive skin prick test (SPT) response for food extracts and 20 with negative SPT response were included. All patients were instructed to restrict the most common allergen foods during 12 days and then assigned into two groups according to SPT results. Food challenges were performed with all of the allergen foods in prick test positive group (PTPG) and with corn and rice in prick test negative group (PTNG) during 12 days. Allergen foods were then eliminated from PTPG patients’ diet, while corn and rice were removed in PTNG. Clinical evaluations were performed after fasting (baseline), at the end of the challenge phase and reelimination
phase. Stiffness, pain, physician's and patient's global assessment of disease activity, health assessment questionnaire (HAQ), Ritchie's index, serum amyloid A protein, erythrocyte sedimentation rate and C-reactive protein were determined. Our results showed that the individualized dietary manipulations may effect the disease activity for selected RA patients.

Vlieg-Boerstra, B. J., et al (2006) investigated if avoidance of allergenic foods in children adhering to a food allergen avoidance diet from birth was complete and feasible, and whether dietary assessment can be used as a tool in predicting the outcome of double-blind, placebo-controlled food challenges (DBPCFCs). Thirty-eight children aged 1-13 years, who were consecutively referred to the University Medical Centre Groningen for DBPCFC between January 2002 and February 2004. It was concluded that, dietary avoidance was incomplete and not feasible in most cases. Tolerance of small amounts of allergenic foods does not preclude positive challenge reactions. Dietary assessment does not seem a useful tool in predicting the outcome of DBPCFC in children adhering to an elimination diet.

Ghroubi, S., Elleuch, H., Kaffel, N., Echikh, T., Abid, M., & Elleuch, M. H. (2008) determined whether exercise and weight loss are more effective either separately or in combination, in improving pain and physical function in obese adults with moderate knee osteoarthritis (OA). Forty-five obese adults, with a body mass index greater than 35 kg/m2 or 30<or=BMI<35 associated to at least one cardiovascular risk factor, suffering from knee pain with evident radiographic signs of knee osteoarthritis, were involved in our study. All patients were evaluated at baseline and at the end of the study. The assessment parameters were weight loss, the
bioelectric impedance analysis, pain, six-minute walk distance, cardiovascular parameters, and muscular strength. The physical function was measured with the Womac and the Lequesne indexes. Patients were randomized into four groups, a control group (G1), exercise only group (G2), diet plus exercise group (G3) and diet only group (G4). It was concluded that, the combination of weight loss and exercise provide better improvements in physical function and pain in obese adults with knee osteoarthritis compared with either intervention alone. Exercise used alone or associated to dietary provides better improvements in physical capacity and muscle strength.

Hagen, K. B., Byfuglien, M. G., Falzon, L., Olsen, S. U., & Smedslund, G. (2009) assessed the effectiveness and safety of dietary interventions in the treatment of rheumatoid arthritis. Two authors independently selected trials for inclusion, assessed the internal validity of included trials and extracted data. Investigators were contacted to obtain missing information. It was concluded that, the effects of dietary manipulation, including vegetarian, Mediterranean, elemental and elimination diets, on rheumatoid arthritis are still uncertain due to the included studies being small, single trials with moderate to high risk of bias. Higher drop-out rates and weight loss in the groups with dietary manipulation indicate that potential adverse effects should not be ignored.

Abendroth, A., et al (2010) evaluated changes in short-chain fatty acid (SCFA) profiles and clinical outcome in RA during medical fasting or Mediterranean diet. Methods: Fifty consecutive in-patients from an Integrative Medicine Department were included in a prospective observational, non-randomised, clinical trial. Patients
underwent a 7-day fasting (MF) therapy or a Mediterranean diet (MD) as part of a multimodal therapeutic treatment approach. It was concluded that, alterations in SCFA were found in terms of significant changes to increased acetate levels in the fasting group. A correlation between changes of SCFA from intestinal microflora and disease activity in RA could not be revealed.

