Kinesio Taping® of the Metacarpophalangeal Joints and its Effect on Hand Function in Individuals with Rheumatoid Arthritis.

Submitted in partial fulfilment of the requirement for the degree

Masters in Upper Limb Rehabilitation

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DECLARATION

I, Sarah Roberts, declare that the research project "Kinesio Taping® of the Metacarpophalangeal Joints and its effect on Hand Function in Individuals with Rheumatoid Arthritis" is my own work and has not been submitted in any form to any organisation or university. All sources that were used or quoted have been indicated by means of complete references.

Sarah Roberts

Date

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ABBREVIATIONS AND ACRONYMS

ADL – Activities of daily living

BREC – Biomedical Research Ethics Committee

cm - centimetre

ISOM – International Standards of Measurement

JP – joint protection

kg - kilogram

MCP – metacarpophalangeal

MHQ – Michigan Hand Outcomes Questionnaire

mm – millimetre

OT – Occupational Therapist

OTs – Occupational Therapists

PADCA – Pietermaritzburg and District Council for the Care of the Aged

PIP – proximal interphalangeal

RA – rheumatoid arthritis

ROM – range of motion

SPSS 22 - Statistical Package for Social Sciences version 22

TENS - transelectrical nerve stimulation

UKZN – University of KwaZulu Natal

VAS – Visual Analogue Scale

DEFINITION OF TERMINOLOGY

Kinesio Taping®

Kinesio Taping® was first developed by Kenzo Kase in 1973. It is a proprioceptive tape composed of polymer elastic strands and cotton fibers (Kase, Wallis, Kase, 2003). According to (Hancock, n.d.), the tape is thought to work in conjunction with the body's own ability to heal by providing stimulation through the sensory and mechanical receptors in order that the nervous system can adjust and organize effects of the tape on pain, stiffness, muscle contraction and tissue healing. Together with the properties of the tape and correct evaluation of the patient, the cut of the tape (eg I-strip, Y-strip – named for the likeness of the tape to the letter following cutting), direction of application of the tape and the stretch of the tape are all taken into consideration before applying the tape in order to create the therapeutic effect. In addition, one condition may require only one type of Kinesio Taping® Method or may require different types of taping as the therapeutic aims change (Kase et al, 2003).

Metacarpophalangeal joints

The joint between the phalanges and the metacarpals in the hand.

Rheumatoid arthritis

Rheumatoid arthritis is a "chronic systemic auto-immune inflammatory disorder" (Mennen & van Velze, 2008: 233). It is chronic in nature which causes inflammation to the synovium of the small joints and tendon sheaths in a symmetrical pattern with later secondary changes to the articular cartilage through formation of a pannus (Mennen & van Velze, 2008; Swanson, 1995a).

Elderly individuals

Individuals aged over 50 years of age.

Joint protection

Joint protection is defined as a "self-management approach for coping with pain and functional limitations in order to improve daily task and role performance. It includes the application of alternative working methods, balancing activity and rest and use of assistive devices" (Niedermann, Hammond, Forster & de Bie, 2010, p. 144). Research completed initially on a standard JP programme showed that this JP programme had a negligible impact on using the lessons learnt through the programme (Hammond & Lincoln, 1999).

Later research completed by Hammond and Freeman (2001; 2004) has shown that a JP programme incorporating practice of the skills taught does have an important role to play in maintaining functional ability. This educational-behaviour JP programme therefore includes written and photographic resources, information and definitions on RA and JP, verbal education incorporating different learning styles, self awareness of JP behaviour patterns and pain, demonstration and practice of JP skills (66%), use of assistive devices and goal setting over a total of eight hours (Hammond and Freeman, 2001).

ABSTRACT

Background

Rheumatoid arthritis (RA) is a chronic systemic disease that affects the hands bilaterally, resulting in inflammation, pain, joint instability, diminished grip strength and difficulties with function. The metacarpal joint (MCP) is commonly affected in the hand. The effectiveness of Kinesio Taping® on taping of the MCP joints has not been established in assisting with the symptoms in the hand.

Aim

To determine the effectiveness of bilateral Kinesio Taping® of the MCP joints on pain, range of motion, grip strength and hand function in elderly individuals previously diagnosed with RA.

Methods / Design

A repeated measure experimental design was used for the study over a seven week period with the experimental group (n = 30) receiving bilateral space correction Kinesio Taping® of the MCP joints and the control group (n = 31) participating in joint protection (JP) workshops. The Kinesio Tape® was worn for 3 days per week with four applications during the data collection process. For the control group, 2 hour JP educational-behavioural workshops were run weekly for four weeks. Weekly assessments were completed for grip strength, ulnar deviation and pain (VAS), and two pre-intervention assessments and one post-intervention assessment was completed for the Michigan Hands Outcomes Questionnaire (MHQ).

Results

Kinesio Taping® of the MCP joints has shown a significant decrease in pain (P=0.00) and range of motion (P=0.00 bilaterally). Joint protection was found to have a significant difference in grip strength and in the work and ADL sections of the MHQ.

No significant difference was found between groups after intervention in the majority of outcomes except for grip strength where a significant difference was found.

The level of significance was set at 0.05.

Discussion and Conclusion

This study has shown that Kinesio Taping® of the MCP joints is an effective conservative intervention that can be used to improve pain and MCP ulnar deviation in individuals with RA over a 4 week period. This is completed through a space correction application of three days, with the tape being reapplied weekly. Kinesio Taping® can be therefore included into Occupational Therapy standard practice especially when the aim is to decrease levels of pain in the MCP joint but it may not be effective to ensure a long term effect on pain.

Therefore, in order to ensure ongoing pain relief as well as to ensure maximum functioning in ADL, the taping should be used in conjunction with other therapy interventions as part of the total rehabilitation process. Further, Kinesio Taping® in conjunction with JP programmes would work effectively together to minimise pain and maximise participation in valued occupations, especially in the newly diagnosed client.

Further research into the use of Kinesio Taping® in people with RA is recommended.

Key words

Rheumatoid arthritis, hand, Kinesio Taping®, joint protection, rehabilitation

CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

This chapter provides an introduction to the research. It includes a statement of the problem being investigated, the background to the study and the purpose of the study. The significance of the research is presented in this chapter followed by an outline of the chapters written for this study.

1.2 BACKGROUND

Rheumatoid Arthritis (RA) is a chronic, autoimmune disorder globally affecting approximately 1% of the population with an increase in this prevalence seen with an increase in age (Abdel-Nasser et al cited in Symmons, Mathers & Pfleger, 2003; Woolf & Pfleger, 2003). Women are affected by RA twice as often as men (Abdel-Nasser et al cited in Symmons et al, 2003; Peltzer & Paswana-Mafuya, 2013; Woolf & Pfleger, 2003). A recent national study in South Africa conducted since 1998 has shown a prevalence of 27% self reported RA in older individuals (over 50 years of age) (Peltzer & Paswana-Mafuya, 2013). A diagnosis of RA is made when at least four of the criteria as defined by the American Rheumatoid Association (1987 cited in Mennen & van Velze, 2008) are met. Criteria include more than 6 weeks of presentation of symptoms: morning stiffness in joints; swelling in at least three areas; involvement of hand joints; rheumatic nodules; and bilateral symmetrical symptoms. In addition a serum rheumatoid factor and radiological evidence are included in the criteria.
With reference to the hand, it is reported that the metacarpophalangeal joint (MCP) is affected in 65% of individuals experiencing RA (Goosens, Heemskerk, van Tongeren, Zwinderman, Vliet-Vlieland and Huizinga, 2000). This joint is vital for adequate hand function but, due to deformities occurring in this joint, hand function is affected in individuals with RA (Alter, Feldon & Terrono, 2011). Aside from inflammation, joint tenderness and stiffness the MCP may present with deformities such as volar subluxation, dislocation and ulnar drift (Alter et al, 2011; Mennen & van Velze, 2008; Swanson, 1995b). Occupational Therapists (OTs) make use of various conservative interventions to influence the symptoms of RA (pain, grip strength, range of motion, fatigue and function). These interventions include splinting; exercise; treatment modalities; assistive devices; joint protection (JP) education and Kinesio Taping®. Minimal strong evidence is available for the use of these conservative interventions although OTs' practice and experience continues to support the use of these interventions (Beasley, 2011).

A variety of hand and finger splints is used to improve hand function through the treatment of pain and inflammation and the prevention of further joint deformity (Beasley, 2011; Beasley, 2012). Splints have been found to improve pain (immediately after splinting as well as over the long term) and grip strength (immediately following splinting) whilst dexterity is negatively affected by the splints (Steuljens, Dekker, Bouter, Schaardenburg, Kuyk & Van den Ende, 2003).

Hand function has been shown to improve when completing hand exercises that are aimed at improving strength, endurance and mobility (Lamb et al, 2014). This was research of a well designed and high quality nature that would provide motivation for therapists to look at their own clinical practice when using hand exercises for the treatment of individuals with RA (Opava & Björk, 2014).

Treatment modalities are used by therapists to improve pain, stiffness and inflammation (Beasley, 2011) but little evidence is available for the use of these modalities, especially the thermal modalities (Beasley, 2011; Beasley, 2012). One form of transelectrical nerve stimulation (TENS) has been found to assist with pain management (Brosseau, Yonge, Welch, Marchand, Judd, Wells & Tugwell, 2003).

The use and effectiveness of assistive devices, whilst widely used, has not been researched extensively (Beasley, 2011; Steuljens et al, 2003; Tuntland, Kjeken, Nordheim, Falzon, Jamtvedt, & Hagen, 2009).

JP programmes address how a person can self manage the symptoms that they are experiencing due to RA across their daily activities through the use of JP principles and energy conservation (Hammond, 2010). JP principles include respecting pain, balancing rest and activity, exercising in a pain free range of motion, reducing the amount of effort utilised, avoiding positions of deformity and making use of larger joints in activities (Beasley, 2011). Therapists are involved in not only facilitating the knowledge acquisition of these principles and information pertaining to the mechanics of RA, but are also involved in facilitating the utilisation of these principles in the long term by the person with RA. Therefore JP programmes have moved away from a didactic, educational approach to educational-behavioural group workshops whereby the emphasis is on long term application of the JP principles through observation, repetition and goal setting in order to increase the individual's belief that they can accomplish the tasks using the new principles learnt (Dures, 2012; Hammond, 1999; Hammond, 2013; Hammond & Freeman, 2001; Hammond & Lincoln, 1999a; Hammond & Lincoln, 1999b; Hammond, Bryan & Hardy, 2008; Iversen, Hammond &

Betteridge, 2010; Masiero, Boniolo, Wasserman, Machiedo, Volante & Punzi, 2007). Strong evidence on the effectiveness of JP programmes on function has been found for this type of JP programme (Steuljens, Bouter, Schaardenburg, Kuyk & Van den Ende, 2003).

A different therapeutic modality that has not been extensively researched in terms of its effectiveness in treating the symptoms of RA is that of Kinesio Taping®. Evidence generated in the use of Kinesio Taping® in other musculo-skeletal conditions has found that Kinesio Taping® decreases levels of pain, improves range of motion, facilitates muscles and increases function, all of which are outcomes identified in the research of interventions for RA. Although Kinesio Taping® is used in conjunction with other therapy interventions for the treatment of clients with RA in the upper limb, the evidence for this is often anecdotal and is reliant on the therapists' own experiences and knowledge around the topic (Taylor, O'Brien & Brown, 2014). Further research is required into the application and effectiveness of Kinesio Taping® in a person with RA.

1.3 PROBLEM STATEMENT

Evidence around the use of Kinesio Taping® for people with RA is predominantly anecdotal in nature and there is a lack of statistical evidence. Therapists making use of Kinesio Taping® for the symptoms of RA in the hand are basing their treatment on their own experience and knowledge of the application of the tape for other conditions. Therefore the current research will be conducted to determine whether Kinesio Taping® is effective in alleviating MCP joint symptoms in people with RA in order to understand whether it can be used as one of the conservative methods in the treatment of RA.

1.4 RESEARCH QUESTION

Research was conducted to ascertain whether Kinesio Taping® could influence the symptoms seen within RA in order to understand whether it could be used as one of the conservative methods in the treatment of RA in addition to JP programmes.

Therefore the research question is:
Is bilateral Kinesio Taping® of the MCP joints effective in reducing the symptoms of rheumatoid arthritis in the hand in elderly individuals (over 50 years of age) previously diagnosed with RA?

1.5 PURPOSE OF THE STUDY

The *aim* of this research study is:

- To determine the effectiveness of bilateral Kinesio Taping® of the MCP joints on pain, range of motion, grip strength and hand function in elderly individuals previously diagnosed with RA.

The *objectives* of the study include:

- To describe the demographic profile of participants in the study.
- To determine the effectiveness of bilateral Kinesio Taping® of the finger MCP joints on the pain experienced by elderly individuals previously diagnosed with RA.
- To determine the effectiveness of bilateral Kinesio Taping® of the finger MCP joints on MCP ulnar deviation in elderly individuals previously diagnosed with RA.
- To determine the effectiveness of bilateral Kinesio Taping® of the finger MCP joints on grip strength in elderly individuals previously diagnosed with RA.
- To determine the effectiveness of bilateral Kinesio Taping® of the MCP joints on hand function in elderly individuals previously diagnosed with RA.
- To compare the effectiveness of bilateral Kinesio Taping® of the MCP joints with JP workshops in elderly individuals previously diagnosed with RA.

1.6 SIGNIFICANCE OF THE STUDY

Kinesio Taping® is a treatment modality that has gained popularity by various disciplines including OTs. It is reportedly a convenient modality to use as a person can be taught the application of the taping (Coopee, 2011). In addition, previous research has indicated that no adverse effects to the tape have been noted, making it an easily tolerated intervention (Beasley, 2011). Whilst the tape may be used widely, there is little evidence in the literature to support the use of Kinesio Taping® in people with RA. Research has indicated that Kinesio Taping® may be effective in treating the symptoms of pain, range of motion, strength and function in other conditions. These symptoms are all experienced by people with RA. Therefore the current research will be conducted to determine whether Kinesio Taping® is effective in alleviating MCP joint symptoms in people with RA in order to understand whether it can be used as one of the conservative methods in the treatment of RA.

1.7 OUTLINE OF CHAPTERS

This research project is presented in 6 chapters:

Chapter 1 provides the reader with an orientation to the research and an overview of the chapters included in the research.

Chapter 2 identifies and analyses literature in two main themes viz. rheumatoid arthritis (prevalence, definitions, stages and pathomechanics); and the different kinds of conservative treatment methods used by OTs for individuals with rheumatoid arthritis. This second theme includes splinting, exercise, treatment modalities, JP programmes and Kinesio Taping®.

The methodology used in this research project is discussed in Chapter 3. This chapter therefore includes information on the research design, setting and procedure for data collection. This includes a discussion on the instrumentation used to collect data on pain, grip strength, MCP ulnar deviation and hand function. The two methods and procedures used for the interventions (Kinesio Taping® and JP workshops) are then outlined. Finally, ethical considerations for safety are presented.

The findings of the research are presented in Chapter 4 with specific emphasis being placed on the effectiveness of Kinesio Taping® on pain, ulnar deviation, grip strength and hand function in individuals previously diagnosed with RA. Information on the characteristics of the sample is presented with reference to the experimental and control groups. Any improvements over time are commented on for each outcome assessed with the level of significance being set at P = 0.05.

Chapter 5 provides a discussion of the findings with regard to the current literature and evidence as provided in Chapter 2. Emphasis is placed on results that showed a significant difference i.e. pain and MCP ulnar deviation in the experimental group and grip strength and performance in work and ADL in the control group.

Chapter 6 provides a brief summary of the research study with a discussion on the implications for practice for OTs. Limitations and recommendations of the research are presented in this chapter.

1.8 CONCLUSION

This chapter has presents an introduction and overview of this study with regard to the background for the need of the study as well as the significance of the results found in the study.

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

This chapter begins with situating the literature in terms of defining rheumatoid arthritis (RA) and detailing the prevalence of RA in South Africa. Following this, the pathomechanics and the stages of RA are discussed, leading into the changes that occur in the metacarpophalangeal (MCP) joints and the symptoms that a person with RA may experience in these joints. Literature on conservative interventions that influence joint pain, stiffness and hand function in RA are briefly reviewed. These include joint protection (JP) programmes, splints (resting splints and finger splints), exercise, treatment modalities, assistive devices and Kinesio Taping®.

2.2 RHEUMATOID ARTHRITIS

2.2.1 *Prevalence of Rheumatoid Arthritis*

Woolf and Pfleger (2003) and Abdel-Nasser et al cited in Symmons, Mathers and Pfleger (2003), reported that the prevalence of RA in European and American countries is approximately 1% with an increase in prevalence with age until the age of seventy where the prevalence figures then decline. In a national study conducted in South Africa, a prevalence of 27% of self reported RA was found for the age groups above 50 years of age (Peltzer & Paswana-Mafuya, 2013). RA affects women to men in a 2:1 (Abdel-Nasser et al cited in Symmons et al, 2003; Woolf & Pfleger, 2003; Peltzer & Paswana-Mafuya, 2013).

Although studies have been completed in South Africa, namely in Lesotho (Moolenburgh, Moore, Valkenburg & Erasmus, 1984; Moolenburgh, Valkenburg & Fourie, 1986), Soweto (Solomon, Robin & Valkenburg, 1975) and Phokeng (Meyers, Daynes & Beighton, 1977), these studies have been completed in isolated communities with varying degrees of medical intervention between the years of 1975 and 1986. McGill (1991) reports that although these studies have a small sample size, their results can be merged and adjusted for age in order to obtain a more accurate rate of 0.7%. Due to differing prevalence rates being identified in specific South African communities (i.e. 3.3% in Soweto and 0.87% in rural Tswane), it is postulated that the prevalence may be higher in urban areas (Symmons et al, 2003; Moolenburgh et al, 1986). In a recent systematic review of RA in Africa (Bowman, Campbell, Zgaga, Adeloye & Yee Chan, 2012) it is recommended that further studies need to be conducted in Africa as the research indicated that there is a possibility of a higher prevalence rate than previously reported.

2.2.2 ***Defining Rheumatoid Arthritis***

RA is a "chronic systemic auto-immune inflammatory disorder" (Mennen & van Velze, 2008, p. 233). The American Rheumatoid Association (1987) as cited in Mennen and van Velze (2008, p. 233) has revised the diagnostic criteria for RA of which at least four of the criteria must be present for a diagnosis to be made:

"1. Morning stiffness (duration > 1 hour lasting > 6 weeks)
2. Arthritis of at least three areas (soft-tissue swelling lasting > 6 weeks)
3. Arthritis of hand joints (wrist, MP joints, PIP joints > 6 weeks)
4. Bilateral symmetrical arthritis (at least one area lasting > 6 weeks)
5. Rheumatic nodules
6. Serum rheumatoid factor
7. Radiological changes (erosions and osteopenia)"

2.2.3 ***Stages of RA***

RA can be divided into four stages during the progression of the disease. The following stages are described by Beasley (2011):

Stage One is the early stage where there is acute inflammation with "joint swelling, heat, redness and the pain is most severe" (Beasley, 2011, p. 1330). There are no destructive changes of the joints as yet but there is osteopenic bone.

In Stage Two there is tenosynovitis and the beginning of the invasion of the synovium into the soft tissues causing a decrease in mobility of the joints. There is no narrowing of the joint spaces and at this stage there is no evidence of obvious deformities. This is the subacute stage.

Stage Three is the stage of severe destruction where there are deformities evident and there is joint, bone and cartilage destruction.

Finally there is Stage Four which is the chronic stage. At this stage there is total joint disorganisation, joints are ankylosed and there is evidence of severe deformities.

2.2.4 ***Pathomechanics of Deformities in Rheumatoid Arthritis***

The joint damage, destruction and joint deformities, are caused by the interaction between the rheumatoid synovium and the normal tissues surrounding and within the joints (Alter et al, 2011). By definition synovium is "the membrane that lines the joint capsule" (Alter et al, 2011, p. 1321) but this synovium goes through various changes as the disease progresses. Initially the circulation of blood through the synovium is hindered and the endothelium swells. This is followed by the cells in the synovium proliferating and thickening with an infiltration of plasma cells, lymphocytes and neutrophils (Alter et al, 2011). Enzymes formed by these

cells cause cartilage and bone invasion, remodelling and destruction with the synovium forming a pannus, a granulomatous mass (Alter et al, 2011; Swanson, 1995a). In addition, increased fluid is secreted into the joint space, resulting in stretching of the joint capsule and surrounding joint tissues with resultant joint instability (Alter et al, 2011). The synovium can also infiltrate tendon tissues, either causing damage to the tendon itself or to the surrounding tissues which ultimately leads to tendon rupture (Alter et al, 2011). This can result in an imbalance in the biomechanics of the hand (Swanson, 1995b). The typical RA deformities seen in the hand are ultimately caused through the damage caused by the synovium to the cartilage, bone, ligaments and tendons surrounding the joints (Swanson, 1995b).

2.2.5 ***Rheumatoid Arthritis in the Metacarpophalangeal Joints***

The MCP joint is affected in 65% of individuals experiencing RA (Goosens et al, 2000) with the MCP joint being the most significant joint in the fingers for functioning (Alter et al, 2011). Therefore rheumatic disease in this joint results in both deformity and loss of function. Deformities usually seen in the MCP joint include volar subluxation, dislocation and an ulnar drift (Alter et al, 2011; Mennen & van Velze, 2008; Swanson, 1995b). Alter et al (2011) describe how the changes occur in the MCP joint:

Changes in the MCP joint can be caused through synovitis in the MCP joint itself, deformities in the wrist, an imbalance between flexion and extension tendons, intrinsic muscle tightness and a combination of all of these factors. Synovitis in the MCP joint causes stretching of the joint capsule, the collateral ligaments and the sagital band, thereby diminishing joint stability. In addition this stretching affects the ligaments securing the central tendon to the volar plate and the central tendon works less efficiently. Additionally, the changes in the wrist decrease the efficiency of the wrist extensors with a resultant imbalance in the functioning of the intrinsic muscles. The intrinsics therefore have a greater force of pull to the extrinsic extensors causing flexion of the MCP joints resulting in the intrinsic plus position. These factors, together with inflammation in the muscles themselves, work together causing a tightness of the intrinsic muscles. As all these factors cause further imbalances, the MCP joint subluxes in a volar direction. Stretching of the collateral ligaments also causes a shift of the A2 pulley in a volar and ulnar direction which further contributes to the MCP deformities. Changes in the wrist cause radial deviation of the metacarpals. This causes an increased tendency for the MCP joints to ulnar deviate and, additionally, the extensor tendons are pulled in an ulnar direction. Together with the laxity in the ligaments around the MCP joint, the ulnar deviation in the MCP joint is unopposed.

2.3 CONSERVATIVE REHABILITATION INTERVENTIONS FOR RHEUMATOID ARTHRITIS

Aside from pharmacological intervention, various conservative treatment modalities and techniques have been researched attempting to influence joint pain, muscle strength stiffness and hand function. These have included amongst others, splints (resting splints and finger splints), exercise, treatment modalities, assistive devices, JP programmes and Kinesio Taping®. Each of these will be discussed below.

2.3.1 *Splinting*

Depending on the phase of RA splints are used for pain relief, to decrease inflammation, to support the joints and improve stability at the joint, to prevent further deformities and to improve function (Beasley, 2011; Beasley, 2012). Various splints are used in the treatment of RA including resting splints, Mallet finger splints, Boutonniere splints, Swanneck deformity splints, exercise splints and splints post surgery (Beasley, 2011; Bradley & Adams, 2013). Evidence from research into the effectiveness of splinting for RA in the hand and fingers is limited with minimal evidence showing an improvement in pain and function (Beasley, 2012; Egan et al, 2001). However, Steuljens' et al review (2003) found definitive evidence for the use of splints to improve pain and grip strength. Further high quality research is indicated in this area particularly as "expert opinion and practice clearly supports" the use of splinting in individuals with RA (Beasley, 2011, 1334).

2.3.2 *Exercise*

Hand exercises are used by therapists in order to address muscle atrophy, poor grip strength, decreased range of motion and poor hand function (Wessel, 2004). Two systematic reviews (Bergstra, Murgia, Velde, Caljouw, 2014; Wessel, 2004) demonstrated little statistical evidence to support the use of exercise with RA. Bergstra et al (2014) indicate that the research analysed collectively in their study shows that exercise may improve hand strength and function. Due to this low level of evidence available, a large randomised controlled trial incorporating an end sample size of 438 participants with RA was completed in the United Kingdom (Lamb et al, 2014). Overall hand function was found to significantly improve through this stretching and strengthening programme (Lamb et al, 2014).

2.3.3 ***Treatment Modalities***

A variety of modalities (heat, cold, ultrasound, transelectrical nerve stimulation (TENS) and laser) are used in RA in order to assist with pain management, stiffness and inflammation (Beasley, 2011). Little evidence is available for the use of thermal modalities (Beasley, 2011; Beasley, 2012) but a systematic review of the use of the TENS on RA found that acupuncture-like TENS assists with pain management but that individuals with RA often find the actual stimulation uncomfortable (Brosseau et al, 2003).

2.3.4 ***Assistive Devices***

Although Occupational Therapists (OTs) frequently recommend assistive devices for people with RA in order to improve or maintain function, there is insufficient evidence for the use of assistive devices in the treatment of RA (Beasley, 2011; Steuljens et al, 2003; Tuntland, Kjeken, Nordheim, Falzon, Jamtvedt, & Hagen, 2009). Further research into the effectiveness of assistive devices for people with RA is needed.

2.3.5 ***Joint Protection***

JP is defined as a "self-management approach for coping with pain and functional limitations in order to improve daily task and role performance. It includes the application of alternative working methods, balancing activity and rest and use of assistive devices" (Niedermann, Hammond, Forster & de Bie, 2010, p. 144). It uses ergonomic principles throughout all activities of daily living (ADL) (Hammond, 2010). As such it is an education program and does not include the use of splinting as this is described and considered as a different conservative treatment.

The JP principles as defined by the College of Occupational Therapists (2003) can be summarised into 5 areas: respecting pain; balancing rest and activity; exercising in a pain free range of motion; reducing the amount of effort utilised; avoiding positions of deformity; and making use of larger joints (Beasley, 2011). As such JP education usually comprises of information sharing on defining RA, RA stages and the pathomechanics and deformities of RA. Following this, information on energy conservation, ergonomic changes, assistive devices and JP principles are discussed. Traditionally, JP has included a didactic educational session where information on RA is presented either in a group or individually, and possibly a written brochure is given. Although this knowledge is vital and can be imparted and retained through educational programs (Barry, Purser, Hazleman, McLean & Hazleman, 1994; Cartlidge, Higson & Stent, 1984; Grønning, Skomsvoll, Rannestad & Steinsbekk, 2012; Hammond, 1994; Hammond, 2013; Hammond & Lincoln, 1999b), in order for an impact to be made on a person's functioning and on the symptoms that they may be

experiencing, long term adherence to JP principles is required. This can be achieved through educational-behavioural JP programmes (Dures, 2012; Hammond, 1999; Hammond, 2013; Hammond & Lincoln, 1999a; Hammond & Lincoln, 1999b; Hammond & Freeman, 2001; Hammond, Bryan & Hardy, 2008; Iversen et al, 2010; Masiero et al, 2007). Educational- behavioural JP workshops are based on Bandura's theory of social learning as well as the Health Belief Model (Hammond, 2013). Both Bandura's theory and the Health Belief Model incorporate feelings of self efficacy i.e one's own belief in being able to accomplish a behaviour (George & Tanner, 2014; Hammond, 2013). The Health Belief Model evaluates perceived health threats / barriers against perceived benefits of completing the new behavioural change (George & Tanner, 2014; Pasma, van't Spijker, Hazes, Busschbach & Luime, 2012). Bandura cited in Woolfolk (2007) highlighted four important elements with regard to social learning specifically regarding self efficacy: observation of other individuals' behaviour; being able to remember this behaviour verbally or through visual representation; translating this remembered behaviour into action; and having the motivation to carry out the new behaviour. Therefore educational-behavioural JP workshops should include teaching of:

> self-management skills; repeated demonstrations; simplification and repetition of information; modelling (watching others similar to oneself perform the actions); supervised practice and feedback over several sessions to enhance skill development; and the setting of goals and homework programmes to facilitate incorporating these into daily life (Hammond & Lincoln, 1999b, p. 399).

In order to be able to complete these types of educational-behavioural JP workshops, a group workshop needs to be conducted.

Integral to JP programmes is that a person with RA is a vital member of the team – they need to have full knowledge about the disease, treatment and long term prognosis and care. This needs to be achieved through a multidisciplinary approach including occupational therapists (OTs), physiotherapists, psychologists, dieticians, social workers, medical practitioners and arthritis organisations (Alderson, Starr, Gow & Moreland, 1999; Dures, 2012.). In addition, the person needs to be ready to make lifestyle changes and it is therefore not always opportune to begin JP programmes in the newly diagnosed person (Freeman, Hammond & Lincoln, 2002). Pain, stiffness, function and grip strength have all been shown to be improved through these workshops, especially over time – from six months to four years (Alderson et al, 1999.).

2.3.6 *Kinesio Taping®*

Kinesio Taping® was first developed by Kenzo Kase in 1973 and has evolved since this time. It is a proprioceptive tape composed of polymer elastic strands and cotton fibers (Kase et al, 2003).

The properties of the tape used in this research project, Kinesio® Tex Gold™ (hereafter named the tape), have been described by Coopee (2011) and Kase et al (2003). The thickness of the tape is set to mimic the thickness of the epidermis of the skin. Theory described for the required thickness is that this will not cause unnecessary sensory stimuli through the weight of the tape. It is reported that the person wearing the tape will not be aware of the tape following ten minutes of wear. The tape allows for evaporation of body moisture and rapid drying due to the cotton fibres. In addition it is coated in paraffin so as to limit the amount of water absorption. The adhesive is designed in a wave pattern to mimic qualities of fingerprints. This is envisaged to aid in lifting the skin. In addition the wave-like pattern allows the skin to breathe and also allows for evaporation of body moisture. The polymer elastic fibres run longitudinally with a stretch of up to 55-60% of the resting length, mimicking the elastic capabilities of the skin. There is no horizontal stretch. These elastic fibres last for approximately three to five days. The tape is latex free and the adhesive is 100% acrylic thereby ensuring less allergenic properties.

According to (Hancock, n.d.), the tape is thought to work in conjunction with the body's own ability to heal by providing stimulation through the sensory and mechanical receptors in order that the nervous system can adjust and organize effects of the tape on pain, stiffness, muscle contraction and tissue healing.

Together with the properties of the tape and correct evaluation of the patient, the cut of the tape (for example the I-strip, Y-strip, X-strip, fan-strip – named for the likeness of how the tape has been cut to the relevant letter – **Figure 2.1**), direction of application of the tape and the stretch of the tape are all taken into consideration before applying the tape in order to create the therapeutic effect. In addition, one condition may require only one type of Kinesio Taping® Method or may require different types of taping as the therapeutic aims change (Kase et al, 2003).

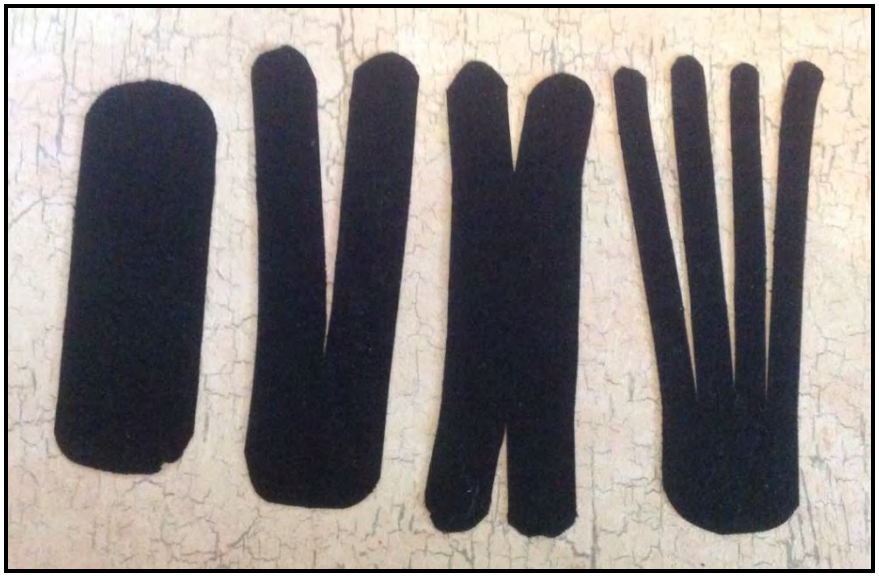

Figure 2.1 Cut of the tape - I-strip, Y-strip, X-strip, fan-strip

Physiological effects of the application of the tape have been defined by Coopee (2011) and Hancock (n.d.) on the skin, muscle, joints, fascia and the circulatory and / or lymphatic system. Cutaneous receptors in the skin include mechanoreceptors, thermoreceptors and nociceptors. Stimulation of these receptors causes different responses in the nervous system, depending on the type and intensity of the stimulus. Application of the tape to the skin and these receptors provides a low intensity stimulus which is postulated to have a reduction on pain. Short term pain relief has been found in shoulder impingement as well as in medial epicondylitis as well as in injuries affecting the neck, back, knees and ankles (Anandkumar, Sudarshan & Nagpal, 2014; Bae, Lee, Oh & Kim, 2013; Campolo, 2013; Djordjevic, Vukicevic, Katunac & Jovic, 2012; Donec & Kriščiūnas, 2014; Gonzales-Iglesias, 2009; Kalichman, Vered & Volchek, 2010; Karatas, Bicici, Baltaci & Caner, 2012; Kaya, Zinnuroglu & Tugcu, 2011; Kuru, Yaliman & Dereli, 2012; Paoloni et al, 2011; Saavedra-Hernández, Arroyo-Morales, Cleland, Lara-Palomo & Fernández-de-Las-Peñas, 2012; Simsek, Balk, Suner, Keklik, Ozturk & Elden, 2013; Taylor, O'Brien & Brown, 2014; Thelen, Dauber & Stoneman, 2008).

Similarly, Golgi tendon organs (receptors found in the musculotendinous junctions) are stimulated through the application of the tape. Depending on the direction of pressure away or towards these receptors, inhibition or facilitation of the muscle can be stimulated. With regard to taping to facilitate muscle activity, research indicated that increased muscle activity was obtained between 24 and 72 hours whilst a decrease in muscle activity was noted on the 4th day of wearing the tape (Slupick, Dwornick, Bialoszewski & Zych, 2007). Improvements in muscle strength have been noted in taping of injuries to the elbow,

shoulders and knees (Anandkumar et al, 2014; Hsu, Chen, Lin, Wang & Shih, 2009; Mousavi & Khayambashi, 2011). In terms of improving grip strength in hands, discrepancies are found as to the effect of Kinesio Taping® in healthy participants. Fratocchi, Mattia, Rossi, Mangone, Santilli and Paoloni (2011) found that Kinesio Taping® over the biceps brachii improved eccentric elbow torque. Kuo and Huang (2013) found that applying Kinesio Tape® in different directions according to the muscle's origins and insertions plays a role in the effect of Kinesio Taping® on muscle strength in the wrist and fingers. Lee, Woo and Lee (2010) found that Kinesio Taping® of the flexor muscles in the forearm increased grip strength, whilst Merino-Marban, Mayorga-Veg and Fernandez-Rodriguez (2012) found no changes in grip strength when the flexor muscles were taped. However, Mohammadi et al (2014) found that increased grip strength was found following Kinesio Taping® of the extensor muscles of the forearm specifically ½ an hour after taping in men and 1½ hours following taping in women.

When taping around joints, both pain receptors and proprioceptors are stimulated in order to increase support to the ligament and muscular structures working on that joint, thereby aligning the joint, reducing pain and improving range of motion. Kinesio Taping® is also used to assist in the alignment of the fibres in fascia order to increase mobility of tissues and reduce joint stiffness. Kinesio Taping® has been seen to improve range of motion in the following conditions: shoulder impingement, post knee surgery, patellofemoral pain syndrome, musculoskeletal pain in lower back, whiplash, mechanical neck pain and sub-acute lateral ankle sprain (Djordjevic et al, 2012; Donec & Kriščiūnas, 2014; Gonzales-Iglesias, 2009; Karatas et al, 2012; Kuru et al, 2012; Saavedra-Hernández et al, 2012; Simsek et al, 2013).

Finally, Kinesio Taping® is used through a different technique to lift the skin, thereby creating wrinkles in the skin and therefore channels in the underlying tissue. These channels assist with lymphatic drainage as areas of differing pressure are created to move the lymph. In addition, the pressure of the tape does not block the lymphatic system and, as well as creating channels, it stimulates the lymphatic system through the movement of the tape on the skin as it moves within its elastic properties. Deeper lymphatic drainage can be stimulated through facilitation of muscle contraction through use of the tape.

Whilst Kinesio Taping® can have an effect in each of the above areas mentioned above, once applied it will have effects on the other tissues or structures as these tissues are closely related and often interconnected. By using different applications of the tape a

greater influence can be gained in one area over the others. Therefore two main types of Kinesio Taping® are identified: basic application and corrective taping (Kase et al, 2003).
Basic taping involves taping the muscles involved in order to either offload (inhibit) or facilitate the muscle through stimulating the Golgi tendon organs (Kinesio Taping® Association International, 2011).
A variety of corrective taping methods can be used in order to improve tissue functioning following injury / damage. Mechanical corrective taping and facial corrective taping work on either facilitating correct alignment of soft tissue and joints or through blocking these tissues to limit movement. Once the relevant tissue has been placed in its correct alignment or the alignment required in order to minimise further tissue damage, adaption of the surrounding tissues can occur to the stimulation. Ligament / tendon correction is completed through increasing stimulation of the mechanoreceptors through placement of the tape over a ligament or tendon, thereby increasing the proprioceptive input to these tissues. Functional correction is completed in order to either assist or limit a motion through the sensory input to the mechanoreceptors. One motion is assisted whilst the reciprocal motion is resisted at the end of its range. Space correction and lymphatic correction both work through lifting the skin in order to create space either to relieve pressure over the pain receptors or to allow for the creation of channels for lymphatic drainage.

Drouin, McAlpine, Primak and Kissel (2013) completed a literature synthesis, and Csapo and Alegre (2014) a meta-analysis, both investigating the use of Kinesio Taping® across research conducted in healthy participants. These researchers indicated that Kinesio Taping® does not significantly affect muscle strength (regardless of muscle group being investigated) or athletic performance in healthy participants. Five systematic reviews around musculoskeletal conditions all indicated that there is not sufficient evidence for the use of Kinesio Taping® over other therapeutic modalities (Basset, Lingman & Ellis, 2010; Kalron & Bar-Sela, 2013; Kiebzak et al, 2012; Morris, 2013; Mostafavifar, Wertz & Borchers, 2012; Parreira, 2014). These systematic reviews report that no research has found adverse effects to Kinesio Taping®

Of high relevance to this research project is research conducted by Szczegielniak, Łuniewski, Bogacz and Śliwiński (2012) into the use of Kinesio Taping® in RA. Forearm taping with exercise improved hand strength in the participants and, in addition, the Kinesio Taping® group showed improvement in speed of hand function. Another relevant research project, a randomised controlled trial, showed a significant improvement in isokinetic torque and pain for the experimental group (Kinesio Taping®) versus the control group (sham taping) in participants with knee osteoarthritis (Anandkumar et al, 2014).

2.3.6.1 *Contraindications and Precautions for the use of Kinesio Taping®*

Kinesio Taping® should not be used in people with the following medical conditions / symptoms (Kinesio Taping® Association International, 2011):

- malignancy
- cellulitis
- open wounds
- infection
- deep vein thrombosis

Due to the elastic properties in the tape, circumferential Kinesio Taping® is not indicated or used for any condition as it may constrict circulation (Dynamic Tape Sales Handbook, 2011). Precautions in using Kinesio Taping® are similar to precautions in using physical agents in therapy. As Kinesio Taping® increases blood flow there are conditions in which it should be avoided. As it has been shown that severe extra-articular manifestations can lead to an increase in cardiovascular disease (Turesson, McClelland, Christianson & Matteson, 2007), participants with severe extra-articular manifestations would need to be excluded from the sample. This would include those experiencing any form of vasculitis, congestive heart failure, pericarditis, myocarditis, ischaemic heart disease, pleuritis, Felty's syndrome, polyneuropathy, mononeuropathy, scleritis, episcleritis and glomerulonephritis. In deep vein thromboses there is a possibility that the tape can cause blood clots to break free and travel to one of the vital organs, which could be fatal. In renal insufficiency the kidneys are unable to properly process body fluids and the tape could cause an increase in blood circulation and lymphatic drainage to an already failing organ. This is the same as in the case of congestive heart failure. In infections and cancer, the increased circulation and increased efficient movement of fluids throughout the body can encourage the spread of the infection or cancer cells. There has not been any research into circulatory constrictions in individuals without the above mentioned conditions. Research has shown that the tape increases the volume of peripheral blood flow in individuals with pathology (Kase & Hashimoto, 1998).