Denton, C. (2012) discussed elimination diets can be both a diagnostic tool and a therapeutic intervention for people with a suspected food sensitivity or allergy. They are clinically relevant not only for patients with functional gastrointestinal disorders but also for those with conditions where symptoms are refractory and a diagnosis is elusive. Elimination diets can help a physician make a diagnosis or identify an underlying cause of symptoms. The physician and team treating the patient can then use that information to recommend appropriate dietary and lifestyle changes as well as judicious drug therapy. This article describes the elimination/challenge diet approach and explains the rationale for undertaking it.

**Studies of Exercise and diet modification on Knee Pain Osteoarthritis**

Fisher, N. M., Kame, V. D. Rouse, L., & Pendergast, D. R. (1994) quantified the effects of a 3-mo home exercise program on muscle function and functional capacity. The progressive program included flexibility, strength, endurance, active range of motion and functional activities. Nineteen subjects (67.4 +/- 7.5 yr) with osteoarthritis of the knees began the program, with only nine completing it. There were no significant improvements in hamstring strength. Maximal angular velocity improved after 3 mo of exercise (40%). Muscle endurance did not improve significantly. Although there was a slight increase in functional capacity, these data
failed to demonstrate significant clinical or statistical improvement in overall function in patients after home exercise.

Brosseau, R., Juneau, M., Sirard, A., Savard, A., Marchand, C., Boudreau, M. H., Bradley, S., & Bleau, L. (1995) determined the safety and effectiveness of a self-monitored, home-based phase II exercise program for high risk patients after cardiac surgery. High risk patients were defined as those presenting with severe left ventricular dysfunction with an ejection fraction less than 35%, severe ventricular arrhythmias, incomplete revascularization, abnormal response to a standard walking test or significant (grade 3/4) valvular regurgitation persisting postoperatively. Eighty patients (mean age 58.5 +/- 8.9 years) were randomly assigned to two groups. The experimental group (n = 37) received a home program of aerobic training with an intensity gradually increasing from 1.5 to 4.0 multiples of resting oxygen consumption (METs). This program was started at discharge from the hospital and lasted eight weeks. The control group (n = 43) received general guidelines for progressive increase of their activity level. Functional capacity was measured at discharge by the 6 min walking test and between the sixth and eighth week following discharge by a symptom-limited exercise test, according to the Naughton protocol. It was concluded that, no cardiovascular complications occurred during the training program. At the final evaluation, there was no significant difference between the experimental and control groups regarding aerobic capacity.

Leaf, D. A., & Reuben, D. B. (1996) determined the feasibility (adherence and safety) of employing calorie expenditure as the basis for prescribing a home-based walking program to healthy, community-dwelling men and women was examined.
This was a 16-week pretest-posttest feasibility study of a home-based calorie-expenditure walking program conducted in an outpatient clinic in an academic medical center. Participants included 20 healthy, elderly, community-dwelling men and women. A 16-week home-based walking program was individually prescribed as a weekly amount of calorie expenditure increasing from an initial 300 calories per week to 1,200 calories per week (approximately 30 minutes of walking daily) during the final 6 weeks of the study. Adherence to the program was recorded individually in a diary (kept daily and reviewed at each visit), body weight, and walking pace. All but one participant were able to complete this 16-week program (95 percent adherence). That a calorie-based approach to promote physical activity among the elderly has a high adherence rate is suggested by these findings.

MacRae, P. G., Asplund, L. A., Schnelle, J. F., Ouslander, J. G., Abrahamse, A., & Morris, C. (1996) determined the effects of a 12-week walking program on walk endurance capacity, physical activity level, mobility, and quality of life in ambulatory nursing home residents who had been identified as having low physical activity levels and low walk endurance capacities. To determine the effects of 12 versus 22 weeks of walk training on walk endurance capacity, physical activity level, mobility, and quality of life in ambulatory nursing home residents. Maximal walk endurance capacity, the resident's maximum walk time performed in a single day of walking (distance and speed also were measured); physical activity level based on time-sampled observations and physical activity monitors; mobility as measured with the Timed-Up-and-Go test, left handgrip strength, and Tinetti's Mobility Assessment; and quality of life as assessed with the Geriatric Depression Scale (a bodily pain scale) and the Dartmouth Primary Care Cooperative Information Project (COOP)
physical work chart. It was concluded that, twelve weeks of daily walking at a self-selected walking pace by ambulatory nursing home residents produced significant improvements in walk endurance capacity. No other significant changes were noted in physical activity level, mobility, or quality of life in either group after the intervention. Also, there were no side effects, such as increases in falls or cardiovascular complications, due to the walking intervention. Lengthening the walking program to 22 weeks produced no further significant changes in any outcome measures.