In addition Kinesio Taping® should be used with precaution in the following conditions (Kinesio Taping® Association International, 2011):

- pregnancy
- kidney disease
- congestive heart failure
- fragile skin

2.4 CONCLUSION

RA is a chronic disorder that affects a person's functioning in their activities of daily living. The MCP joint is vital for a person's functioning but the incidence of joint involvement for the MCP joint is high. Instability and joint damage in the MCP joints can cause further difficulties in the hand of a person with RA. Depending on the stage of RA a person can experience pain, inflammation, stiffness and poor grips strength. In order to improve these hand impairments and, in turn, hand function for a person with RA various conservative interventions are used by OTs which include splinting, exercise, modalities, JP programmes and Kinesio Taping®. Research into many of these conservative interventions shows an improvement in pain but further empirically sound research projects need to be conducted in order to support positive observations and outcomes found in clinical practice.

CHAPTER 3 METHODOLOGY

3.1 INTRODUCTION

This chapter will discuss the methodology used in the research including the research design and setting. The sample size is outlined with reference to the recruitment, allocation and fallout of participants. The instrumentation used in the research is discussed in terms of the rationale for the use of the instruments as well as a description of each instrument used. Following this, the process of the data collection is detailed according to the pilot study, experimental group and control group. Data management and description of data analysis is included with the chapter ending with the ethical considerations followed during the research.

3.2 RESEARCH DESIGN

A repeated measure, experimental design was used for the study over a seven week period. The experimental group received four applications of Kinesio Taping® and the control group received four joint protection (JP) workshops. Three pre-test measures and four post test measures were conducted on a weekly basis, measuring ulnar deviation, grip strength and pain. In addition, participants completed a subjective measure on weeks one, three and seven. The control group received an intervention in accordance with the ethical considerations governing the Occupational Therapy profession, which states that new therapeutic techniques need to be compared with interventions that have already been proven to be effective (Health Professions Council of South Africa, 2008). The experimental group did not receive JP workshops because any statistical difference found with Kinesio Taping® and JP workshops completed together compared with JP workshops alone, would not have indicated the effectiveness of Kinesio Taping®, but would rather have been conclusive of the combination of therapeutic interventions.

3.3 RESEARCH SETTING

Due to the high prevalence rate of RA in adults over the age of 80 years, as opposed to the prevalence of all age groups (see **Section 2.2.1**), the sample was drawn from seven Retirement Facilities in Howick and Pietermaritzburg in the Midlands of KwaZulu-Natal (for confidentiality purposes, these are named Facility A – G) i.e. convenient sampling of the Retirement Village occurred. The retirement facilities ranged from 32 residents to 1200

residents. One facility is entirely for independent living, one for residential care whilst the remaining facilities offer Independent Living in addition to other facilities (**Table 3.1**).

Table 3.1 Retirement Facilities included in the sample

Retirement Facility	Description	Total number of residents	Sample size obtained
Facility A	Independent living cottages as well as a frail care facility (89).	+/- 1200 residents	34
Facility B	Independent living units with midcare and frail care units available.	250	2
Facility C	Offers residential care, frail care, psycho-geriatric or respite care.	162	6
Facility D	Independent living facilities (rooms and cottages) as well as a frail care facility and midcare facility.	132	2
Facility E	Independent living cottages.	375	8
Facility F	Residential care unit.	32	4
Facility G	Independent living cottages as well as a frail care facility.	650	8

Three of the retirement facilities fall under the Pietermaritzburg and District Council for the Care of the Aged (PADCA) which is a non-profit organisation offering services to the aged within their facilities as well as within the greater Pietermaritzburg community. As such PADCA is a recognised organisation working with the aged and, by working through the CEO of PADCA, linkages with the Matrons of the PADCA facilities was more effective which assisted with the recruitment of participants as well as with the data collection (Stoy et al, 1995).

By including only retirement facilities within Howick and Pietermaritzburg, similar weather patterns were ensured amongst the participants. This was important as it has been shown that the weather may affect pain in certain individuals who have been diagnosed with RA (Smedslund & Hagen, 2011).

3.4 ETHICAL CLEARANCE

Following provisional ethical clearance from the University of KwaZulu Natal's Biomedical Research Ethics Committee (BREC) dated 29 April 2013 (**Appendix 1**), the Nursing Matrons in each retirement facility were approached in order to obtain information on the correct procedure necessary to obtain permission to participate in the study. Either the Chief Executive Officer or the Director of the Board for the retirement facility was approached verbally and in writing and they thereafter supplied written letters of permission (**Appendix 2**). Final ethical clearance (BFC183/12) (**Appendix 3**) was obtained from BREC or each retirement facility on the following dates:

- Facilities A and B – 22 August 2013
- Facilities C and D – 16 May 2014
- Facilities E, F, G - 7 August 2014

Recertification of the final ethical clearance was obtained on the 22 August 2014 (**Appendix 4**).

3.5 SAMPLING

3.5.1 *Participant Recruitment*

Following recommendations provided by the Matrons of each Retirement Facility, potential participants were identified either by the Matron, through the use of a newsletter / facility communicator or through the use of both means. In addition, in four of the Retirement Facilities, participants recommended further individuals for participation.

Table 3.2 Recruitment means for each Retirement Facility

	Identified by Matron	**Recruited through newsletter / facility communicator**	**Identified by Matron and recruited through newsletter**
Retirement Facility	B, C, D, F	A	E, G

Participants were then approached either by the Matron or by the principal researcher in order to ascertain the individual's willingness to participate in the research. In one Retirement Facility an information session was requested by the Matron. All potential participants attended this session where information regarding the research was presented and individual appointments were made with those individuals who indicated that they were willing to participate in the research.

3.5.2 *Informed Consent*

The following procedure was followed for each individual who indicated that they were willing to participate in the research:

- The research was discussed with each potential participant
- A written information letter was given to each potential participant outlining the purpose of the research and the research process. Information was given on voluntary participation, while confidentiality of information outside of the research process and anonymity of the participants was assured at all times. All participants were given the principal researcher's contact details as well as the principal researcher's supervisors' contact details should they have had any queries regarding the research process (**Appendix 5**).

3.5.3 *Sample Size*

Purposive sampling was conducted through the use of a screening questionnaire to identify those meeting the inclusion criteria (**Appendix 6**). Exclusion and inclusion criteria were identified as follows:

Inclusion criteria for the sample were:

- People with previously diagnosed RA of the hand
- People experiencing pain in their hands due to RA

Exclusion criteria were identified as the following.

- Past / anticipated surgery to MCP
- PIP fixed deformities
- Ongoing conservative interventions to the hand, for example physiotherapy
- Participation in a different clinical trial for RA
- Previous involvement in a JP programme or use of joint protection principles
- Poor comprehension / literacy
- Severe cognitive impairment
- People with hemiplegia
- Other conditions affecting the MCP joints eg Dupuytrens / previous major hand trauma
- Osteoarthritis of the hand
- Extra- articular manifestations of RA - vasculitis, congestive heart failure, pericarditis, myocarditis, ischaemic heart disease, pleuritis, Felty's syndrome, polyneuropathy, mononeuropathy, scleritis, episcleritis and glomerulonephritis

- Contraindications as outlined for Kinesio Taping® i.e. malignancy, cellulitis, open wounds on the hands, infections, deep vein thrombosis, kidney disease, congestive heart failure conditions

From previous studies of therapeutic intervention on RA, as well as KT research, research samples range from 20 - 110 participants.

Sample size also needs to be considered in terms of the instruments to be used, one of which is the Michigan Hand Outcomes Questionnaire (MHQ) (**Section 3.6.2.3**). According to the MHQ, a minimum of 75 patients per diagnosis should be used in order to gain the mean MHQ score with a 95 % confidence interval which will allow a power rating of 0.80 for group comparison (Chung, Pillsbury, Walters & Hayward, 1998).

Another consideration in the sample size is that of experimental mortality. Hammond and Freeman (2001), in a study size of 127 participants over a two year period reported a 4% fallout before intervention began. This will therefore be taken into consideration in the calculation of the sample size and additional participants will be included to allow for any fall out.

A minimum of 15 participants is required when comparing two research groups i.e. control versus experimental group (Maree & Pietersen, 2007).

Taking all of the above into consideration, including financial, time and logistical constraints, a sample size of 64 participants was recruited. As this sample size may not meet the effect size for the Michigan test, it could thus impact upon statistical conclusion validity and this will be taken into account when interpreting the data.

A total of 80 potential participants were identified. Seven participants did not meet the inclusion criteria and nine individuals declined to participate. Therefore a total of 64 participants were obtained for the sample. Retirement facility A was able to identify 34 participants (initially 32 with later a further 2 being added) and therefore, out of convenience, the initial 32 participants formed the control group (JP workshops). The remaining 2 participants from this retirement facility as well as all participants from the other retirement facilities (B – G) (30) were included in the experimental group (Kinesio Taping®). Therefore each group had a total of 32 participants. In the experimental group one participant withdrew before the intervention began as she began to experience a severe flare-up. Another participant withdrew from the experimental group following four weeks of data

collection as she found the intervention too cumbersome. In the control group one participant withdrew due to his spouse being unwell. Therefore 30 participants completed the data collection in the experimental group and 31 participants completed the data collection in the control group. All participants in the experimental and control groups completed a background information form prior to the beginning of the data collection process (**Appendix 7**).

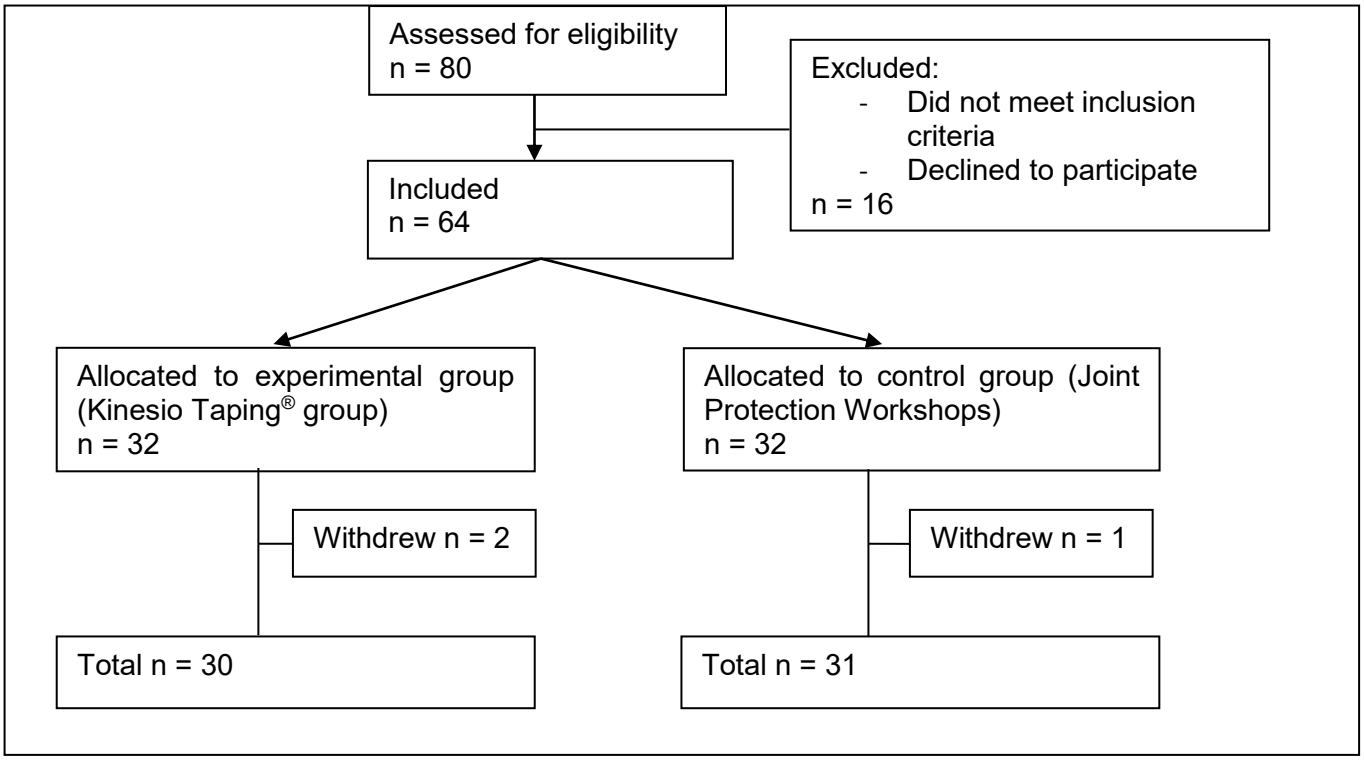

Figure 3.1 Flow diagram of sample size

3.6 INSTRUMENTATION

In this section the rationale behind the choice of the data collection instruments is discussed, followed by a more detailed scrutiny of each instrument chosen for the data collection.

3.6.1 *Rationale behind the Choice of Data Collection Instruments*

RA has been frequently measured through the use of hand impairments such as range of motion, pain and grip strength. Eberhardt, Sandqvist and Geborek (2008) recommend that hand function, necessary for ADL, needs to be assessed through a functional measure as the impairment measures do not fully reflect their impact on the person's functioning in daily life. This may be due to the fact that the authors defined hand function as a combination of the joint integrity, strength of muscles working on joints on the hand and coordination rather than impairments working in isolation (Eberhardt et al, 2008). Adams, Burridge, Mullee,

Hammond and Cooper (2004) indicate this reasoning as they found that grip strength and pain are both indicators of rheumatoid disease activity. In addition, grip strength is strongly correlated with upper limb ability but the measurement of ulnar deviation has a poor correlation with upper limb functional ability. Not only is it important to address ADL in terms of research outcomes, but ADL functioning and hand function are important to Occupational Therapists (OTs) as the focus of intervention needs to be on the person's ability to use their hands in meaningful activity (Goodacre & McArthur, 2013). However, Schneider, Manabile and Tikly (2008) report that, although the symptoms of RA (pain, stiffness and fatigue) all impact negatively on functioning in ADL, it is equally important to include measures of hand impairment (for example grip strength, range of motion and pain). From the literature it was therefore found that it is important to measure impairments, hand function and independence in ADL when completing research into RA.

According to research completed by Goodson, McGregor, Douglas and Taylor (2007**)**, tests of grip strength and range of motion can be repeated and are tests that correlate with diminished functioning in individuals with arthritis. In addition Adams et al (2010) reported that grip strength, MCP joint ulnar deviation and the Michigan Hand Outcome Questionnaire (MHQ) are the most responsive measures over a period of twelve months. Therefore, pain, MCP ulnar deviation, grip strength and the MHQ have been found to be relevant to the repeated assessment of RA and were used for data collection in this particular study.

3.6.2 *Description of Data Collection Instruments*

3.6.2.1 Range of Motion – MCP Ulnar Deviation:

Bilateral MCP joint ulnar deviation was assessed dorsally using a 15 centimetre (cm) clear plastic goniometer with a 360 degree head that has 3 scales all calibrated for use with the International Standards of Measurement (ISOM) (Hitech Therapy 2013).

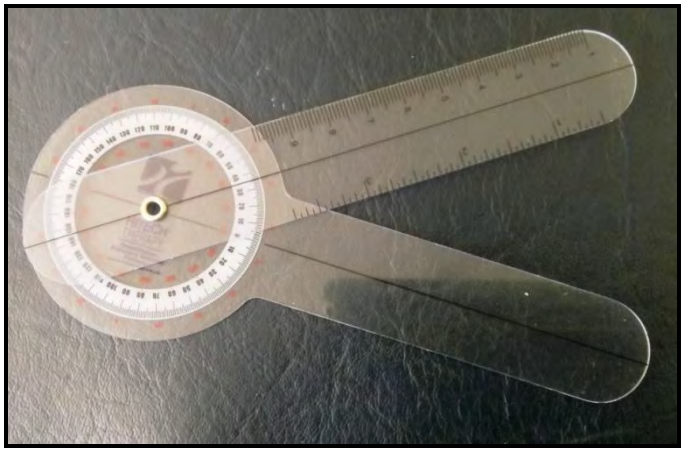

Figure 3.2 15cm goniometer

Cambridge-Keeling (1995) reported that it is advisable to use a standard protocol and one tester in order to attain greater reliability. According to Seftchick, Detullio, Fedorczyk and Aulicino (2011), interater and intrarater reliability is usually within 5 to 10 degrees upon repeated measure but that it is recommended that the same therapist complete all assessments.

3.6.2.2 Grip Strength:

Bilateral grip strength was measured using a calibrated Jamar Hydraulic Hand Dynamometer (Item # 08-1028950). The dynamometer measures isometric grip force either in kilograms (kg) or pounds. The gauge has a dual scale, reading from 0 to 90kg or 0 to 200 pounds. A peak reading is automatically retained by the peak hold needle until the gauge is reset. The handle on the dynamometer can be adjusted to five different settings ranging incrementally in 13 millimetre (mm) increases from 35 to 87mm (Hitech Therapy 2013).

Figure 3.3 Jamar Hydraulic Hand Dynamometer

When it is calibrated correctly and used in situations that can be repeated, it has been shown to be a repeatable, sensitive test and accurate instrument of the force of a person's grip (Bell-Krotoski, Breger-Lee & Beach, 1995). Specifically with regard to the elderly, the Jamar Dynamometer has been found to have test-retest reliability over a period of twelve weeks (intraclass correlation coefficients 0.954 and 0.912 for right and left hands respectively) (Bohannon & Schaubert, 2005).

*3.6.2.3 Michigan Hand Outcomes Questionnaire (**Appendix 8**):*

The Michigan Hand Outcomes Questionnaire (MHQ) was decided upon to assess the outcomes related to RA. The MHQ measures overall bilateral hand function, ADL, pain, work performance, aesthetics, and patient satisfaction with hand function through 72 questions, taking approximately 15 minutes to complete. The MHQ section on pain assesses the pain in both hands (not specified to the MCP joints) felt over the past week according to five descriptive words (very mild, mild, moderate, severe and very severe). In addition, it has three questions regarding pain i.e. did the pain interfere with sleep, did it interfere with activities of daily living and did it make the individual feel unhappy? In addition, an overall MHQ score is computed using all of the sections scored. Included in it is a demographic section but this was adapted for the current research sample. Scores are reported as a percentage, with a higher score denoting better performance in that area.

The MHQ is a self report measure. Self report measures have been shown to correlate with objective outcome measures (O'Connor et al*,* 1999). In a recent study Durmus, Uzuner, Durmaz, Bilgici and Kuru (2013) reported that the MHQ scoring had been found to correlate with disease activity, functional ability and grip strength. Use of the MHQ in general hand conditions has been found to be reliable and valid in terms of internal consistency and construct validity but that criterion validity has not yet been established (Chung, Pillsbury, Walters & Hayward,1998). With regard to individuals with RA, the MHQ has been found to be a responsive, reliable and valid measure (Adams et al, 2010; Massy-Westropp, Krishnan & Ahern, 2004; Waljee et al, 2010).

3.6.2.4 Visual Analogue Scale:

The MHQ's pain measure is descriptive in nature. Therefore in order to additionally obtain a numerical rating, a visual analogue scale (VAS) of 100mm was used to assess pain where 0 represented no pain and 10 represented the worst pain the participant has experienced (Fedorczyk, 2011). The visual analogue scale has been shown to be reliable in terms of test-retest reliability and validity has been established (MacDermid, 2011).

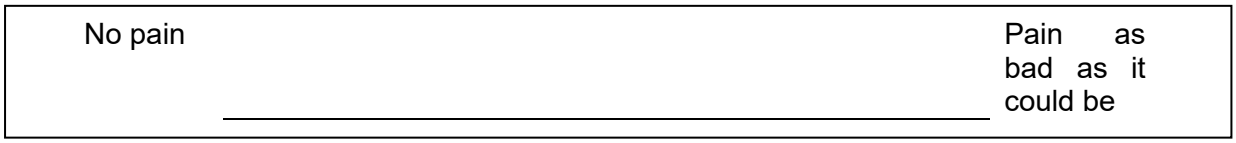

Figure 3.4 Visual Analogue Scale for pain assessment

3.7 DATA COLLECTION PROCEDURE

Throughout the data collection procedure two Occupational Therapists (OTs) experienced in hand therapy conducted the fieldwork: the *principal researcher* who completed the pilot study and conducted the interventions, and the *assessor* who completed all of the measures. The *assessor* was blinded to the interventions.

3.7.1 *Pilot Study*

A pilot study was completed by the principal researcher in order to test the use of the screening tool and assessment instruments. The total sample size for the pilot study was six individuals (as identified by the Matron in one Retirement Facility). Participants were identified through purposive sampling and all met the inclusion criteria.

3.7.1.1 *Demographics of the Pilot Project Sample*

Two men and four women participated in the pilot project. Four participants' ages ranged between 66 and 70 years of age and two participants were between the age range of 71 to 75 years of age. Five participants in the pilot study were white and one participant was black. All six participants were right dominant.

Table 3.3 Demographics of the Pilot Project Sample

Male	Female	Right handed	Left handed	Ages 66 – 70	Ages 71 – 75	Race – black	Race - white
2	4	6	0	4	2	1	5

3.7.1.2 *Process of the Pilot Study*

All participants in the pilot study completed the informed consent form, the screening questionnaire, demographic information and the MHQ. The principal researcher assessed the participants' ulnar deviation, grip strength and pain as well as noted any deformities in the participants' hands. The raw data from the MHQ and the objective assessment were loaded into the data base formed on SPSS.

3.7.1.3 Adjustments made to Data Collection Instruments Based on the Pilot Study Findings

The following changes were made:

- Formatting changes were made to the informed consent form, screening questionnaire and the MHQ.
- In future the screening questionnaire would be completed with the help of the principal researcher in order to explain terminology.
- Any participants experiencing difficulties with writing would be assisted in completing the questionnaires.

The six participants in the pilot study were not included in the final sample size and the data generated from the pilot study was not included in the final data analysis.

3.7.2 *Training of the Assessor*

A therapist with expertise in hand therapy was trained in the procedure and assessments used in the data collection. In addition she was trained in issues of confidentiality, anonymity, bias and research ethics.

3.7.3 *Data Collection Process*

The data collection ran over a seven week period for each participant. During weeks one to two only assessments were completed; during weeks three to six four assessments and interventions were completed; and finally in week seven a final assessment was completed.

Table 3.4 Representation of the data collection process

Week	MHQ	Ulnar deviation	Grip strength	VAS	Intervention - Kinesio Taping®or JP workshops
1	X	X	X	X	
2		X	X	X	
3	X	X	X	X	X
4		X	X	X	X
5		X	X	X	X
6		X	X	X	X
7	X	X	X	X	

Therefore the data collection incorporated the pre test measures, post test measures and intervention (JP workshops or Kinesio Taping®). These components of the data collection will be discussed below.

3.7.3.1 *Pretest, Post Test Measures:*

Three pre test measures and four post test measures were completed for each participant in the experimental and control groups by the assessor. These measures were completed on the same day in every week at approximately the same time of day. The pretest measures were completed over a period of three weeks prior to any intervention.

Post test measures were completed once the interventions of JP workshops and Kinesio Taping® had begun. Four post test measures were then completed in order to allow for four weeks of Kinesio Taping®. Each week's results were recorded on a separate assessment form per participant to ensure that the assessor could not make reference to the previous weeks' results (**Appendix 8**).

The assessor was blinded as to the experimental and control groups by ensuring the following:

- Only the principal researcher was aware of the allocation of participants to the experimental and control groups. The assessor was not made aware to which group the participants were allocated.
- The interventions (JP workshops and Kinesio Taping®) occurred at a separate time from the assessment thereby ensuring that the assessor did not see the Kinesio Taping® application or when in situ. In terms of the Kinesio Taping® (which is visible on the hand) the assessment was completed before the tape was reapplied each day.
- All participants were requested not to talk to the assessor regarding their intervention and the assessor was also instructed not to ask for any information regarding the intervention.

<u>Range of Motion – MCP ulnar deviation:</u>

Guidelines for the measuring of MCP ulnar deviation, although developed in 1990, are provided by the American Society of Surgery to the Hand (1990) and continue to be used in the clinical setting. Participants were asked to rest their hand on a surface with their forearms in pronation, extending their fingers. When measuring MCP ulnar deviation, the axis of the goniometer is placed over the dorsum of the MCP joint. The proximal arm of the goniometer is placed longitudinally over the metacarpal bone for the finger being tested. The distal arm is lined up with the base of the proximal interphalangeal joint. Three measures of each finger's ulnar deviation at the MCP joint were completed, with the mean of the three being taken in order to ensure reliability of the data. Ulnar deviation of each of the MCP joints in both hands was assessed every week for the seven weeks.

Grip Strength

With specific reference to RA, it has been found that one pain free grip strength test-retest measurement is reliable when compared to the mean of three measurements with the intraclass correlation coefficient being ≥0.91 for both the one grip measurement and mean of three grip measurements (Kennedy, Jerosch-Herold & Hickson, 2010). It has also been found that the degree of elbow flexion does not have an influence on the measurement and that it is important to test grip strength at the same time of day (Ferraz, Ciconelli, Araujo, Oliveira & Atra, 1992). Therefore only one test of pain free grip strength (at the second spacing) was completed in order to limit the amount of pain experienced by the participant and each participant's assessment was completed at approximately the same time of day throughout the measures.

The testing procedure was first demonstrated to each participant and the participants were asked to grasp the dynamometer as hard as was possible. Their positioning during this test was observed and rectified if necessary. Instructions were given to the participant to grasp the dynamometer with maximum pressure. The standard testing position was used which necessitated that the participant was seated, shoulder adducted, forearm in neutral and elbow flexed to 90 degrees and the wrist position self selected by the participant (Seftchick et al, 2011). The American Society for Surgery of the Hand, as cited in Fess (2011), recommends that the second spacing be used when a single grip strength measure is being used. Bilateral grip strength was assessed each week for the seven weeks by the assessor.

Visual Analogue Scale

Participants were requested to indicate on the VAS the average pain that they had experienced in their hands over the past week. In addition, each participant was asked to indicate, on a diagram of a hand, where they had experienced the pain in their hands. Participants completed the VAS every week.

Michigans Hand Outcomes Questionnaire

Participants completed the MHQ on weeks 1, 3 and 7. No participant required assistance to record their results.

3.7.3.2 *Interventions*

Experimental Group - Application of Kinesio Taping®:

Kinesio Taping® using Kinesio® Tex Gold™ was only completed for the experimental group, beginning in week three. Each participant had the tape applied four times over a period of four weeks and wore the tape for three days on each occasion. The Kinesio Taping® was applied by the principal researcher who, apart from having a degree in Occupational Therapy and 18 years of practical experience in the treatment of hands, had previously completed the Kinesio Taping® 1 and Kinesio Taping® 2 course.

Tape was applied over the finger MCP joints bilaterally due to the higher percentage of involvement of the MCP joint in RA. It was isolated to the MCP joint to exclude confounding variables such as the impact of the tape on the extrinsic muscles of the forearm or RA pathology in the wrist were the tape to cross the wrist joint. An I-strip over all of the MCP joints was first applied with individual I-strips over each joint being placed at 90 degrees to the first tape. This second strip is postulated to provide further feedback through the tactile system in order to increase motor control of the joint (Simoneau, Degner & Kramper cited in Garcıa-Muro, Rodrıguez-Fernandez & Herrero-de-Lucas, 2010). Bilateral taping of the MCP joints was completed.

Figure 3.5 Application of Kinesio Taping®

The taping was completed in the manner of a space correction application as this assists with pain reduction. Space correction is created through Kinesio Taping® in order to lift the skin and thereby the pressure from areas of pain, inflammation or oedema, thereby either decreasing the stimulation to the receptors in order to alleviate pain and / or create channels for increased circulation. It is also postulated that the mechanoreceptors are stimulated, thereby initiating the gate control theory of pain. Space correction is completed through placing the soft tissue on stretch – in this instance having the person fully flex their MCP

joints, laying down the middle section of the tape with less than 50% stretch and lastly fixing the two tails (anchors) of the tape.

On each occasion, the tape was removed after three days of wearing as the efficacy of the tape on muscle facilitation is apparent during the first three days of application but it decreases on the fourth day of wearing the tape (Slupick et al, 2007). As the effects of the tape have been shown to continue for a further 48 hours after removal, it was not reapplied for a further four days (Slupick et al, 2007). In addition this allowed for the participants' skin to rest, especially as some of the participants had fragile or thinner skin due to advanced age. No adverse reactions to the tape were reported by any participants.

Therefore the procedure for the experimental group's assessment and intervention (Kinesio Taping®) included the following (**Table 3.5**):

Day 1 - All participants completed the demographical questionnaire and the MHQ. In addition each participant's MCP ulnar deviation, grip strength and pain were assessed (*Pre test 1).*

During this time, a trial strip of tape was then applied to the dorsum of each participant's hand in order to establish any sensitivity to the tape. The participants were personally instructed and also were given written instructions on how to remove the tape. In addition, each participant was offered a small bottle of Milk of Magnesia for easy removal of the tape and for application should there be any adverse reaction to the tape (*Trial strip of tape).*

Day 4 – Removal of the trial strips and examination of skin for any reaction to the tape (*Removal of trial strip of tape)*.

Day 8 – The second pre test assessment was completed of the participant's MCP ulnar deviation, grip strength and pain *(Pre test 2).*

Day 15 – The third pre test assessment was completed with regard to the participant's MCP ulnar deviation, grip strength and pain. In addition the participants were asked to complete the MHQ (*Pre test 3)*.

Following the assessment, the tape was applied (*AT 1)*.

Day 18 – Removal of the tape and inspection of the skin (*RT 1).*

Day 22 – The first post test assessment was completed of the participant's MCP ulnar deviation, grip strength and pain levels *(Post test 1)*.

The second application of tape was completed (*AT 2).*

Day 25 - Removal of the tape and inspection of the skin *(RT 2).*

Day 29 - The second post test assessment was completed which included assessment of the participant's MCP ulnar deviation, grip strength, pain (*Post test 2)*.

The third application of the tape was completed (*AT 3)*.

Day 32 - Removal of the tape and inspection of the skin *(RT 3)*

Day 36 - The third post test assessment was completed which included assessment of the participant's MCP ulnar deviation, grip strength, pain (*Post test 3)*.

The fourth application of the tape was completed (*AT 4).*

Day 39 - Removal of the tape and inspection of the skin *(RT 4).*

Day 43 - The fourth post test assessment was completed including MCP ulnar deviation, grip strength, pain and completion of the MHQ (*Post test 4).*

Table 3.5 Representation of the procedure for the experimental group

KEY

MHQ – Michigan Hand Outcomes Questionnaire	ROM – Range of Motion (MCP ulnar deviation)
VAS – Visual Analogue Scale	GS – Grip Strength
AT – Application of tape	RT – Removal of tape

DAY	**1**	**4**
Week 1	*Pre test 1:* Demographic information; MHQ; ROM; VAS; GS. *Application of Trial strip of tape.*	Removal of trial strip of tape
DAY	**8**	**11**
Week 2	*Pre test 2*: ROM; VAS; GS.	
DAY	**15**	**18**
Week 3	*Pre test 3*: MHQ; ROM; VAS; GS. *AT 1*	*RT 1*
DAY	**22**	**25**
Week 4	*Post test 1*: ROM; VAS; GS. *AT 2*	*RT 2*
DAY	**29**	**32**
Week 5	*Post test 2*: ROM; VAS; GS. *AT 3*	*RT 3*
DAY	**36**	**39**
Week 6	*Post test 3:* ROM; VAS; GS. *AT 4*	*RT 4*
DAY	**43**	**46**
Week 7	*Post test 4:* MHQ;ROM; VAS; GS.	

Control Group - Joint Protection (JP) Workshops:

Two hour JP workshops were run by the principal researcher with the control group participants for four weeks, beginning after the three pre test measures had been completed. The workshops included facilitation of learning on RA and JP principles; facilitation of self-awareness of the participants' own RA symptoms and JP behaviours; demonstration and practice of JP skills with the use of assistive devices; and weekly goal setting in terms of using the JP principles and skills. Each participant was given notes on a weekly basis and a PowerPoint presentation was used for each session.

The following is an overview of the four sessions, based on Hammond and Lincoln (1999b):

Session 1:

Discussion around RA: - education on the normal joint and how the RA joint differs; how deformities develop.

Discussion around JP: - defining JP and energy conservation principles; outlining the benefits of using JP principles; practical examples of JP skills.

Homework task: Participants were asked to identify activities that could be damaging to their joints and to apply the JP principles to such identified activities at home.

Session 2:

Initially there was feedback on the homework task. Thereafter more specific discussion was facilitated around specific tasks such as gardening, cooking. During this discussion, the information from session one was reinforced and integrated into the specific tasks mentioned. Following this, a cooking activity was demonstrated utilising JP principles and the participants were then given the opportunity to try out some assistive devices (bottle openers, adapted scissors, adapted breadboard, built up spoon, build up pen, tin opener). In addition, pictures of other assistive devices were shown and given to the participants. Lastly, participants were asked to set a goal in terms of JP principles and skills for the coming week.

Session 3:

Firstly, feedback on the week and their goals was completed. Following this, information on pharmaceutical interventions was discussed. Different splints were shown and explained according to the different deformities present in RA. Further goals were set for the upcoming week. Finally, relaxation methods were practically applied.

Session 4:

Again, feedback on the previous week and their goals was facilitated. Information on exercise, diet, rest and alternative therapies was then discussed. Lastly, participants were given an opportunity for questions

The procedure for the control group's assessment and intervention (JP workshops) included the following (**Table 3.6**):

Day 1 - All participants completed the demographical questionnaire and the MHQ. In addition each participant's MCP ulnar deviation, grip strength and pain was assessed (*Pre test 1).*

Day 8 - The second pre test assessment was completed of the participant's MCP ulnar deviation, grip strength and pain (*Pre test 2).*

Day 15 - The third pre test assessment was completed with regard to the participant's MCP ulnar deviation, grip strength and pain. In addition, the participants were asked to complete the MHQ (*Pre test 3).*

Following the assessment, the participants were involved in their first JP workshop *(JPW 1)*.

Day 22 - The first post test assessment was completed of the participant's MCP ulnar deviation, grip strength and pain levels (*Post test 1)*.

The second JP workshop was completed *(JPW 2)*.

Day 29 and 36 – The second and third post test assessments were completed respectively which included assessment of the participant's MCP ulnar deviation, grip strength, pain (*Post test 2 and 3 respectively)*.

The third and fourth JP workshops were completed respectively *(JPW 3 and 4 respectively)*.

Day 43 – The fourth post test assessment was completed including MCP ulnar deviation, grip strength, pain and completion of the MHQ *(Post test 4)*.

Table 3.6 Representation of the procedure for the control group

KEY

MHQ – Michigan Hand Outcomes Questionnaire	ROM – Range of Motion (MCP ulnar deviation)
VAS – Visual Analogue Scale	GS – Grip Strength
JPW – Joint protection workshop	

DAY	**1**
Week 1	*Pre test 1:* Demographic information; MHQ; ROM; VAS; GS.
DAY	**8**
Week 2	*Pre test 2:* ROM; VAS; GS.
DAY	**15**
Week 3	*Pre test 3:* MHQ; ROM; VAS; GS. *JPW 1*
DAY	**22**
Week 4	*Post test 1:* ROM; VAS; GS. *JPW 2*
DAY	**29**
Week 5	*Post test 2:* ROM; VAS; GS. *JPW 3*

DAY	36
Week 6	*Post test 3:* ROM; VAS; GS. *JPW 4*
DAY	**43**
Week 7	*Post test 4:* MHQ; ROM; VAS; GS.

3.8 DATA MANAGEMENT

A database was created in the Statistical Package for Social Sciences version 22 (SPSS 22) for entering of raw data. The data base developed was tested by entering the raw data from the pilot project. This was completed in order to "identify any difficulty with the method or materials and to investigate the accuracy and appropriateness of any instruments that have been developed. It has also allowed the researcher to determine the community's likely response to the actual programme when it is implemented" (Bless, Higson-Smith, Kagee, 2007: 61). Each outcome measure was coded and the fields entered into SPSS 22:

The three measurements for ulnar deviation of a certain finger were averaged. ROM measures for one hand was completed by averaging the measures of the four fingers in that hand. One score was obtained for the right hand and one score was obtained for the left hand.

Only one score for grip strength for the right or left hand was obtained in the data collection and therefore this score was used for entering of data.

A VAS score was obtained be measuring the point where the participant had marked the scale. This was entered into SPSS 22.

The MHQ was coded according to the MHQ codebook. Scoring procedures were completed as per the MHQ scoring (Chung, Pillsbury, Walters & Hayward,1998). Any missing data was controlled in the following manner: if more than 50% of the scores were missing, that scale was not scored; if less than 50% of the scores were missing, the average of the remaining scores for that scare were included for the missing score. Raw scores for all sections of the MHQ were obtained and were converted into a score from 1 – 100. As a bilateral hand score was needed, the scores for the right and left hands were averaged as appropriate. An average for the MHQ was obtained by reversing the pain score and dividing by five.

According to the MHQ instructions, two people are required to enter the data in order to verify that it has been correctly entered.

All raw data was rounded to two decimal places.

3.9 DATA ANALYSIS

The data collected was subsequently analysed using SPSS 22. Descriptive statistics such as the mean, standard deviation, frequencies and percentages were used to summarize data for both the experimental and control groups. Within each group the paired t-test was used to compare symptoms of arthritis before and after each intervention i.e. the results from week 3 were compared with the results from week 7. The independent samples t-test was used to compare the characteristics of arthritis between the experimental and the control group. The level of significance was set at 0.05. Cohen's effect size (standardised difference in means) was calculated in order to determine the degree to which the difference between the two interventions was clinically significant (McGough & Faraone, 2009). Standardised differences in means were qualitatively recorded according to Hopkins as cited in Hopkins, Marshall, Batterham and Hanin (2009). Repeated measure analysis of variance (ANOVA) was not utilised as the power of the sample size was inadequate. A statistician was consulted with regard to the data analysis.

3.9.1 ***Confounders***

When completing the MHQ confounders such as memory loss, fatigue and poor concentration due to pain medication may have influenced the quality of participants' ratings. Reactivity to the test through boredom may additional be a confounder. This was limited through only completing the MHQ three times, whilst the other more objective measures were completed at each assessment. Pain and fatigue may influence grip strength and therefore only one grip strength test was completed for each hand to ensure that the person did not experience undue pain or fatigue. Finally, the weather may act as a confounder as this has been found to have an impact on pain. Therefore retirement facilities within Howick and Pietermaritzburg were identified in order to attempt to ensure similar weather patterns amongst the participants.

3.10 RELIABILITY AND VALIDITY

3.10.1 ***Reliability***

Reliability is defined as the "ability of an assessment to produce consistent responses over time and between assessors" (Laver-Fawcett, 2007 cited in Sands & Goodacre, 2013:85).

The current research needed to address the influence of the researcher, the participation, the measuring instruments and the research context.

Researcher effects:

In order to counteract researcher effects such as bias, training of the assessor was completed before data collection began (please see 3.7.2). In addition the assessor was not made aware of the allocation of the participant to the control or experimental group (please see 3.7.3.1).

Participant effects:

Initial interview with participants allowed for the development of interpersonal relationships with the participants in order to limit the effect of role selection by the participant (Mouton & Marias, 1993).

Reactivity to the test may result from repeated measures, for example the participants may become bored with the questions and answer haphazardly. In order to limit this, the Michigan Hand Outcomes Measure was only completed twice throughout the repeated measure, whilst the other more objective measures were completed at each assessment.

Fatigue in the assessment is often a constraint when completing multiple tests. Therefore only one grip strength test was completed for each hand to ensure that the person did not experience undue pain or fatigue.

In order to limit sensitisation to the mean, a control group was used (Bless, Higson-Smith & Kagee, 2007 and Mouton & Marias, 1993).

The measuring instruments:

Initially a pilot study was completed in order to identify any instrument effects and, if so, remove these (Mouton & Marias, 1993). Difficulties with regard to completing the screening questionnaire and MHQ were identified in terms of participants not fully understanding the terminology and fatigue in writing to complete the forms. Changes were made to the informed consent form, screening questionnaire and the MHQ with the recommendations that assistance with writing would be offered (please see 3.7.1.3).

Reliability of the instruments used was established based on prior research (please see 3.6.2). Recommendations from this research were followed to ensure greater reliability including: MCP ROM was assessed by the same therapist; the assessor was trained in the assessment techniques and positions to be used; the Jamar Hydraulic Hand Dynamometer was calibrated; and the measures were constant throughout each of the measures.

By completing three pre intervention measures and three post intervention measures, “the effects of history or maturation, test effects and regression towards the mean” were able to

be observed and these biases were taken into consideration when attempting to analyse the effect of the treatment (Bless, Higson-Smith, Kagee, 2007: 82).

Context effects:
The greatest external factor that could have played a role was the differing temperatures across the seven weeks of the data collection. Retirement facilities within Howick and Pietermaritzburg were identified in order to attempt to ensure similar weather patterns amongst the participants.

3.10.2 ***Validity of Research Design***

Validity of the research design occurs when the relationships between the variables has a strong degree of certainty (Bless, Higson-Smith & Kagee, 2007).

Internal validity:
Using pre-test post-test assessments can cause sensitisation of the participants to the measures which would influence their answering in the post tests. By using a control group, this sensitisation will be the same for both the control and experimental groups and was therefore used to limit internal validity.