Sashika, H., Matsuba, Y., & Watanabe, Y. (1996) studied the effect of a home program of physical therapy. Subjects had total hip arthroplasty (THA) for hip osteoarthritis (hip-OA) without THA failure, or cardiopulmonary, neurological, or cognitive problems. Twenty-three subjects (mean age 63.4 years; mean post-THA period 793 days, 6 to 48 months) were divided into 3 groups matching with age, gender, and postoperative periods. Hip ROM, maximum isometric hip abduction torque measured by Cybex II, gait speed, and cadence were evaluated. It was concluded that, the home program was effective in long-term post-THA.

Sherrington, C., & Lord, S. R. (1997) determined the effect of a home exercise program on strength, postural control, and mobility following hip fracture. Forty-two people 64 to 94 years of age, 35 of whom were living independently in the community and 7 of whom were residing in institutional care. Subjects were recruited on average 7 months after a fall-related hip fracture and randomly allocated to either the intervention or the control group (n = 21 each). The groups were well matched in terms of medical conditions, medication use, disability, and activity levels.
Quadriceps strength, postural sway, functional reach, weight-beariing ability, walking velocity, and self-rated fall risk. The subjects undertook these assessments at the beginning and end of the trial. This exercise program improved strength and mobility following hip fracture. Further research is needed to ascertain whether the extent of this improvement in these fall risk factors is sufficient to prevent falls.

Bruce-Brand, R. A., Walls, R. J., Ong, J. C., Emerson, B. S., O'Byrne, J.M., & Moyna, N. M. (1998) determined the effect of home based resistance training. 41 patients aged 55 to 75 years were randomised to 6 week programs of RT, NMES or a control group receiving standard care. The primary outcome was functional capacity measured using a walk test, stair climb test and chair rise test. Additional outcomes were self-reported disability, quadriceps strength and cross-sectional area. Outcomes were assessed pre- and post-intervention and at 6 weeks post-intervention (weeks 1, 8 and 14 respectively). It was concluded that, home-based NMES is an acceptable alternative to exercise therapy in the management of knee osteoarthritis, producing similar improvements in functional capacity. Trial registration: Current Controlled Trials ISRCTN85231954.

Alexanderson, H., Stenström, C. H., & Lundberg, I. (1999) investigated whether a home exercise programme could safely be performed by patients with stable, inactive polymyositis (PM) and dermatomyositis (DM), regarding disease activity, muscle function, health status and pain. Ten patients with reduced muscle function completed the study. A home exercise programme including exercises for strength in the upper and lower limbs, neck and trunk, for mobility in the upper limbs and moderate stretching was developed. The patients exercised for 15 min and took a
15 min walk 5 days a week during a 12 week period. Assessments included clinical evaluation of disease activity, serum creatinine phosphokinase (CPK) levels, magnetic resonance imaging (MRI) of the quadriceps, repeated muscle biopsy of the vastus lateralis, a muscle function index (FI), a walking test and a health status instrument (the SF 36) performed at the start of the study and after 12 weeks. Our results indicate that this home exercise programme can be safely employed in patients with stable, inactive PM and DM, with beneficial effects on muscle function.