3.11 ETHICAL CONSIDERATIONS

The following considerations were observed during the research in order to uphold ethical standards for research and ensure safety of the participants:

- The researcher obtained ethical clearance from the Biomedical Research Ethics Committe (BFC183/12) following written permission for each site.
- Each participant signed informed consent. Participants were ensured of confidentiality of information outside of the research process and ensured of anonymity of their information at all times. All confidential information was, and will be, kept in a locked filing cabinet and any computer files will be password protected and encrypted.
- The Occupational Therapist (OT) completing the assessments was trained in the correct procedures for confidentiality and anonymity.
- Kinesio® Tex Gold was used as it is latex free and is therefore less prone to allergic reactions. A small strip of the tape was applied to each participant's skin on the dorsum of the hand prior to the experimental taping to evaluate the participant's skin's reaction to the tape (Kase, Wallis, Kase, 2003).

- Milk of Magnesia was offered to each participant for the removal of the tape during an instance where there is an adverse reaction to the tape (Kase, Wallis, Kase, 2003) and for removal of the tape during the data collection. Each participant was shown the correct manner in which to remove the tape.
- Participants were given the choice of colour of tape to be used.
- Each participant was given the researcher's and the supervisor's contact numbers.
- The Matron and nursing staff were given verbal and written information on the precautions of Kinesio Taping®, possible reactions to Kinesio Taping®, correct ways to remove the tape and procedures to be followed in instances of adverse reactions. They were also given the contact numbers of the researcher and supervisor.
- The research was conducted at the Retirement Facilities to minimise the inconvenience experienced by the participants in terms of travel. In addition, during those assessments and JP workshops where the participants gathered together, refreshments were made available for the participants.
- Precautions and contraindications to Kinesio Taping® were strictly adhered to and investigated with the participants before the tape was applied.
- Grip strength was assessed through one pain free test in order not to exacerbate any further pain that the participant may have been experiencing.
- Two participants were given the contact details for referral to specialists as, prior to the interventions, they were presenting with possible symptoms of Carpal Tunnel Syndrome.
- All participants in both the control group and experimental group will be given feedback following the research on their role in the research (for example being in the control group and not receiving the Kinesio Taping®), as well as the findings of the research.

3.12 CONCLUSION

This chapter has addressed the methodology of the study. Therefore it has explained how a repeated measure, experimental design including 61 participants was conducted over a 7 week period. The outcomes to be measured (grip strength, MCP ulnar deviation, pain and the MHQ) were discussed in terms of the rationale for use as well as the procedures used. The interventions (Kinesio Taping® and JP workshops) were described according to the methods employed. Procedures for ethical clearance were discussed as were the ethical considerations required for safety for completion of the study.

CHAPTER 4 RESULTS

4.1 INTRODUCTION

This chapter will present the results from the research conducted. The demographic and statistical information will be presented in tables and graphs and the results will be presented according to the objectives of this study. First, the demographic information of the experimental and control groups will be presented. Second, the results from the experimental group will be described, followed by the results of the control group. After this, results from the intergroup comparison will be shown. Last, the findings will be summarised.

4.2 CHARACTERISTICS OF THE EXPERIMENTAL AND CONTROL GROUPS

64 participants were screened and met the inclusion criteria for the study. There were 32 participants each in the experimental and control groups. Two participants withdrew from the experimental group: one because the participant found the Kinesio Taping® cumbersome and the second because the participant experienced a severe flareup of her joints during the second week of the data collection. In the control group one participant withdrew due to the ill health of his wife. All other participants completed the data collection and interventions as described in **Section 3.7**.

4.2.1 *Characteristics of the Experimental Group*

4.2.1.1 *Gender of the Participants*

A total of 30 participants in the experimental group completed the data collection with the majority (25) being female (**Table 4.1**).

Table 4.1 Gender of participants in the experimental group

	Gender	
	Male	**Female**
Number of participants	5	25
Percentage	16.67%	83.33%

4.2.1.2 *Ethnicity of Participants*

Within the experimental group 4 different ethnic groups were represented with Indian and White participants having 12 participants each (**Figure 4.1**).

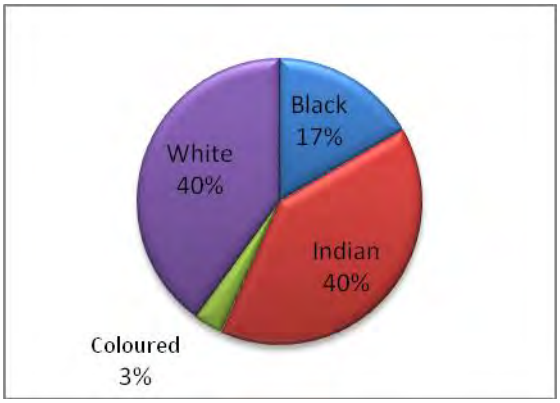

Figure 4.1 Ethnicity of participants in the experimental group

4.2.1.3 *Age Range of Participants*

The majority of the participants in the experimental group were found within the 76-80 years of age (16 participants). There were no participants between the ages of 56 - 65.

Table 4.2 Age range of participants in the experimental group

	Age range				
	56-60	**61-65**	**66-70**	**71-75**	**76-80**
Number of participants	0	0	3	11	16

4.2.1.4 *Disease Duration of Participants*

The majority of the participants (12) in the experimental group were diagnosed with RA over 16 years prior to the data collection. From the experimental group 9 participants (28%) were diagnosed with RA less than 5 years prior to the data collection and 23 participants (72%) were diagnosed with RA more than 5 years prior to the data collection.

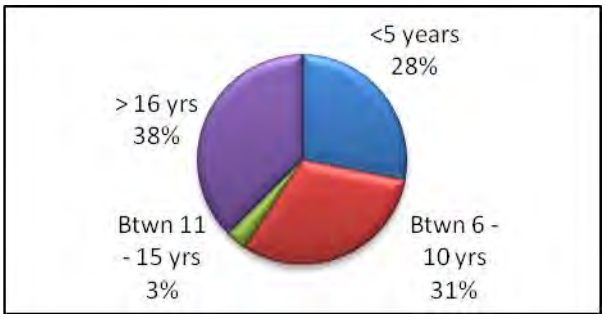

Figure 4.2 Disease duration of participants in the experimental group

4.2.2 *Characteristics of the Control Group*

4.2.2.1 *Gender of the Participants*

31 participants in the control group completed the data collection of which the majority (28) were female.

Table 4.3 Gender of participants in the control group

	Gender	
	Male	**Female**
Number of participants	3	28
Percentage	9.7%	90.33%

4.2.2.2 *Ethnicity of Participants*

Only two different ethnic groups were represented in the control group: Indian (1) and White (30) participants (**Figure 4.4**).

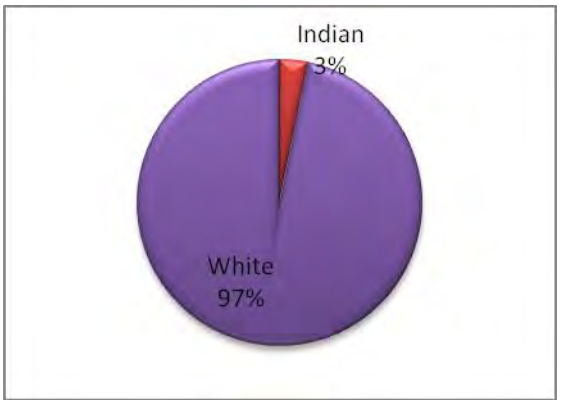

Figure 4.3 Ethnicity of participants in the control group

4.2.2.3 *Age Range of Participants*

Within the control group the majority of participants were found within the 71-75 years of age (13 participants) but 9 participants were within the 66-70 age category and 8 participants were within the 76-80 age category. As for the experimental group, 0 participants were found between the ages of 61-65.

Table 4.4 Age range of participants in the control group

	Age range				
	56-60	**61-65**	**66-70**	**71-75**	**76-80**
Number of participants	1	0	9	13	8

4.2.2.4 *Disease Duration of Participants*

Within the control group 9 participants (28%) were diagnosed with RA over 16 years prior to the research. 6 participants (19%) were each within the categories of diagnosis 6-10 years prior to the research and 11-15 years prior to the research. 8 participants (25%) were uncertain as to when their RA had been diagnosed.

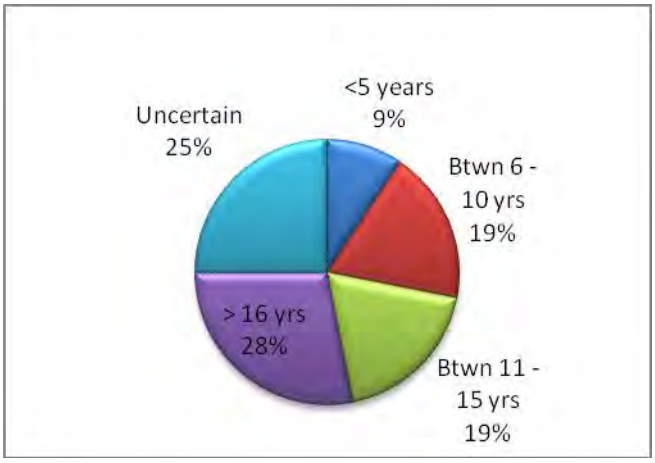

Figure 4.4 Disease duration of participants in the control group

4.3 RESULTS

4.3.1 *Pain*

Pain was assessed through two subjective measures i.e. the Visual Analogue Scale (VAS) and the Michigans Hands Outcome Questionnaire (MHQ). The VAS is a numerical rating scale with 0 being no pain and 10 being the worst pain ever experienced. The results of the MHQ are reported as a percentage, with a higher percentage indicating improvement in the levels of pain.

4.3.1.1 *Pain Results for the Experimental Group*

Kinesio Taping® of the MCP joints has shown a significant decrease in pain as assessed through both the VAS (P = 0.0) and the MHQ (P = 0.01) with regard to scores assessed before and after the interventions (i.e. week 3 and week 7 respectively) (**Table 4.7**). In both the VAS and MHQ an improvement in the maximum score was also observed (**Tables 4.5 and 4.6**).

Table 4.5 Pain measured with the VAS for the experimental group

	N	Minimum	Maximum	Mean	Standard Deviation
Week 1	31	0	10	3.94	3.43
Week 2	30	0	10	5.47	3.17
Week 3	30	0	10	5.35	3.05
Week 4	30	0	8	4.81	2.59
Week 5	30	0	7	3.88	2.1
Week 6	30	0	7	3.12	2.42
Week 7	30	0	6	2.48	2.21

Table 4.6 Pain measured with the MHQ for the experimental group

	N	Minimum	Maximum	Mean	Standard Deviation
Week 1	31	0	60	39.74	15.94
Week 3	31	0	65	32.27	17.98
Week 7	30	0	64.5	40.2	18.55

Table 4.7 Paired t-test for changes over time for pain for the experimental group

	Mean	Standard Deviation	95% Confidence Interval		Significance
			Lower	Upper	
Pain (VAS)	2.7	2.39	1.77	3.62	0.0 *
Overall pain score (MHQ)	-6.85	13.81	-1.69	-2.72	0.01 *

4.3.1.2 *Pain Results for the Control Group*

There was no significant difference found in pain in the control group (JP workshops) over time using either the VAS (P = 0.20) or the MHQ (P = 0.33) statistics (**Table 4.10**).

Table 4.8 Pain measured with the VAS for the control group

	N	Minimum	Maximum	Mean	Standard Deviation
Week 1	32	0	10	3.34	2.66
Week 2	31	0	10	3.52	2.83
Week 3	31	0	10	3.06	2.59
Week 4	31	0	8	2.87	2.46
Week 5	31	0	8	3.39	2.56
Week 6	31	0	8	3.16	2.85
Week 7	31	0	8	2.71	2.87

Table 4.9 Pain measured with the MHQ for the control group

	N	Minimum	Maximum	Mean	Standard Deviation
Week 1	32	0	80	37.06	19.41
Week 3	31	0	82.5	36.90	22.32
Week 7	31	0	75	34.35	20.47

Table 4.10 Paired t-test for changes over time for pain for the control group

	Mean	Standard Deviation	95% Confidence Interval		Significance
			Lower	Upper	
Pain – VAS	0.35	1.52	-.20	.91	0.20
Overall pain score – MHQ	2.55	14.30	-3.02	3.31	0.33

4.3.2 *Metacarpal (MCP) Ulnar Deviation*

4.3.2.1 *MCP Ulnar Deviation Results for the Experimental Group*

A significant decrease in MCP ulnar deviation bilaterally (P = 0.00 bilaterally) was seen in the experimental group (**Table 4.12**). A change from 8.21 to 4.86 was found for the mean range in the right hand and a change from 8.68 to 5.08 in the left hand prior to and after the intervention (**Table 4.11**).

Table 4.11 Descriptive statistics for MCP ulnar deviation in the experimental group

	N	Minimum	Maximum	Mean	Standard Deviation
Right hand					
Week 1	32	2.25	26.25	9.60	6.09
Week 2	32	3.00	25.75	9.66	6.12
Week 3	32	1.25	25.00	8.21	6.36
Week 4	31	1.25	21.75	8.00	6.17
Week 5	30	0	21.25	7.54	6.5
Week 6	30	0	19.50	5.39	5.31
Week 7	30	0	20.00	4.86	5.54
Left hand					
Week 1	32	0	30.50	9.98	6.94
Week 2	32	2.25	40.00	10.12	7.99
Week 3	32	0	31.75	8.68	6.79
Week 4	31	1.75	33.75	8.27	6.60
Week 5	30	0	32.25	7.59	7.07
Week 6	30	0	33.75	5.48	6.69
Week 7	30	0	31.25	5.08	6.31

Table 4.12 Paired t-test for changes over time for MCP ulnar deviation for the experimental group

	Mean	Standard Deviation	95% Confidence Interval		Significance
			Lower	Upper	
Ulnar deviation – right hand	3.44	3.90	1.98	4.90	0.00 *
Ulnar deviation – left hand	3.62	3.10	2.46	4.77	0.00 *

4.3.2.2 *MCP Ulnar Deviation Results for the Control Group*

In the control group no significant difference was noted for MCP ulnar deviation prior to and after the intervention (**Table 4.14**).

Table 4.13 Descriptive statistics for MCP ulnar deviation in the control group

	N	Minimum	Maximum	Mean	Standard Deviation
Right hand					
Week 1	32	0.50	12.50	4.43	2.73
Week 2	31	1.00	10.75	4.22	2.49
Week 3	31	0.75	10.25	4.80	2.38
Week 4	31	2.25	9.50	5.88	1.75
Week 5	31	0.75	7.00	4.19	4.61
Week 6	31	0.25	6.75	4.27	1.79
Week 7	31	0.25	7.00	4.12	1.80
Left hand					
Week 1	32	0.75	11.00	3.93	2.11
Week 2	31	0.75	30.00	4.40	5.11
Week 3	31	1.25	27.75	5.03	4.43
Week 4	31	2.25	25.00	5.94	4.00
Week 5	31	0.75	24.25	4.87	3.95
Week 6	31	0.00	23.50	4.60	3.91
Week 7	31	0.25	23.25	4.58	3.95

Table 4.14 Paired t-test for changes over time in MCP ulnar deviation for the control group

	Mean	Standard Deviation	95% Confidence Interval		Significance
			Lower	Upper	
Ulnar deviation – right hand	0.63	2.16	-1.63	1.42	0.12
Ulnar deviation – left hand	0.44	2.10	-0.33	1.21	0.25

4.3.3 *Grip Strength*

Scores were measured in kg for both the right and left hands.

4.3.3.1 *Grip Strength Results for the Experimental Group*

Although an increase in grip strength was seen in the mean score (right hand 8.80 to 9.43 and left hand (6.77 to 7.40) (**Table 4.15**) this was not seen to be a statistically significant (right - P = 0.76 and left - P = 0.14) (**Table 4.16**).

Table 4.15 Descriptive statistics for grip strength for the experimental group

	N	Minimum	Maximum	Mean	Standard Deviation
Right hand					
Week 1	32	0	20	8.71	5.60
Week 2	32	0	20	8.07	5.39
Week 3	32	0	20	8.80	5.55
Week 4	31	0	20	8.72	6.04
Week 5	30	0	20	9.76	4.94
Week 6	30	0	22	9.84	5.64
Week 7	30	0.5	22	9.43	5.52
Left hand					
Week 1	32	0	15	6.35	3.91
Week 2	32	0	16	6.23	3.96
Week 3	32	0	14	6.77	3.92
Week 4	31	0	14	6.83	4.26
Week 5	30	0	14	7.69	3.99
Week 6	30	0.50	15	7.22	3.46
Week 7	30	0.50	14	7.40	3.31

Table 4.16 Paired t-test for changes over time in grip strength for the experimental group

	Mean	Standard Deviation	95% Confidence Interval		Significance
			Lower	Upper	
Grip strength – right hand	0.16	2.75	-0.91	1.22	0.76
Grip strength – left hand	0.48	1.66	-1.13	0.16	0.14

4.3.3.2 *Grip Strength Results for the Control Group*

Joint protection as completed for the control group has been found to significantly improve grip strength in both the right and left hands (P = 0.00 bilaterally) (**Table 4.18**). Following intervention (i.e. after week 3), a maximum grip strength of 23 (right hand) was achieved (**Table 4.17**).

Table 4.17 Descriptive statistics – grip strength for the control group

	N	Minimum	Maximum	Mean	Standard Deviation
Right hand					
Week 1	32	3	22	11.03	5.34
Week 2	31	2	24	10.65	5.83
Week 3	31	2	22	10.55	5.18
Week 4	31	3	20	10.94	5.46
Week 5	31	4	23	11.97	5.33
Week 6	31	4	22	12.37	5.17
Week 7	31	5	23	12.65	5.27
Left hand					
Week 1	32	2	23	10.2	5.92
Week 2	31	0	21	9.77	5.60
Week 3	31	0	20	9.32	4.81
Week 4	31	0.5	21	10.61	5.78
Week 5	31	0.5	22	11.08	5.55
Week 6	31	0.5	19	11.4	5.20
Week 7	31	1	20	11.84	5.22

Table 4.18 Paired t-test for changes over time in grip strength for the control group

	Mean	Standard Deviation	95% Confidence Interval		Significance
			Lower	Upper	
Grip strength – right hand	-2.30	2.50	-3.02	-1.18	0.00 *
Grip strength – left hand	-2.52	2.11	-3.30	-1.74	0.00 *

4.3.4 *Michigans Hand Outcomes Questionnaire (MHQ)*

Scores for the MHQ are reported as a percentage, with a higher score denoting better performance in that area. The pain section of the MHQ is not referred to in this section as it has been covered in **Section 4.3.1**. but the pain scores are included in the overall MHQ score. Many participants did not completely answer the aesthetics section of the MHQ and, according to the MHQ scoring, this section was unable to be scored. This section is therefore neither reported on nor included in the overall MHQ score.

4.3.4.1 *MHQ Results for the Experimental Group*

The mean values for the experimental group ranged from 52.14 to 68.22 (**Table 4.19**). The overall mean score for the experimental group did not show an improvement between the assessment completed of week 3 and that of week 7. Activities of daily living showed an improvement between week 3 and 7 assessments but this was not statistically significant (**Table 4.20**). Although work showed a significant difference (P = 0.00), overall work performance mean scores deteriorated over time.

Table 4.19 Descriptive statistics for the MHQ for the experimental group

	N	Minimum	Maximum	Mean	Standard Deviation
Overall MHQ score					
Week 1	32	33.07	78.03	58.02	13.19
Week 3	31	34.87	75.71	59.71	12.62
Week 7	30	36	72.18	57.44	20.91
Overall bilateral hand function					
Week 1	32	25	75	52.14	15.31
Week 3	31	25	80	54.31	17.25
Week 7	30	25	80	53.27	13.59
Overall activities of daily living					
Week 1	32	10.36	90.18	59.73	22.7
Week 3	31	10.36	86.07	59.42	20.37
Week 7	30	10.36	93.93	62.36	18.64
Work performance					
Week 1	32	20	95	64.84	22.81
Week 3	31	20	90	68.22	20.68
Week 7	30	20	80	56.83	19.32

	N	Minimum	Maximum	Mean	Standard Deviation
Overall satisfaction					
Week 1	32	25	100	53.14	18.05
Week 3	31	25	79.17	58.1	14.93
Week 7	30	25	95.83	58.65	20.13

Table 4.20 Paired t-test for changes over time in MHQ scores for the experimental group

	Mean	Standard Deviation	95% Confidence Interval		Significance
			Lower	Upper	
Overall MHQ score	2.62	10.34	-6.17	2.92	0.18
Overall bilateral hand function	1.68	8.54	-1.51	4.87	0.29
Overall activities of daily living	-1.94	11.88	-6.37	2.5	0.38
Work performance	12	21.32	4.04	19.96	0.00 *
Overall satisfaction	0.41	12.8	-4.37	5.19	0.86

4.3.4.2 *MHQ Results for the Control Group*

In the control group a significant difference was noted in performance in activities of daily living (P = 0.01) and in work (P = 0.01) but the overall MHQ score did not show a significant difference (**Table 4.22**).