O'Reilly, S. C., Muir, K. R., & Doherty, M. (1999) assessed the effect of a home based exercise programme, designed to improve quadriceps strength, on knee pain and disability. 191 men and women with knee pain aged 40-80 were recruited from the community and randomised to exercise (n = 113) or no intervention (n = 78). The exercise group performed strengthening exercises daily for six months. The primary outcome measure was change in knee pain (Western Ontario McMaster Osteoarthritis index (WOMAC)). Secondary measures included visual analogue scales (VAS) for pain on stairs and walking and WOMAC physical function scores. It was concluded that a simple programme of home quadriceps exercises can significantly improve self reported knee pain and function.

Evcik, D., & Sonel, B. (2002) investigated the effects of home-based exercise and walking programs in the treatment of osteoarthritis. A total of 90 patients with knee osteoarthritis were included. Their ages ranged between 48 and 71 years. The patients were separated into three groups. None of them had practiced a daily simple exercise program during the previous year. Group 1 (n=30) was given a home-based exercise program. Group 2 ( n=30) had regular a walking program three times per
week, starting with 10-min duration. Group 3 (n=30) was accepted as the control group. Patients were assessed according to pain, functional capacity, and quality of life parameters. It concluded that a simple home-based exercise therapy and a regular walking program are effective in treating the symptoms of osteoarthritis.

Klein, M. G., Whyte, J., Esquenazi, A., Keenan, M. A., & Costello, R. (2002) compared the effectiveness of exercise and lifestyle modification therapy in treating shoulder symptoms in polio survivors with lower-extremity weakness. Twenty-three subjects recruited from a cohort of 194 polio survivors who had participated in a previous study had bilateral hip-extensor and knee-extensor weakness and reported experiencing shoulder pain on a regular basis with daily activity. Shoulder symptoms were quantified in terms of number and severity. Isometric strength of bilateral hip and knee extensors was measured with a hand-held dynamometer. The result indicated that, both exercise and lifestyle modification therapies that focus on reducing the stress related to lower-extremity weakness are effective in treating shoulder overuse symptoms in polio survivors. A trend toward greater improvement in shoulder symptoms in subjects who participated in the exercise program and who also showed a trend toward increased knee-extensor strength supports muscle strength and/or endurance as a key factor.

Ransdell, L. B., Taylor, A., Oakland, D., Schmidt, J., Moyer-Mileur, L., & Shultz, B. (2003) compared the effectiveness of home- and community-based physical activity interventions that target mothers and daughters to increase physical activity and improve health-related fitness. Mothers (45.18 +/- 7.49 yr) and daughters (15.41 +/- 1.33 yr) were randomly assigned to a community-based (CB) (N = 20 participants)
or home-based (HB) (N = 14 participants) program. CB participants attended three instructor-led sessions per week for 12 wk. HB participants were asked to participate in 3 sessions per week for 12 wk in a program similar to the CB program. The main difference between the programs was that CB activities were completed at a fitness facility within a university and HB activities were completed in or near the home. Before and after the intervention, changes in health-related fitness and physical activity were assessed. A series of 2 (group assignment) × 2 (time) ANOVAs were conducted to assess changes separately for mothers and daughters. It was concluded that, mothers and daughters responded positively to CB and HB physical activity programs. Home-based physical activity programming is a cost-effective means to increase physical activity and improve health-related fitness in these groups.

Jan, M. H., Hung, J. Y., Lin, J. C., Wang, S. F., Liu, T. K., & Tang, P. F. (2004) assessed the efficacy of a home exercise program in increasing hip muscle strength, walking speed, and function in patients more than 1.5 years after total hip replacement (THR). Fifty-three patients with unilateral THR were randomly assigned to the training (n=26) and control (n=27) groups. Patients in the training group were further divided into exercise-high (n=13) and exercise-low (n=13) compliance groups according to their practice ratio (high, > or =50%). The training group underwent a 12-week home program that included hip flexion range of motion exercises for both hip joints; strengthening exercises for bilateral hip flexors, extensors, and abductors; and a 30-minute walk every day. The control group did not receive any training. The designed home program was effective in improving hip muscle strength, walking speed, and function in patients after THR who practiced the program at least 3 times a week, but adherence to this home program may be a problem.
McCarthy, C. J., Mills, P. M., Pullen, R., Richardson, G., Hawkins, N., Roberts, C. R., et al. (2004) established the relative effectiveness and cost of providing a home-based exercise programme versus home-based exercise supplemented with an 8-week class-based exercise programme. A total of 214 patients, meeting the American College of Rheumatology's classification of knee osteoarthritis, were selected from referrals from the primary and secondary care settings. Assessments of locomotor function, using a timed score of three locomotor activities, walking pain and self-reported disability with the Western Ontario and McMaster's Universities osteoarthritis index (WOMAC) were made. General health, lower limb strength, range of movement and compliance with exercise were also measured. Patients were assessed before and after treatment, and also at 6- and 12-month follow-ups. The economic evaluation looked at health service resource use and assessed cost-effectiveness by relating differential costs to differences in quality-adjusted life-years (QALYs) based on patients' responses to the EuroQol-5 Dimensions. Data were obtained at baseline, 1 month, 6 months and 12 months through face-to-face interviews and, where appropriate, examination of hospital medical records. It was concluded that, the supplementation of a home-based exercise programme with a class-based exercise programme led to superior improvement in the supplemented group. These differential improvements were still evident at review 12 months after treatment had ceased. The additional cost of the supplemented group was offset by reductions in resource use elsewhere in the system. Compliance with the home exercise programme did not differ between the groups. Based on this evidence, the supplementation of a home-based exercise programme with an 8-week class-based
exercise programme can be confidently expected to produce small improvements in locomotor function and clinically important reductions in pain.

Ravaud, P., et al (2004) evaluated the clinical efficacy of patient administered assessment tools and an unsupervised home based exercise programme alone or in combination in patients with osteoarthritis. The study was a 24 week, open cluster randomised controlled trial with a factorial design. Rheumatologists (n = 867) were assigned to four groups according to the treatment given: standardised tools (ST; n = 220), exercises (EX; n = 213), both tools and exercises (ST+EX; n = 213), or usual care (n = 221). Each rheumatologist was to enroll four patients who met the American College of Rheumatology criteria for OSTEOARTHRITIS (three with knee OSTEOARTHRITIS, one with hip OSTEOARTHRITIS). "Tools" consisted of weekly recording of pain and disabling activities in a diary. A home based exercise programme was performed daily at least four times per week with the aid of videotape and booklet. In addition to exercise and assessment, all patients received 12.5 mg or 25 mg of the non-steroidal anti-inflammatory drug rofecoxib once daily. Outcome variables were: pain (measured on a visual analogue scale, 0-100); Western Ontario and McMaster Universities Osteoarthritis Index, function subscale (0-100); and patient assessment of the quality of care (0-100). Although patients' assessments favoured the exercise programme, results from this study failed to demonstrate a short term symptomatic effect of the two non-pharmacological treatments (weekly recording of condition and exercise) in patients with OSTEOARTHRITIS concurrently receiving nonsteroidal anti-inflammatory drugs.
Cheon, E. Y. (2005) examined the effects of a Self-management program on physical function and quality of life of women with knee osteoarthritis. The participants for this study, who had knee osteoarthritis, were recruited from an arthritis clinic, at a university hospital located in S city, Korea between February 16, 2004 and June 15, 2004. Seventeen subjects in the control group received no intervention and 18 subjects in for experimental group received an individual Self-management program. The self-management program consisted of dietary education and home-based exercise; walking and resistance exercise. The subjects performed this program 5 times per week during 8 weeks and recorded a diary for diet and exercise. In order to verify the effects of the Self-management program, physical function and Quality of life as a dependent variable were measured at three points in time: before, week 4 and week 8 after the interventions. This study revealed that a Self-management program can be used as an efficient nursing intervention for women with knee osteoarthritis.