Table 4.21 Descriptive statistics for the MHQ for the control group

	N	Minimum	Maximum	Mean	Standard Deviation
Overall MHQ score					
Week 1	32	19.07	100	56.6	19.28
Week 3	31	17.18	100	55.67	21.14
Week 7	31	22.68	100	56.87	20.91
Overall hand function					
Week 1	32	20	100	54.28	19.12
Week 2	31	27.5	100	53.60	21.29
Week 3	31	25	100	50.45	22.49
Overall activities of daily living					
Week 1	32	7.86	100	57.77	27.44
Week 2	31	12.15	100	52.68	25.65
Week 3	31	21.79	100	57.70	24.46
Work performance					
Week 1	32	20	100	58.91	24.02
Week 2	31	20	100	48.55	27.42
Week 3	31	20	100	58.22	26.54
Overall satisfaction					
Week 1	32	12.5	100	49.89	24.92
Week 2	31	6.25	100	51.01	26.82
Week 3	31	6.25	100	52.38	28.33

Table 4.22 Paired t-test for changes over time in MHQ scores for the control group

	Mean	Standard Deviation	95% Confidence Interval		Significance
			Lower	Upper	
Overall MHQ score	1.20	5.59	-3.25	0.85	0.24
Overall bilateral hand function	3.15	12.24	-1.35	7.66	0.16
Overall activities of daily living	4.98	10.31	1.20	8.76	0.01 *
Work performance	-9.68	19.53	-16.84	-2.51	0.01 *
Overall satisfaction	-1.36	9.02	-4.67	1.95	0.41

4.3.5 *Comparison Between the Experimental and Control Group*

The mean scores in the experimental group at week 7 were higher for the outcomes of pain (VAS and MHQ), MCP ulnar deviation (right and left hands), overall MHQ, overall bilateral hand function, overall ADL and satisfaction (**Table 4.23**). Cohen's effect size for these outcomes indicate trivial to small clinical difference between the two interventions (**Table 4.24**). However, the control group's mean for grip strength bilaterally is considerably higher than the experimental group's mean (**Table 4.23**). In addition Cohen's effect size values (right hand - d = -0.6 and left hand – d = -1.02) indicate a moderate clinically relevant difference between the two interventions (**Table 4.24**). This is also indicated as a significant difference in improvement in grip strength between the means of the control and experimental groups at week 7 (right – P = 0.01 and left - P = 0.00) (**Table 4.24**). Scores for all other outcomes did not indicate any significant differences.

Table 4.23 Group statistics for independent samples t-test between experimental and control group at week 7

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pain (VAS)	Experimental	30	2.57	2.20	0.42
	Control	31	2.71	2.87	0.51
Pain (MHQ	Experimental	30	40.20	18.55	3.39
	Control	31	34.35	20.47	3.68
Ulnar deviation – right	Experimental	30	4.86	5.54	1.01
	Control	31	4.12	1.80	0.32
Ulnar deviation – left	Experimental	30	5.08	6.31	1.15
	Control	31	4.59	3.95	0.71
Grip strength – right	Experimental	30	8.98	5.03	0.95
	Control	31	12.64	5.27	0.95
Grip strength – left	Experimental	30	7.23	3.25	0.61
	Control	31	11.84	5.22	0.94
Overall MHQ score	Experimental	30	57.44	9.88	1.80
	Control	31	56.87	20.91	3.76
Overall bilateral hand function	Experimental	30	53.27	13.59	2.48
	Control	31	50.45	22.49	4.04
Overall activities of daily living	Experimental	30	62.36	18.64	3.40
	Control	31	57.70	24.46	4.39
Work performance	Experimental	30	56.83	19.32	3.53
	Control	31	58.23	26.54	4.77
Satisfaction	Exp	30	58.65	20.13	3.67
	Control	31	52.38	28.33	5.09

Table 4.24 Independent samples t-test at week 7 for comparison between the experimental and control group outcomes

	95% Confidence Interval		Significance	Cohen's standardised difference	Threshold descriptor
	Lower	Upper			
Pain (VAS)	-1.46	1.19	0.84	-0.09	Trivial
Pain (MHQ)	-15.86	4.16	0.25	-0.30	Small
MCP Ulnar deviation – right	-1.36	2.83	0.48	0.18	Trivial
MCP Ulnar deviation – left	-2.20	3.17	0.72	-0.09	Trivial
Grip strength – right	-6.36	-9.74	0.01 *	-0.6 *	Moderate
Grip strength – left	-6.86	-2.31	0.00 *	-1.02 *	Moderate
Overall MHQ score	-8.97	7.86	0.89	0.03	Trivial
Overall bilateral hand function	-12.34	6.75	0.56	-0.17	Trivial
Overall activities of daily living	-15.83	6.47	0.41	-0.21	Small
Work performance	-10.53	13.28	0.82	0.06	Trivial
Satisfaction	-18.90	6.31	0.32	-0.26	Small

4.4 CONCLUSION

This chapter has presented the research results as analysed through SPSS version 22 through a series of graphs and tables. 64 participants were included in the sample size initially with 2 participants withdrawing from the experimental group and 1 participant withdrawing from the control group. Across both the experimental and control groups, the majority of participants were female, between the ages of 71-75 years of age and disease duration of greater than 16 years. Differences in the group were apparent in ethnicity and disease duration less than 5 years (28% in the experimental group and only 9% in the control group).

Results for each outcome assessed (pain, MCP ulnar deviation, grip strength and MHQ overall scores) were reported for significance over time. The level of significance was set at 0.05.

Kinesio Taping® of the MCP joints has shown a significant decrease in pain (0.00) and range of motion (0.00 bilaterally). Joint protection was found to have a significant difference in grip strength and in the work and ADL sections of the MHQ.

No significant difference was found between groups after intervention in the majority of outcomes except for grip strength where a significant difference was found. Trivial to small differences were found for pain, MCP ulnar deviation and MHQ scores but a moderate clinically relevant difference was found between the two interventions for grip strength.

CHAPTER 5 DISCUSSION

5.1 INTRODUCTION

This chapter critically evaluates the results as set out in Chapter 4 with reference to previous research conducted in the areas of Kinesio Taping® and joint protection (JP) workshops. Therefore discussion around the outcomes assessed (pain, metacarpophalangeal (MCP) joint ulnar deviation, grip strength and function) is set out specifically with regard to results indicating a significant difference.

5.2 CHARACTERISTICS OF THE POPULATION

The majority of the participants were women. Literature suggests that RA affects women twice as often as men (Abdel-Nasser et al cited in Symmons et al, 2003; Peltzer & Paswana-Mafuya, 2013; Woolf & Pfleger, 2003). The ethnicity and age ranges of the participants were skewed across both the experimental and control groups. This is not congruent with previous prevalence research (Abdel-Nasser et al cited in Symmons, Mathers & Pfleger, 2003; Woolf & Pfleger, 2003). The representation of participants in the study is indicative of the ethnicity and ages of residents in the Retirement Facilities accessed. Retirement Facilities which could have improved the distribution of the ethnicity and ages of participants did not give permission for the research to be conducted.

5.3 KINESIO TAPING®

5.2.1 *Kinesio Taping® and Pain in RA*

Pain in RA is due to primary inflammation as well as due to the pathomechanics of RA causing poor support of joints by ligaments, contact between the bones in the joints as well as osteophyte formation within or around soft tissue (Bradley & Adams, 2013). In addition, inflammation in the joint capsules results in stretching of the tissues around the joint, causing further pain (Alter et al, 2011). Reeve and McArthur (2013) indicate that chronic rheumatic pain of different types (inflammatory, biomechanical and neuropathic pain) can lead to central sensitisation. This is caused by prolonged inflammation and biomechanical changes resulting in continuous stimulation of the nociceptors which affects change in the central nervous system. As therapists the goals of pain management are to use various interventions in order to decrease inflammation, assist with pain relief through the gate

control mechanism, counter-irritate or distract the pain and/or facilitate the release of endogenous opioids.

In this study, space correction Kinesio Taping® of the MCP joints bilaterally has shown a significant decrease in pain (VAS score P = 0.00 and MHQ score P = 0.01). Due to the fact that the VAS and the MHQ were instruments used for assessment of pain, these scores give an indication of the severity of pain as well as the individual's subjective perceptions about their feelings about the pain (Fedorczyk, 2011) This is in keeping with research conducted which has found that Kinesio Taping® is effective in providing short term pain relief in the shoulder, elbow, neck, back, knees and ankles (Anandkumar et al, 2014; Bae et al, 2013; Campolo, 2013; Djordjevic et al, 2012; Donec & Kriščiūnas, 2014; Gonzales-Iglesias, 2009; Kalichman et al, 2010; Karatas et al, 2012; Kaya et al, 2011; Kuru et al, 2012; Paoloni et al, 2011; Saavedra-Hernández et al, 2012; Simsek et al, 2013; Thelen et al, 2008). The above research studies vary in providing evidence for immediate pain relief as opposed to pain reduction following four to six weeks of Kinesio Taping®. Previous research varies in the method of Kinesio Taping® utilised for pain reduction. Immediate pain relief has been found in addition to pain reduction following four to six weeks of taping.

It is unclear as to the exact mechanism of pain reduction and various theories have been postulated (Brăteanu, 2009; Coopee, 2011; Donec & Kriščiūnas, 2014; Hancock, n.d.; Paoloni et al, 2011). Stimulation of the mechanoreceptors, thermoreceptors and nociceptors in the skin by the tape causes different responses in the nervous system and may have the following effects on the reduction of pain:

a) Mechanoreceptors are stimulated thereby causing response through endogenous analgesics
b) Touch receptors are stimulated which could possibly activate the spinal inhibitory response to pain
c) Pressure on the nociceptors is reduced as inflammation decreases

In addition Paoloni (2011) speculates that, through having an immediate and ongoing effect on pain, Kinesio Taping® acts as a continuous analgesic to the area of pain due to the ongoing interface between the cutaneous receptors and the pain transmission pathways.

It is therefore recommended that space correction Kinesio Taping® of the MCP joints be completed in the manner outlined in this research project in order to decrease levels of pain in people with RA (i.e. for periods of three days at a time, reapplied weekly).

5.3.2 *Kinesio Taping® and Range of Motion in RA*

Ulnar deviation at the MCP joint is one of the deformities seen in RA and contributes to a loss of function (Alter et al, 2011). Results from this study indicate that bilateral Kinesio Taping® of the MCP joints has shown a significant improvement in MCP ulnar deviation bilaterally (P = 0.00 bilaterally). Range of motion is not frequently used as an outcome measure in previous Kinesio Taping® research but various studies on the effectiveness of Kinesio Taping® have shown an improvement in active range of motion, especially when levels of pain have also been seen to improve (Djordjevic et al, 2012; Donec & Kriščiūnas, 2014; Gonzales-Iglesias, 2009; Karatas et al, 2012; Kuru et al, 2012; Saavedra-Hernández et al, 2012; Simsek et al, 2013). The majority of these studies investigated conditions with symptom onset of under five months as opposed to more chronic conditions.

Two mechanisms for increasing range of motion are evident with Kinesio Taping®. This first is due to a decrease in pain positively impacting on active range of motion. Therefore Kinesio Taping® that has reduced pain over a joint can lead to increased active range of motion (Lipinska et al, cited in Donec & Kriščiūnas, 2014). This effect may be caused by Kinesio Taping® improving mechanical irritation in the soft tissues surrounding the joint, thereby increasing the range of motion (Coopee, 2011; Kaya et al, 2011). Secondly, it is thought that increased support is given to the ligament structures working on that joint thereby aligning the joint, reducing pain and improving range of motion (Coopee, 2011; Hancock, n.d.). Coopee (2011) indicates that a space correction method over a joint draws the fascia centrally over the joint, thereby supporting the ligaments and improving the alignment of the joint.

In this study, the space correction tape across all the MCP joints may have supported the superficial transverse metacarpal ligament thereby assisting to align the MCP joints. In addition, the reduction in pain (**Section 5.2.1**) may have improved the ulnar deviation of the MCP joint through increasing the degree to which the joint could move pain free.

5.3.3 *Kinesio Taping® and Grip Strength in RA*

Grip strength in elderly individuals with RA is weaker than the grip strength for individuals in the healthy population (Sheehy, Gaffney & Mukhtyar, 2013). In addition decreased grip strength is an indicator of rheumatic disease activity and strongly correlates with poor functioning (Adams et al, 2004; Alter et al, 2011). No significant difference was found in grip strength following Kinesio Taping® although a mild increase in grip strength was seen in the means scores. Previous research has shown improvements in muscle strength in injuries at the shoulder, elbow and knee immediately following taping (Anandkumar et al, 2014; Hsu, Chen, Lin, Wang & Shih, 2009). Taping in combination with exercise has shown an

improvement in patellofemoral pain syndrome and rheumatoid arthritis in the hand (Mousavi & Khayambashi, 2011; Szczegielniak et al, 2012). The research that has shown improvements in muscle strength have made use of a basic taping method to facilitate muscle. Therefore it appears that basic taping of muscles can improve immediate strength or, combined with exercise, can improve strength over time.

Further research has been conducted into grip strength, specifically in healthy participants (Fratocchi et al, 2011; Kuo & Huang, 2013; Lee et al, 2010; Merino-Marban et al, 2012; Mohammadi et al, 2014). Conflicting evidence has been generated regarding the area of application of Kinesio Taping® to improve grip strength but it appears that basic taping of the extensor muscles of the forearm has the greatest impact on grip strength with a resultant increase in grip strength ½ to 1½ post taping (Mohammadi et al, 2014). It is thought that muscle facilitation is stimulated through the Golgi tendon organs when the tape is applied from muscle insertion to origin (Hancock, n.d.; Coopee, 2011).

As the taping in the current study was isolated to the MCP joints, no taping to facilitate the forearm extensor muscles was completed. In addition, the assessment time following taping in this study was not within the 1½ that has previously indicated improvement in grip strength. Finally, this study did not incorporate exercise in conjunction with the Kinesio Taping® which has previously been found to improve strength. These reasons may therefore be why a significant difference was not noted in grip strength in this study. As for range of motion, a reduction in pain can cause an increase in grip strength. Therefore the mild improvement noted in the means of grip strength over time may have been caused by the reduction in pain.

5.3.4 ***Kinesio Taping® and the MHQ in RA***

When working with individuals with RA the goals of treatment are to decrease pain and inflammation, maintain range of motion and joint integrity and facilitate maximum participation in those occupations and activities that are valuable to the individual (Beasley, 2011; Reeve & McArthur, 2013). Decreased independence in ADL has been attributed to decreased hand function due to decreased grip strength and increased levels of pain (Dellhag & Bjelle, 1999). In this study no improvements were noted in the bilateral hand function, ADL, work performance, patient satisfaction or MHQ overall scores, despite the differences noted in pain and MCP ulnar deviation. Goodacre and McArthur (2013) comment that it is often difficult for individuals with a chronic condition, such as RA, to adjust to a change in their condition. Therefore the changes in pain and MCP ulnar deviation have not been carried over to facilitate a change in ADL and function.

5.4 COMPARISON BETWEEN KINESIO TAPING® AND JOINT PROTECTION IN RA

JP programmes in RA are used in order to avoid overuse of the affected joints so as to decrease inflammation and pain and prevent further deformities (Hammond, 2013). In prior research pain, stiffness, function, grip strength and joint protection behaviour have all been shown to be improved through educational-behavioural JP workshops (Alderson et al, 1999; Dures, 2012; Hammond, 1999; Hammond, 2013; Hammond & Lincoln, 1999a; Hammond & Lincoln, 1999b; Hammond & Freeman, 2001; Hammond et al, 2008; Iversen et al, 2010; Masiero et al, 2007). These research findings include follow up research which has ascertained that the results have continued over time provided that the behaviour change is continued (Hammond et al, 2008).

In this study JP workshops showed a significant improvement in grip strength as well as in the work performance and ADL sections of the MHQ. Grip strength was found to be a significant difference between the two interventions. In addition, a moderate clinically relevant difference was found in grip strength bilaterally. Grip strength has been correlated with hand function (Adams et al 2010; Vliet-Vlieland, Van der Wuk, Joile, Zwinderman and Hazes, 1998). Grip strength in the control group increased to a mean of 12.65kg. It has been found that grip strength of 20 pounds (9.07kg) allows individuals to perform most ADLs (Shipham & Pitout, 2003) which is possibly the reason why work and ADL scores improved in the MHQ. In addition, it is recommended that practising meaningful activities during the JP workshops can facilitate self efficacy and understanding of the perceived benefits of using the JP principles (Niedermann et al, 2010). Pain, ulnar deviation and the remaining sections of the MHQ did not show significant improvements. One of the reasons for this may be that the participants did not own any of the assistive devices used in the JP workshops and were therefore not implementing and reinforcing ongoing JP principles. Therefore this ongoing practice of JP could not have a positive impact on pain and ulnar deviation as the behaviour change at home could not occur.

5.5 CONCLUSION

The results from the study have been discussed with reference to previous research conducted in Kinesio Taping® and JP programmes. In addition, various theories as to the reasons for changes in the outcomes assessed have been discussed.

CHAPTER 6 CONCLUSION

Rheumatoid arthritis (RA) is a chronic systemic disease which affects approximately 1% of the population globally with an increase being seen in individuals over 50 years of age (Abdel-Nasser et al cited in Symmons et al, 2003). Self reported RA in South Africa has been established at 27% in individuals over 50 years of age (Peltzer & Paswana-Mafuya, 2013). Symptoms include morning stiffness, joint instability, inflammation, pain, poor grip strength and difficulties with function. The metacarpal joint (MCP) is affected in 65 % of individuals experiencing RA (Goosens et al, 2000).

This study set out to determine whether Kinesio Taping® of the metacarpophalangeal (MCP) joints can be used as a conservative treatment method in the treatment of individuals with RA. Occupational Therapists use various conservative interventions (splinting, exercise, treatment modalities, assistive devices and joint protection (JP) programmes) in order to decrease pain and inflammation and maintain range of motion and joint integrity in individuals with RA. In addition, a primary focus is to facilitate functioning of the individual in meaningful activity (Beasley, 2011; Reeve & McArthur, 2013). Kinesio Taping® has been used by therapists to treat other musculoskeletal conditions but only one study has been completed in RA which found that forearm taping and exercise improved grip strength. Therefore this study sought to determine the effectiveness of bilateral Kinesio Taping® of the MCP joints in reducing the symptoms in the hand of rheumatoid arthritis in elderly individuals (aged 50 – 80 years of age) previously diagnosed with RA.

A repeated measure experimental design was used for this study. Ethical clearance was obtained through the University of KwaZulu Natal's Biomedical Research Ethics Committee (BFC183/12). The data collection proceeded over a seven week period with the experimental group (n = 30) receiving bilateral space correction Kinesio Taping® of the MCP joints and the control group (n = 31) participating in educational-behavioural JP workshops. Three pre-test assessments of pain, MCP ulnar deviation, grip strength and function were conducted for all participants at weekly intervals. Following this Kinesio Tape® was applied to the MCP joints (an I-strip was applied over the dorsum of the 2nd to 5th MCP joints with individual I-strips being placed at 90 degrees to the first tape over each individual MCP joint). The tape was worn for 3 days per week with four applications during the data collection process. For the control group, 2 hour JP educational-behavioural workshops were run weekly for four weeks. During the interventions, weekly assessments were completed for grip strength, ulnar deviation and pain (VAS), and two pre-intervention

assessments and one post-intervention assessment was completed for the Michigan Hands Outcomes Questionnaire (MHQ). During assessment the assessor was blinded as to the intervention used.