Cochrane, T., Davey, R. C., & Matthes Edwards, S. M. (2005) determined the efficacy of community water-based therapy for the management of lower limb osteoarthritis (OA) in older patients. 106 patients (93 women, 13 men) over the age of 60 years with confirmed hip and/or knee osteoarthritis took part in the preliminary study. A similar, but larger, group of 312 patients (196 women, 116 men) took part in the main study, randomised into control (159) and water exercise (153) groups. Pain score on the Western Ontario and McMaster Universities osteoarthritis index (WOMAC). Additional outcome measures were included to evaluate effects on quality of life, cost-effectiveness and physical function measurements. It was concluded that, group-based exercise in water over 1 year can produce significant
reduction in pain and improvement in physical function in older adults with lower limb osteoarthritis, and may be a useful adjunct in the management of hip and/or knee osteoarthritis. The water-exercise programme produced a favourable cost--benefit outcome, using reduction in WOMAC pain as the measure of benefit.

Deyle, G. D., et al (2005) compared outcomes between a home-based physical therapy program and a clinically based physical therapy program. One hundred thirty-four subjects with OSTEOARTHRITIS of the knee were randomly assigned to a clinic treatment group (n=66; 61% female, 39% male; mean age [+/−SD]=64+/−10 years) or a home exercise group (n=68, 71% female, 29% male; mean age [+/−SD]=62+/−9 years). Subjects in the clinic treatment group received supervised exercise, individualized manual therapy, and a home exercise program over a 4-week period. Subjects in the home exercise group received the same home exercise program initially, reinforced at a clinic visit 2 weeks later. Measured outcomes were the distance walked in 6 minutes and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). The results indicate that a home exercise program for patients with osteoarthritis of the knee provides important benefit. Adding a small number of additional clinical visits for the application of manual therapy and supervised exercise adds greater symptomatic relief.

Delbaere, K., Bourgois, J., Van Den Noortgate, N., Vanderstraeten, G., Willems, T., & Cambier, D. (2006) investigated the efficacy of a guided and graded home-based exercise program for improving a range of physical outcomes in older people. 66 independent-living older people (age: 71-98) with a history of falls and moderate physical impairment. Twenty-four 30-minute training sessions were
given by a trained physiotherapist over a period of 16 weeks in the participant's home. Different types of exercises on balance, aerobic performance, flexibility, and muscle strength were provided. Muscle strength, static and dynamic balance, aerobic performance, activities in daily living, fear of falling and avoidance of daily activities were assessed at baseline and after 16 weeks intervention. The home-based, individualized exercise program was effective in reducing several physical factors associated with falls in community-dwelling older people with moderate physical impairment. The decrease in fear of falling and other behavioural variables needs to be considered with care and needs further investigation.

Sowers, M., et al (2006) discussed performance based physical functioning considering body composition, quadriceps strength and knee osteoarthritis. Body composition was assessed with bioelectrical impedance. Functioning measures were gait assessment, timed walk, timed stair climb with and without videography, and isometric quadriceps strength. Knee osteoarthritis was determined by Kellgren-Lawrence score from radiography, whereas knee pain was self-reported. In conclusion, compromised physical functioning began earlier than expected, with indications that approximately 12-31% of women might benefit from interventions to forestall future decline.

O'Shea, S. D., Taylor, N. F., & Paratz, J. D. (2007) determined home based resistance exercise program. 54 people with moderately severe chronic obstructive pulmonary disease not undergoing pulmonary rehabilitation. Primary outcomes were strength (knee extensor, hip abductor, shoulder horizontal flexor, shoulder flexor) measured using hand-held dynamometry, and walking capacity measured by the 6-
minute Walk Test performed before and after intervention and again at 12 weeks after the cessation of intervention. A predominantly home-based progressive resistance exercise program led to modest improvements in knee extensor strength in people with chronic obstructive pulmonary disease. However, 44% of the experimental group was unable to complete the exercise program, highlighting the need to understand factors influencing adherence to exercise in this population.

Tully, M. A., Cupples, M. E., Hart, N. D., McEneny, J., McGlade, K. J., Chan, W. S., & Young, I. S. (2007) determined, using unsupervised walking programmes, the effects of exercise at a level lower than currently recommended to improve cardiovascular risk factors and functional capacity. 106 healthy, sedentary 40 to 61 year old adults of both sexes. Blood pressure, serum lipids, body mass index, waist:hip ratio, and functional capacity (using a 10 m shuttle walk test). This study provides evidence of benefit from exercising at a level below that currently recommended in healthy sedentary adults. Further studies are needed of potential longer term health benefits for a wider community from low levels of exercise.

Coleman, S., Briffa, N. K., Carroll, G., Inderjeeth, C., Cook, N., & McQuade, J. (2008) determined whether an education self management program for subjects with Osteoarthritis (OA) of the knee (OAK program) implemented by health professionals in a primary health care setting can achieve and maintain clinically meaningful improvements compared standard medical management in a control group. The effects of standard medical management will be compared with the effects of the OAK program in a single-blind randomized study. 146 male and female participants with established osteoarthritis knee will be recruited. Volunteers with
coexistent inflammatory joint disease or serious co-morbidities will be excluded. Participants will be randomized into either intervention or control groups (delayed start). The intervention group will complete the osteoarthritis knee program and both groups will be followed for 6 months. Assessments will be at baseline, 8 weeks and 6 months. SF-36, WOMAC and VAS pain questionnaires will be completed. Isometric quadriceps and hamstring strength will be measured using a dynamometer; knee range of movement using a goniometer; and physical function will be determined by a modified timed up and go test. Data will be analysed using repeated measures ANOVA. The results of the study will provide evidence to guide clinicians and funding bodies seeking to establish priorities regarding the provision of this disease specific program.

Dubbert, P. M., Morey, M. C., Kirchner, K. A., Meydrech, E. F., & Grothe, K. (2008) evaluated the effects of counseling linked with primary care visits on walking and "strength exercise" (the combination of strength-building and flexibility exercise) in aging veterans. Male veterans aged 60 to 85 years (N = 224) with physical function limitations were randomized to either counseling for home-based walking and strength exercise (EXC) or discussion of their choice of health education topics (EDUC) with a nurse at baseline, 1 month, and 5 months. The EXC participants recorded exercise on monthly calendars and received brief follow-up calls from the nurse; all participants received bimonthly newsletters throughout the 10-month trial. It was concluded that, relatively brief counseling linked with primary care visits can increase home-based walking and strength exercise in aging male veterans.
Galea, M. P., et al. (2008) examined the physical function, gait, and quality of life of patients after total hip replacement (THR) randomly assigned to either a targeted home- or center-based exercise program. Twenty-three patients with unilateral THR were randomly assigned to a supervised center-based exercise group (n=11) or an unsupervised home-based exercise group (n=12). The center-based group completed an 8-week targeted exercise program while under the direct supervision of a physiotherapist. After initial instruction, the home-based group completed the 8-week targeted exercise program at home without further supervision. It was concluded that the targeted strengthening program was effective for both the home- and center-based groups. No group differences were found in the majority of the outcome measures. This finding is important because it shows that THR patients can achieve significant improvements through a targeted strengthening program delivered at a center or at home.

Chaipinyo, K., & Karoonsupcharoen, O. (2009) determined the four weeks of home-based balance training more effective than four weeks of home-based strength training at decreasing pain in patients with knee osteoarthritis? 48 community volunteers with knee osteoarthritis. Two groups undertook home-based exercise programs: one group performed balance training and the other performed strength training. Participants performed 30 repetitions/leg/day, 5 days/week for four weeks. Outcome measures: The Knee injury and Osteoarthritis Outcome Score was used to evaluate pain, which was the primary outcome. Secondary outcomes were the other subscales of the Knee injury and Osteoarthritis Outcome Score (other symptoms, function in daily living, function in sport and recreation, knee-related quality of life), strength, and mobility. It was concluded that, there was no difference in pain between
home-based strength training and home-based balance training in patients with knee osteoarthritis.