From the results obtained it was found that Kinesio Taping® of the MCP joints can be used to effectively improve pain and MCP ulnar deviation in individuals with RA. It is a convenient conservative modality for individuals with RA as the application can be shown to the individuals themselves or the caregiver. Whilst Kinesio Taping® of the MCP joints has shown an improvement in pain and MCP ulnar deviation, no significant improvement was found in terms of grip strength or function. Therefore the improvements in pain and MCP ulnar deviation have not facilitated changes in daily functioning. Whilst pain may be one of the first symptoms causing individuals to turn to medical assistance (Montecucco et al cited in Reeve & McArthur, 2013), the treatment of a biomedical source of pain through a single intervention does not often ensure a long term effect (Ashburn & Staats cited in Reeve & McArthur, 2013). When therapists work with people with chronic pain in a condition such as RA the goals are to "minimise the impact of pain and maximise participation in value occupations (Dubouloz et al, cited in Reeve and McArthur, 2013:140). In addition, a vital principle of any chronic pain management is to include patient education as part of the rehabilitation process (Fedorczyk, 2013). Therefore, should Kinesio Taping® of the MCP joints be used to alleviate pain in RA, further education on pain mechanisms should be included to facilitate carry over to functional activities in addition to other conservative interventions such as treatment modalities, JP programmes, exercise and the use of assistive devices. When looking at the two interventions included in this study it can be said that Kinesio Taping® of the MCP joints can be used as a standard practice in Occupational Therapy in order to alleviate pain in people with RA. Working in conjunction with a JP programme, especially in the newly diagnosed client where behaviour change has been found to be less effective, the therapeutic effects of the two interventions could be increased. Clinical reasoning skills of the Occupational Therapist are needed in order to ascertain at which stage of treatment the interventions would be most beneficial. Further to this research, an addition of Kinesio Taping® of the forearm muscles in a person with RA could improve the client's grip strength (Szczegielniak, Łuniewski, Bogacz & Śliwiński, 2012).

The results therefore indicate that Kinesio Taping® can be used as one of the conservative treatments by therapists in the treatment of RA but should still be considered as only one part of the total rehabilitation programme.

6.1 LIMITATIONS OF THIS RESEARCH

The limitations regarding this research are linked to the sample:

- A larger sample may have increased validity
- Baseline characteristics were different across the two groups in terms of ethnicity and disease duration.
- The sample was conveniently divided into the experimental and control groups and no true randomisation occurred.
- External validity could have been improved through the use of counterbalancing on the assessment measures.
- There was not adequate representation of the diversity of ethnic groups in KwaZulu Natal.
- Reasons for incomplete answering of the aesthetics section of the MHQ were not investigated as this was beyond the scope of this study.

6.2 RECOMMENDATIONS

Recommendations for clinical practice:
The use of Kinesio Taping® to alleviate pain and improve ROM in the MCP joints of people with RA should be included into Occupational Therapy standard practice. This is completed through a space correction application of three days, with the tape being reapplied weekly. Further, Kinesio Taping® in conjunction with JP programmes would work effectively together to minimise pain and maximise participation in valued occupations, especially in the newly diagnosed client,

Recommendations for further research:
In order to further research into effective conservative treatment interventions in RA it is recommended that ongoing data collection be completed and that further large scale randomised clinical trials be completed with regard to Kinesio Taping® in the hand. In addition it would be of benefit to statistically analyse whether certain baseline characteristics influence more significant outcomes. As RA is a chronic disease, it is recommended that either longer term interventions involving Kinesio Taping® be researched or that the long term effects of Kinesio Taping® be investigated. Due to the convenience factor of the tape, its cost effectiveness should also be investigated with regard to RA. When addressing RA it is apparent that the severity, duration and area of pain varies over the course of time.

Therefore it is also recommended that Kinesio Taping® of other joints affected by RA be investigated.

REFERENCES

Adams, J., Mullee, M., Burridge, N.E., Hammond, A., & Cooper, C. (2010). Responsiveness of self-report and therapist-rated upper extremity structural impairment and functional outcome measures in early rheumatoid arthritis. *Arthritis Care & Research,* 62(2), 274-278.

Alderson, M., Starr, L., Gow, S., & Moreland, J. (1999). The program for rheumatic independent self-management: A pilot evaluation. *Clinical Rheumatology,* 18, 283–92.

Alter, S., Feldon, P., & Terrono, A. (2011). Pathomechanics of deformities in the arthritic hand and wrist. In Skirven, T.M., Osterman, A.L., Fedorczyk, J.M., & Amadio, P.C. (Eds). *Rehabilitation of the hand and upper extremity* (6th ed.) (pp 1321-1329). Philadelphia, United States of America: Mosby.

American Society for Surgery of the Hand. (1990). *The Hand: Examination and diagnosis*. New York: Churchill Livingstone.

Anandkumar, S., Sudarshan, S., & Nagpal, P. (2014). Efficacy of kinesio taping on isokinetic quadriceps torque in knee osteoarthritis: A double blinded randomized controlled study. *Physiotherapy Theory and Practice,* 30(6), 375-383.

Bae, S.H., Lee, J.H., Oh, K.A., & Kim, K.Y. (2013). The effects of Kinesio Taping on potential in chronic low back pain patients anticipatory postural control and cerebral cortex. *Journal of Physical Therapy Science,* 25, 1367–1371.

Barry M,A., Purser, J., Hazleman, R., McLean, A., & Hazleman, B.L. (1994). Effect of energy conservation and joint protection education in rheumatoid arthritis. *British Journal of Rheumatology,* 33, 1171–1174.

Basset, K.T., Lingman, S.A., & Ellis, R.F. (2010). The use and treatment efficacy of kinaesthetic taping for musculoskeletal conditions: A systematic review. *New Zealand Journal of Physiotherapy,* 38(2), 56-62.

Beasley, J. (2011). Therapist's examination and conservative management of arthritis of the upper extremity. In Skirven, T.M., Osterman, A.L, Fedorczyk, J.M., & Amadio, P.C. (Eds). *Rehabilitation of the hand and upper extremity* (6th ed.) (pp. 1330-1343). Philadelphia, United States of America: Mosby.

Beasley, J. (2012). Osteoarthritis and rheumatoid arthritis: Conservative therapeutic management. *Journal of Hand Therapy,* 25(2), 163-171.

Bell-Krotoski, J.A., Breger-Lee, D.E., & Beach, R.B. (1995). Biomechanics and evaluation of the hand. In Hunter, J.M., Mackin, E.J., & Callahan, A.D. (Eds.). *Rehabilitation of the hand: Surgery and therapy* (4th ed.). (pp. 153-184). Philadelphia, United States of America: Mosby.

Bergstra, S., Murgia, A., Velde, A., & Caljouw, S. (2014). A systematic review into the effectiveness of hand exercise therapy in the treatment of rheumatoid arthritis. *Clinical Rheumatology,* 33(11), 1539-1548.

Bless, C., Higson-Smith, C., & Kagee, A. (2007). *Fundamentals of social research methods - An African perspective*. Cape Town, South Africa: Juta and Co.Ltd.

Bohannon, R., & Schaubert, K. (2005). Test–retest reliability of grip-strength measures obtained over a 12-week interval from community-dwelling elders. *Journal of Hand Therapy*, 18(4), 426-428.

Bowman, B., Campbell, R.M., Zgaga, L., Adeloye, D., & Yee Chan, K. (2012). Estimating the burden of rheumatoid arthritis in Africa: A systematic analysis. *Journal of Global Health,* 2(2), 1-9.

Bradley, S & Adams, J. (2013). Rheumatology splinting. In Goodacre, L., & McArthur, M. (Eds.). *Rheumatology practice in Occupational Therapy: Promoting lifestyle management* (pp. 191-206). West Sussex, England: John Wiley & Sons.

Brăteanu, D. (2009). Kinesio Taping technique and Kinesio Tex. *Timisoara Physical Education and Rehabilitation Journal,* 2(3), 36-40.

Brosseau, L., Yonge, K.A., Welch, V., Marchand, S., Judd, M., Wells, G.A., & Tugwell, P. (2003, February 21). Transcutaneous electrical nerve stimulation (TENS) for the treatment of rheumatoid arthritis in the hand (Review). *The Cochrane Database of Systematic Reviews*, (2003)2. Article No.: CD004377. doi: 10.1002/14651858.CD004377.

Cambridge-Keeling, C.A. (1995). Range-of-motion measurement of the hand. In Hunter, J.M., Mackin, E.J., & Callahan, A.D. (Eds.). *Rehabilitation of the hand: Surgery and therapy* (4th ed.). (pp. 93-107). Philadelphia, United States of America: Mosby.

Campolo, M. (2013). A comparison of two taping techniques (kinesio and Mcconnell) and their effect on anterior knee pain during functional activities. *International Journal of Sports Physical Therapy,* 8(2), 105-110.

Cartlidge, P.J., Higson, N.B., & Stent, G. (1984). Rheumatoid arthritis: A pilot evaluation of an inpatient education programme. *Australian Occupational Therapy Journal,* 31, 14–19.

Chung, K.C., Pillsbury, M.S., Walters, M.R., & Hayward, R.A. (1998). Reliability and validity testing of the Michigan Hand Outcomes Questionnaire. *Journal of Hand Surgery American,* 23(4), 575-587.

College of Occupational Therapists. (2003). Occupational therapy clinical guidelines for rheumatology: Joint protection and energy conservation. London, England: College of Occupational Therapists.

Coopee, R.A. (2011). Elastic taping (Kinesio taping method). In Skirven, T.M., Osterman, A.L, Fedorczyk, J.M., & Amadio, P.C. (Eds.). *Rehabilitation of the hand and upper extremity* (6th ed.) (pp. 1539-1528). Philadelphia, United States of America: Mosby.

Csapo, R. & Alegre, L.M. (2014). Effects of Kinesio® taping on skeletal muscle strength – A meta-analysis of current evidence. *Journal of Science and Medicine in Sport,* Article in press.

Dellhag, B. & Bjelle, A. (1999). A five-year follow up of hand function and activities of daily living in rheumatoid arthritis patients. *Arthritis Care and Research*, 12(1), 33-41.

Djordjevic, O.C., Vukicevic, D., Katunac, L., & Jovic, S. (2012). Mobilization with movement and kinesiotaping compared with a supervised exercise program for painful shoulder: Results of a clinical trial. *Journal of Manipulative and Physiological Therapeutics,* 35(6), 454-463.

Donec, V., & Kriščiūnas, A. (2014). The effectiveness of Kinesio Taping® after total knee replacement in early postoperative rehabilitation period. A randomized clinical trial. *European Journal of Physical and Rehabilitation Medicine,* 50, 363-371.

Drouin, J.L., McAlpine, C.T., Primak, K.A., & Kissel, J. (2013). The effects of kinesiotape on athletic-based performance outcomes in healthy, active individuals: A literature synthesis. *The Journal of the Canadian Chiropractic Association,* 2013, 57(4): 356-365.

Dures, E. (2012). "They didn't tell us, they made us work it out ourselves": Patient perspectives of a cognitive-behavioral program for rheumatoid arthritis fatigue. *Arthritis Care and Research,* 64(4), 494.

Durmus, D., Uzuner, B., Durmaz, Y., Bilgici, A., & Kuru, O. (2013). Michigan Hand Outcomes Questionnaire in rheumatoid arthritis patients: Relationship with disease activity, quality of life, and handgrip strength. *Journal of Back and Musculoskeletal Rehabilitation,* 26, 467–473.

Dynamic Tape Sales Handbook. (2011). Retrieved from http://www.htherapy.co.za/user_images/dynamic_Taping/Dynamic_Taping_Intro.pdf.

Eberhardt, K., Sandqvist, G., & Geborek, P. (2008). Hand function tests are important and sensitive tools for assessment of treatment response in patients with rheumatoid arthritis. *Scandinavian Journal of Rheumatology,* 37, 109-112.

Egan, M., Brosseau, L., Farmer, M., Ouimet, M.A., Rees, S., Tugwell, P., & Wells, G.A. (2001, August 21). Splints and orthosis for treating rheumatoid arthritis (Review). *Cochrane Database of Systematic Reviews* 2001(2). Article no.: CD004018. doi: 10.1002/14651858.CD004018.

Fedorczyk, J.M. (2011). Pain management: Principles of therapist's interventions. In Skirven, T.M., Osterman, A.L, Fedorczyk, J.M., & Amadio, P.C. (Eds.). *Rehabilitation of the hand and upper extremity* (6th ed) (pp.1461-1469). Philadelphia, United States of America: Mosby.

Ferraz, M.B., Ciconelli, R.M., Araujo, P.M., Oliveira, L.M., & Atra, E. 1992. The effect of elbow flexion and time of assessment on the measurement of grip strength in rheumatoid arthritis. *The Journal of Hand Surgery,* 17(6), 1099-1103.

Fess, E.E. (2011). Functional tests. In Skirven, T.M., Osterman, A.L, Fedorczyk, J.M., & Amadio, P.C. (Eds.). *Rehabilitation of the hand and upper extremity* (6th ed.) (pp. 152-162). Philadelphia, United States of America: Mosby.

Fratocchi, G, Di Mattia, F., Rossi, R., Mangone, M., Santilli, V., & Paoloni, M. (2011). Influence of Kinesio Taping applied over biceps brachii on isokinetic elbow peak torque. A placebo controlled study in a population of young healthy subjects. *Journal of Science and Medicine in Sport,* 16, 245-259.

Freeman, K., Hammond, A., & Lincoln, N.B. (2002). Use of cognitive-behavioural arthritis education programs in newly diagnosed rheumatoid arthritis. *Clinical Rehabilitation,* 16, 828–836.

Garcıa-Muro, F., Rodrıguez-Fernandez, A.L., & Herrero-de-Lucas, A. (2010). Treatment of myofascial pain in the shoulder with Kinesio Taping. A case report. *Manual Therapy*, 292-295.

George, M. & Tanner, J.F. (2014). Promotion to change lifestyle: Securing participation and success. *Health Marketing Quarterly,* 31(4), 293-311.

Gonzales-Iglesias, J. (2009). Short-term effects of cervical Kinesio Taping on pain and cervical range of motion in patients with acute whiplash injury: A randomized clinical trial. *Journal of Orthopaedic and Sports Physical Therapy,* 39(7), 515-521.

Goodacre, L., & McArthur, M. (2013). Living with a rheumatic disease: The personal perspective. In Goodacre, L., & McArthur, M. (Eds.). *Rheumatology practice in occupational therapy: Promoting lifestyle management* (pp. 12-26). West Sussex, England: John Wiley & Sons.

Goodson, A., McGregor, A.H., Douglas, J., & Taylor, P. (2007). Direct, quantitative clinical assessment of hand function: Usefulness and reproducibility. *Manual Therapy,* 12(2), 144-152.

Goosens, P.H., Heemskerk, B., van Tongeren, J., Zwinderman, A.H., Vliet-Vlieland, T.P.M., & Huizinga, T.W.J. (2000). Reliability and sensitivity to change of various measures of hand function in relation to treatment of synovitis of the metacarpophalangeal joint in rheumatoid arthritis. *Rheumatology,* 39, 909-913.

Grønning, K., Skomsvoll, J.F., Rannestad, T., & Steinsbekk, A. (2012). The effect of an educational programme consisting of group and individual arthritis education for patients with polyarthritis - A randomised controlled trial. *Patient Education and Counselling,* 88, 113-120.

Hammond, A. (1994). Joint protection behavior in patients with rheumatoid arthritis following an education program: A pilot study. *Arthritis Care and Research,* 7(1), 5.

Hammond, A. (1999). A crossover trial evaluating an educational-behavioural joint protection programme for people with rheumatoid arthritis. *Patient Education and Counselling,* 37(1), 19.

Hammond, A. (2010). Joint protection and fatigue management. 2010. In Dziedzic, K., & Hammond, A. (Eds.). *Rheumatology. Evidence-based practice for physiotherapists and occupational therapists* (pp138-142). London, England: Churchill Livingstone, Elsevier.

Hammond, A. (2013). Joint Protection. In Goodacre, L., & McArthur, M. (Eds.). *Rheumatology practice in occupational therapy: Promoting lifestyle management* (pp. 117-135). West Sussex, England: John Wiley & Sons.

Hammond, A., Bryan, J., & Hardy, A. (2008). Effects of a modular behavioural arthritis education programme: A pragmatic parallel-group randomized controlled trial. *Rheumatology,* 47(11), 1712-1718.

Hammond, A., & Freeman, K. (2001). One-Year outcomes of a randomized controlled trial of an educational-behavioural joint protection programme for people with rheumatoid arthritis. *Rheumatology,* 40, 1044-1051.

Hammond, A., & Freeman, K. (2004). The long-term outcomes from a randomized controlled trial of an educational-behavioural joint protection programme for people with rheumatoid arthritis. *Clinical Rehabilitation,* 18:520-528.

Hammond, A., & Lincoln, N. (1999a). Development of the joint protection behavior assessment. *Arthritis Care and Research,* 12(3), 200-207.

Hammond, A., & Lincoln, N. (1999b). The Effect of a Joint Protection Education Programme for People with Rheumatoid Arthritis. *Clinical Rehabilitation,* 13, 392-400.

Hancock, D. (n.d.). *Scientific Explanation of Kinesio® Tex Tape*. Retrieved from http://www.vitagnosis.pt/UploadImages/Downloads/VG/ScientificExplanationofKinesioTexTape.pdf.

Health Professions Council of South Africa. (2008). Guidelines for good practice in the health care professions: General ethical guidelines for health researchers. Retrieved from http://www.hpcsa.co.za/Uploads/editor/UserFiles/downloads/conduct_ethics/rules/generic_ethical_rules/booklet_6_gen_ethical_guidelines_for_researchers.pdf.

Hitech Therapy. (2013). *Hitech Therapy 2013/2014 Product Catalogue*. Retrieved from http://issuu.com/hitechtherapy/docs/htt_catalogue-emailable?e=6508148/3419802.

Hopkins, W.G., Marshall, S.W., Batterham, A.M., & Hanin, J. (2009). Progressive statistics for studies in sports medicine and exercise science. *Medicine & Science in Sports & Exercise*, 41(1), 3-12.

Hsu, Y., Chen, W., Lin, H., Wang, T.J., & Shih, Y. (2009). The effects of taping on scapular kinematics and muscle performance in baseball players with shoulder impingement syndrome. *Journal of Electromyography and Kinesiology,* 19, 1092-1099.

Iverson, M.D., Hammond, A., & Betteridge, N. (2010). Self- management of rheumatic diseases: State of the art and future perspectives. *Annals of the Rheumatic Diseases,* 69(6), 955-63.

Kalichman, L., Vered, E., & Volchek, L. (2010). Relieving symptoms of meralgia paresthetica using Kinesio Taping: A pilot study. *Archives of Physical Medicine and Rehabilitation*, 91(7), 1137-1139.

Kalron, A., & Bar-Sela, S. (2013). A systematic review of the effectiveness of Kinesio Taping®. *European Journal of Physical Rehabilitation Medicine,* 49(5), 699-709.

Karatas, N., Bicici, S., Baltaci, G., & Caner, H. (2012). The effect of Kinesio Tape application on functional performance in surgeons who have musculo-skeletal pain after performing surgery. *Turkish Neurosurgery,* 22(1), 83-89.

Kase, K., & Hashimoto, T. (1998). Changes in the Volume of the Peripheral Blood Flow by using Kinesio Taping. Retrieved from http://www.theratape.com/education-center/wp-content/uploads/2012/11/Kinesio-Study-Peripheral-Blood-Flow.pdf.

Kaya, E., Zinnuroglu, M., & Tugcu, I. (2011). Kinesio Taping compared to physical therapy modalities for the treatment of shoulder impingement syndrome. *Clinical Rheumatology,* 30, 201–207.

Kase, K., Wallis, J., & Kase, T. (2003). *Clinical therapeutic applications of the Kinesio Taping method (2nd Ed)*. Kinesio Taping Association.

Kennedy, D., Jerosch-Herold, C., & Hickson, M. (2010). The reliability of one vs. three trials of pain-free grip strength in subjects with rheumatoid arthritis. *Journal of Hand Therapy,* 23(4), 384-391.

Kiebzak, W., Kowalski, I.M., Pawłowski, M., Gąsior, J., Zaborowska-Sapeta, K., Wolska, O., & Śliwiński, Z. (2012). The use of Kinesiology Taping in physiotherapy practice: A systematic review of the literature. *Fizjoterapia Polska* 1(4), 1-11.

Kinesio Taping Association International. 2011. *KT1 workbook*.

Kuru, T., Yaliman, A., & Dereli, E. (2012). Comparison of efficiency of Kinesio® taping and electrical stimulation in patients with patellofemoral pain syndrome. *Acta Orthopaedica Traumatologica Turcica,* 46(5), 385-392.

Kuo, Y., & Huang, Y. (2013). Effects of the application direction of Kinesio Taping on isometric muscle strength of the wrist and fingers of healthy adults - A pilot study. *Journal of Physical Therapy Science,* 25(3), 287–291.

Lamb, S.E., Williamson, E.M., Heine, P.J., Adams, J.; Dosanjh, S.; Dritsaki, M., ... Williams, M.A. (2014). Exercises to improve hand function of the rheumatoid hand (SARAH): A randomised controlled trial. Lancet, Article in press..

Lee, H., Woo, W., & Lee, K. (2010). Effects of head-neck rotation and Kinesio of the flexor muscles on dominant-hand grip strength. *Journal of Physical Therapy Science,* 22(3), 285-289.