Mangione, K. K., Craik, R. L., Palombaro, K. M., Tomlinson, S. S., & Hofmann, M. T. (2010) determined the effectiveness of a short-term leg-strengthening exercise program with that of attentional control on improving strength, walking abilities, and function 1 year after hip fracture. Community-dwelling older adults (n=26) 6 months after hip fracture at baseline. Isometric force production of lower extremity muscles, usual and fast gait speed, 6-minute walk (6-MW) distance, modified Physical Performance Test (mPPT), and Medical Outcomes Study 36-item Short Form Survey (SF-36) physical function. A 10-week home-based progressive resistance exercise program was sufficient to achieve moderate to large effects on physical performance and quality of life and may offer an alternative intervention mode for patients with hip fracture who are unable to leave home by 6 months after the fracture. The effects were maintained at 3 months after completion of the training program.

Tunay, V. B., Baltacı, G., & Atay, A. O. (2010) established the effects of hospital- and home-based proprioceptive and strengthening exercise programs on proprioception, pain, and functional status in patients with knee osteoarthritis (OA). Sixty patients with bilateral knee osteoarthritis were randomly allocated into either a home-based or hospital-based exercise program. Hospital-based exercise group (n=30, mean age 50.23±9.07 years) received functional training program with proprioceptive ability, ice, and home exercises. Home-based exercise group (n=30, mean age 54.4±7.9 years) had a program of ice and home exercises. Treatment programs was
conducted 5 days per week for 6 weeks (30 sessions). Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Monitorized Functional Squat System-Proprioceptive Test (MFSS), timed performance test (TUG), and visual analogue scale (VAS) for the intensity of pain were used to quantify the variables. It was concluded that, both hospital- and home-based exercise programs decreased joint symptoms and improved function in patients with knee OSTEOARTHRITIS.

Vismara, L., Cimolin, V., Grugni, G., Galli, M., Parisio, C., Sibilia, O., & Capodaglio, P. (2010) determined whether adequate long-term physical training is feasible and effective in improving muscle function and gait in PWS is still unknown. Eleven adult PWS patients (mean age: 33.8±4.3 years; mean BMI: 43.3±5.9 kg/m(2)) admitted to our hospital were enrolled in this study. During their hospital stay they attended a 2-week rehabilitation program which included supervised exercise sessions. At discharge, Group 1 (6 patients) continued the same exercises at home for 6 months, while Group 2 (5 patients) did not continue home-based training. They were assessed at admission (PRE), at 2 weeks (POST1) and at 6 months (POST2). The assessment consisted of a clinical examination, 3D gait analysis and muscle strength measurement with an isokinetic dynamometer. The present study reinforces the idea that even in participants with PWS who present with a distinctive psychological profile, long-term group interventions are feasible and effective in improving their overall physical functioning. Providing an effective and simple home-based training program represents a continuum of the rehabilitation process outside the hospital, which is a crucial issue in chronic conditions.
Richards, K. C., et al (2011) compared the effects of physical resistance strength training and walking (E), individualized social activity (SA), and E and SA (ESA) with a usual care control group on total nocturnal sleep time in nursing home and assisted living residents. One hundred ninety-three residents were randomly assigned; 165 completed the study. Total nocturnal sleep time was measured using 2 nights of polysomnography before and 2 nights of polysomnography after the intervention. Sleep efficiency (SE), non-rapid eye movement (NREM) sleep, rapid eye movement sleep, and sleep onset latency were also analyzed. It was concluded that, high-intensity physical resistance strength training and walking combined with social activity significantly improved sleep in nursing home and assisted living residents. The interventions by themselves did not have significant effects on sleep in this population.

Summary of Literature

The review of literature helped the investigator to spot out relevant topics and variables. Further the literature helped the investigator to frame the suitable hypothesis leading to the problems. The latest literature also helped the investigator to support her findings with regard to the problem. Further the literature collected in the study will also help the research scholar understanding in the similar areas. The reviews were collected from the year 1990 to till date and were arranged in a chronological and alphabetical order.