Masiero, S., Boniolo, A., Wasserman, L., Machiedo, H., Volante, D., & Punzi, L. (2007). Effects of an educational-behavioral joint protection program on people with moderate to severe rheumatoid arthritis: a randomized controlled trial. *Clinical Rheumatology,* 26(12), 2043-2050.

McGill, P. (1991). Rheumatoid arthritis in sub-Saharan Africa. *Annals of the Rheumatic Diseases*, 50, 965-966.

MacDermid, J.C. (2011). Outcome measurement in upper extremity practice. In Skirven, T.M., Osterman, A.L, Fedorczyk, J.M., & Amadio, P.C. (Eds). *Rehabilitation of the hand and upper extremity* (6th ed) (pp. 194-205). Philadelphia, United States of America: Mosby.

Maree, K. & Pietersen, J. (2007). Sampling. In Maree, K. (Ed.). *First Steps in Research*. Pretoria, South Africa: Van Schaik Publishers

Massy-Westropp, N., Krishnan, J., & Ahern, M. (2004). Comparing the AUSCAN Osteoarthritis Hand Index, Michigan Hand Outcomes Questionnaire, and Sequential Occupational Dexterity Assessment for patients with rheumatoid arthritis. *Journal of Rheumatology,* 10, 1996-2001.

McCough, J.J., & Faraone, S.V. (2009). Estimating the size of treatment effects: Moving beyond P values. *Psychiatry*, 6(10), 21-28.

Mennen, U., & van Velze, C. (Eds.). (2008). *The hand book: A practical approach to common hand problems*. Pretoria, South Africa: Van Schaik.

Merino-Marban, R., Mayorga-Vega, D., & Fernandez-Rodríguez, E. (2012). Acute and 48 h effect of kinesiotaping on the handgrip strength among university students. *Journal of Human Sport and Exercise,* 7(4), 741-747.

Meyers, O.L., Daynes, G., & Beighton, P. (1977). Rheumatoid arthritis in a tribal rural Xhosa population in the Transkei, Southern Africa. *Annals of the Rheumatic Diseases,* 36, 62-65.

Mohammadi, H.K., Kalantari, K.K., Naeimi, S.S., Pouretezad, M., Shokri, E., Tafazoli, M., Dastjerdi, M., & Kardooni, L. (2014). Immediate and delayed effects of forearm Kinesio Taping on grip strength. *Iranian Red Crescent Medical Journal,* 16(8), 1-5.

Moolenburgh, J.D., Moore, S., Valkenburg, H.A., & Erasmus, M.G. (1984). Rheumatoid arthritis in Lesotho. *Annals of the Rheumatic Diseases,* 43, 40-43.

Moolenburgh, J.D., Valkenburg, H.A., & Fourie, P.B. (1986). A population study on rheumatoid arthritis in Lesotho, Southern Africa. *Annals of the Rheumatic Diseases,* 45, 691-695.

Morris, D. (2013). The clinical effects of Kinesio® Tex taping: A systematic review. *Physiotherapy Theory and Practice,* 29(4), 259.

Mostafavifar, M., Wertz, J., & Borchers, J. (2012). A systemic review of the effectiveness of Kinesio Taping for musculoskeletal injury. *The Physician and Sportsmedicine,* 40(4), 33-40.

Mousavi, S., & Khayambashi, K. (2011). The effects of Kinesiotape and strength training on knee pain and quadriceps strength in people with Patellofemoral Pain Syndrome (PFPS). *Journal of Isfahan Medical School,* 29(159), 1-12.

Mouton, J., & Marais, H.C. (1993). *Basic concepts in the methodology of the social sciences*. Pretoria, South Africa: Human Sciences Research

Niedermann, M.P.H., Hammond, A., Forster, A., & de Brief, R. (2010). Perceived benefits and barriers to joint protection among people with rheumatoid arthritis and occupational therapists. A mixed methods study. *Musculoskeletal Care,* 8, 143-156.

O'Connor, D., Kortman, B., Smith, A., Ahern, M, Smith, M., & Krishnan, J. (1999). Correlation between objective and subjective measures of hand function in patients with rheumatoid arthritis. *Journal of Hand Therapy,* 12(4), 323-329.

Opava, C & Björk, M. (2014). Towards evidence-based hand exercises in rheumatoid arthritis. *The Lancet,* Article in press.

Paoloni, M., Bernetti, A., Fratocchi, G., Mangone, M., Parrinello, L., Del Pilar Cooper, M., ... & Santilli, V. (2011). Kinesio Taping applied to lumbar muscles influences clinical and electromyographic characteristics in chronic low back pain patients. *European Journal of Physical and Rehabilitation Medicine,* 47(2), 237-243.

Parreira, P. (2014). Current evidence does not support the use of Kinesio Taping in clinical practice: A systematic review. *Journal of Physiotherapy,* 60(1), 31-39.

Pasma, A., van't Spijker, A., Hazes, J.M.W., Busschbach, J.J.V., & Luime, J.J. (2012). Factors associated with adherence to pharmaceutical treatment for rheumatoid arthritis patients: A systematic review. *Seminars in Arthritis and Rheumatism,* 43(1), 18-28.

Peltzer, K., & Paswana-Mafuya, N. (2013). Arthritis and associated factors in older adults in South Africa. *Turkish Journal of Geriatrics,* 16(4), 389-394.

Reeve, L. & McArthur, M. (2013). Pain management. In Goodacre, L., & McArthur, M. (Eds.). *Rheumatology practice in occupational therapy: Promoting lifestyle management* (pp. 136-156). West Sussex, England: John Wiley & Sons.

Saavedra-Hernández, M, Arroyo-Morales, M., Cleland, J.A., Lara-Palomo, I.C., & Fernández-de-Las-Peñas, C. (2012). Short-term effects of kinesiotaping versus cervical thrust manipulation in patients with mechanical neck pain: A randomized clinical trial. *The Journal of Orthopaedic and Sports Physical Therapy*, 42(8), 724-30.

Sands, A. & Goodacre, L. (2013). Occupational Therapy assessment and outcome measurement. In Goodacre, L., & McArthur, M. (Eds.). *Rheumatology practice in occupational therapy: Promoting lifestyle management* (pp. 117-135). West Sussex, England: John Wiley & Sons.

Schneider, M., Manabile, E., & Tikly, M. (2008). Social aspect of living with rheumatoid arthritis: A qualitative descriptive study in Soweto, South Africa - a low resource context. *Health and Quality of Life Outcomes,* 6, 54-65.

Seftchick, J.L., Detullio, L.M., Fedorczyk, J.M., & Aulicino, P.L. (2011). Clinical examination of the hand. In Skirven, T.M., Osterman, A.L, Fedorczyk, J.M., & Amadio, P.C. (Eds). *Rehabilitation of the hand and upper extremity* (6th ed) (pp. 55-71). Philadelphia, United States of America: Mosby.

Sheehy, C., Gaffney, K., & Mukhtyar, C. (2013). Standardised grip strength as an outcome measure in early rheumatoid arthritis. *Scandinavian Journal of Rheumatology,* 42(4), 289-293.

Shipham, I., & Pitout, S.J.S. (2003). Rheumatoid arthritis: Hand function, activities of daily living, grip strength and essential assistive devices. *Curationis,* 26(3), 98-106.

Simsek, H.H., Balk, S., Suner, S., Keklik, S.S., Ozturk, H., & Elden, H. (2013). Does Kinesio Taping in addition to exercise therapy improve the outcomes in subacromial impingement syndrome? A randomized, double-blind, controlled clinical trial. *Acta Orthopaedica et Traumatologica Turcica,* 47(2), 104-110.

Slupick, A., Dwornick, M., Bialoszewski, D., & Zych, E. (2007). Effect of Kinesio Taping on bioelectric activity of vastus medialis muscle. Preliminary Report. *Ortopedia Traumatologia Rehabilitacja,* 9, 644-651.

Smedslund, G., & Hagen, K.B. (2011). Does rain really cause pain? A systematic review of the associations between weather factors and severity of pain in people with rheumatoid arthritis. *European Journal of Pain,* 15(1), 5-10.

Solomon, L., Robin, G., & Valkenburg, H.A. (1975). Rheumatoid arthritis in an urban South African negro population. *Annals of the Rheumatic Diseases,* 34, 128-135.

Steultjens, E.E.M.J.I, Dekker, J.J., Bouter, L.M., Schaardenburg, D.D., Kuyk, M.A.M.A.H., & Van den Ende, E.C.H.M. (2003, November 17). Occupational therapy for rheumatoid arthritis (Review). *Cochrane Database of Systematic Reviews,* 2004(1). Article No.: CD003114. doi:10.1002/14651858.CD003114.pub2.

Stoy, D.B., Curtis, R.C., Dameworth, K.S., Dowdy, A.A., Hegland, J., Levin, J.A., & Sousoulas, B.G. (1995). The successful recruitment of elderly black subjects in a clinical trial: The CRISP experience. Cholesterol Reduction in Seniors Program. *Journal of the National Medical Association,* 87(4), 280-287.

Swanson, A. (1995a). Pathogenesis of arthritic lesions. In Hunter, J.M., Mackin, E.J., & Callahan, A.D. *Rehabilitation of the hand: Surgery and therapy* (4th ed.). (pp. 1307-1314). Philadelphia, United States of America: Mosby.

Swanson, A. (1995b). Pathomechanics of deformities in hand and wrist. In Hunter, J.M., Mackin, E.J., & Callahan, A.D. *Rehabilitation of the hand: surgery and therapy* (4th ed.). (pp. 1315-1328). Philadelphia, United States of America: Mosby.

Symmons, D., Mathers, C., & Pfleger, B. (2003). *The global burden of rheumatoid arthritis in the year 2000* (Draft). Geneva: World Health Organization. Retrieved from http://www3.who.int/whosis/menu.cfm?path=evidence,burden,burden_gbd2000docs&language=english.

Szczegielniak, J., Łuniewski, J., Bogacz. K, & Śliwiński, Z. (2012). The use of Kinesiology Taping for physiotherapy of patients with rheumatoid hand – Pilot study. *Ortopedia Traumatologia Rehabilitacja,* 1(6), 23-30.

Taylor, R.L., O'Brien, L., & Brown, T. (2014). A scoping review of the use of elastic therapeutic tape for neck or upper extremity conditions. *Journal of Hand Therapy,* 27(3), 235-245.

Thelen, M., Dauber, J., & Stoneman, P.D. (2008). The clinical efficacy of Kinesio Tape for shoulder pain: A randomized, double-blinded, clinical trial. *Journal of Orthopaedic and Sports Physical Therapy,* 38(7), 389-395.

Tuntland, H., Kjeken, I., Nordheim, L.V., Falzon, L. Jamtvedt, G., & Hagen, K.B. (2009, October 7). Assistive technology for rheumatoid arthritis. Cochrane Database of Systematic Reviews, 2009(4). Article No.:doi: 10.1002/14651858.CD006729.pub2.

Turesson, C., McClelland, R.L., Christianson, T.J.H., & Matteson, E.L. (2007). Severe extra-articular disease manifestations are associated with an increased risk of first ever cardiovascular events in patients with rheumatoid arthritis. *Annals of the Rheumatic Diseases,* 66, 70–75.

Vliet-Vlieland, T.P.M., Van der Wuk, T.P., Joile, I.M.M., Zwinderman, A.H., & Hazes, J.M.W. (1996). Determinants of hand function in patients with rheumatoid arthritis. *Journal of Rheumatology,* 23(5), 835-840.

Waljee, J.F., Chung, K.C., Kim, H.M., Burns, P.B., Burke, F.D., Shaw Wilgis, E.F., & Fox, D.A. (2010). Validity and responsiveness of the Michigan Hand Questionnaire in patients with rheumatoid arthritis: A multicenter, international study. *Arthritis Care and Research,* 62(11), 1569–1577.

Wessel, J. (2004). The effectiveness of hand exercises for persons with rheumatoid arthritis: A systematic review. *Journal of Hand Therapy,* 17, 174-180.

Woolf, A.D., & Pfleger, B. (2003). Burden of major musculoskeletal conditions. *Bulletin of the World Health Organisation,* (81), 646-656.

Woolfolk, A. (2007). *Educational psychology* (11th ed.). Boston, United States of America: Pearson Education, Inc.

APPENDIX 1
PROVISIONAL ETHICAL CLEARANCE - BREC

UNIVERSITY OF
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29 April 2013

Ms. S Roberts
Department of Occupational Therapy
University of KwaZulu-Natal

Dear Ms Roberts

PROTOCOL: Kineso Taping® of the Metacarpophalangeal joints and its effect on Hand Function in people with Rheumatoid Arthritis. REF: BFC183/12

A sub-committee of the Biomedical Research Ethics Committee has considered your response dated 13 March 2013 to BREC letter dated 13 February 2013.

The study remains provisionally approved subject to a response to the following:

1. Site permission letters

Yours sincerely

Ms A Marimuthu
Senior Admin Officer: Biomedical Research Ethics

AMBER VALLEY BODY CORPORATE

Amber Valley, Karkloof Rd, Howick
P/Bag X30, Howick 3290
Phone : (033) 2395912
Fax : (033) 2395913
29 July 2013

To Sarah Roberts

Re: Permission to conduct research

I, JANE MILLER, give permission on behalf of Amber Valley for Sarah Roberts to conduct research entitled "Kinesio Taping® of the Metacarpophalangeal Joints and its effect on Hand Function in People with Rheumatoid Arthritis" at Amber Valley. The aim of the study is to determine the effect of Kinesio Taping® of the Metacarpophalangeal joints (the joints between the fingers and the palm) on pain, range of motion, grip strength and hand function in people previously diagnosed with rheumatoid arthritis. I have been given information regarding the data collection and the implications for Amber Valley i.e. that Sarah Roberts may use a small room for approximately 5 hours and a larger room for one and a half hours – each once a week for a period of 7 weeks. In addition that she will be able to advertise her research in order to obtain participants for her research from Amber Valley.

At all times Sarah Roberts will ensure confidentiality and anonymity of the research participants and will explain to each participant that their participation is voluntary.

In addition the research would not commence without full ethical clearance from the Biomedical Research Ethics Committee and, should I require any further information, I can contact Sarah Roberts or Serela Ramklass on the numbers below.

Following the research it is understood that feedback will be given to the participants on their role in the research as well as the findings of the research.

Signed .....

Designation..... NURSE MANAGER, AMBER VALLEY CARE CENTRE

Date..... 29 JULY 2013.....

AMBER VALLEY
CARE CENTRE

Sarah Roberts
Occupational Therapist
Masters in Upper Limb Rehabilitation
University of KwaZulu-Natal (Westville Campus)
033 344 3417
eduarch@mweb.co.za

Supervisor:
Dr Serela Ramklass
031 260 4123
082 654 8936

Woodgrove

To Sarah Roberts

Re: Permission to conduct research

I, Jade Luck, give permission on behalf of Woodgrove for Sarah Roberts to conduct research entitled "Kinesio Taping® of the Metacarpophalangeal Joints and its effect on Hand Function in People with Rheumatoid Arthritis" at Woodgrove. The aim of the study is to determine the effect of Kinesio Taping® of the Metacarpophalangeal joints (the joints between the fingers and the palm) on pain, range of motion, grip strength and hand function in people previously diagnosed with rheumatoid arthritis. I have been given information regarding the data collection and the implications for Woodgrove i.e. that Sarah Roberts may use a small room for approximately 3 hours twice a week for a period of 7 weeks. In addition that she will be able to advertise her research in order to obtain participants for her research from Woodgrove.

At all times Sarah Roberts will ensure confidentiality and anonymity of the research participants and will explain to each participant that their participation is voluntary.

In addition the research would not commence without full ethical clearance from the Biomedical Research Ethics Committee and, should I require any further information, I can contact Sarah Roberts or Serela Ramklass on the numbers below.

Following the research it is understood that feedback will be given to the participants on their role in the research as well as the findings of the research.

Signed .....
Designation...Matron.....
Date.....8 August 2013.....

Sarah Roberts
Occupational Therapist
Masters in Upper Limb Rehabilitation
University of KwaZulu-Natal (Westville Campus)
033 344 3417
eduarch@mweb.co.za

Supervisor:
Dr Serela Ramklass
031 260 4123
082 654 8936

THE MARIAN HOME FOR THE AGED

MARIAN VILLA
282 ALEXANDRA ROAD
PIETERMARITZBURG
3201
TELEPHONE: (033) 3868240
FRAIL CARE: (033) 3861229
FAX: (033) 3868005
EMAIL : info@marianvilla.co.za

002 – 268 NPO
Vat Reg. No. : 4640117554

13 January 2014

Ms Sarah Roberts
Occupational Therapist
Masters in Upper Limb Rehabilitation
University of KwaZulu - Natal (Westville Campus)

Dear Sarah

This letter confirms that you have been grated permission to conduct your study on rheumatoid arthritis at our Home.

We have one resident who suffers from rheumatoid arthritis and she is happy to be part of the study.

Please contact me when you are ready to meet with our resident.

Thanking you

LINDA REES (Mrs)
ADMINSITRATOR

Allison Homes Trust

~ FOR SENIOR CITIZENS

Friday 16th May 2014.

TO WHOM IT MAY CONCERN:

This letter is to confirm that Sarah Roberts will be doing research on Rheumatoid Arthritis here at Allison Homes.

Yours faithfully ,

W Sutherland
Manager

Queen Mary Place • King George V • Albert Allison Haven • 488 Burger Street, Pietermaritzburg, 3201
Tel: (033) 342 6009 Fax: (033) 342 6099 e-mail : allisonhomestrust@telkomsa.net

Nonprofit Organisation Reference Number: 002-217 NPO

Aryan Benevolent Home.
500 Pietermaritz Street
Pietermaritzburg
08. 01. 2014.

To UKZN. Biomedical Research Ethics Committee
117 Mbubu Road · DR Serela Ramklass
Boughton
3201.

To Whom It May Concern.

The above old age Home in Pietermaritzburg have a lot of elderly who have Rheumatoid Arthritis in their hands.

We gave permission to your Student Sarah Roberts - Occupational Therapist to do research on a comparison of two therapy techniques [Kinesio Taping and Joint Protection]

Thank You,
T. Narine Prof / Nurse.

T. NARINE.

ARYAN BENEVOLENT SOCIETY
FUND RAISING No.: 066003020007
P.O. BOX 8269
CUMBERWOOD 3235
500 PIETERMARITZ STREET
PIETERMARITZBURG 3201

Amberfield
Retirement Village

Private Bag X010
Howick
3290

Tel: 033 239 2000
Fax: 033 239 2003
Email: bev@amberfield.co.za
dudley@amberfield.co.za

18 JULY 2014-07-18

To UKZN Biomedical Research Ethics Committee

Re: Permission to conduct research

On behalf of Amberfield Retirement Village, I, Pamela Wanda Oellermann, hereby give Sarah Roberts permission to conduct research, entitled "Kinesio Taping of the Metacarpophalangeal joints and its effect on Hand Function in people with Rheumatoid Arthritis"

The aim of the study is to determine the effect of Kinesio Taping of the joints between the fingers and palm on pain, range of motion, grip strength and hand function in people previously diagnosed with Rheumatoid Arthritis.

I have been given information regarding the data collection.

At all times Sarah Roberts will ensure confidentiality and anonymity of the research participants and will explain to each participant that their participation is voluntary.

In addition the research would not commence without full ethical clearance from the Biomedical Research Ethics Committee and, should I require any further information, I can contact Sarah Roberts or Dr. Serela Ramklass on the numbers below.

Following the research it is understood that feedback will be given to the participants on their role in the research as well as the findings of the research.

Signed....P W Oellermann.....
Designation...MATRON.....
Date....18...7...2014

Sarah Roberts
Occupational Therapist
Masters in Upper Limb Rehabilitation
UKZN (Westville Campus)
033 344 3417
eduarch@mweb.co.za

Supervisor:
Dr. Serela Ramklass
031 260 4123 / 082 654 8936

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

22 August 2013

Ms. S Roberts
Department of Occupational Therapy
University of KwaZulu-Natal

Dear Ms Roberts

PROTOCOL: Kineso Taping® of the Metacarpophalangeal joints and its effect on Hand Function in people with Rheumatoid Arthritis. REF: BFC183/12

The Biomedical Research Ethics Committee (BREC) has considered the abovementioned application.

The study was provisionally approved by a quorate meeting of BREC on 12 June 2012 pending appropriate responses to queries raised. Your responses dated 14 August 2013 to queries raised on 29 April 2013 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as from 22 August 2013 **at the following sites: Amber Valley Care Centre, Riverside Park Home, Jan Richter Home and Woodgrove.**

This approval is valid for one year from **22 August 2013.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2004), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx. BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

Professor D Wassenaar (Chair)
Biomedical Research Ethics Committee
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 2384 **Facsimile:** +27 (0)31 260 4609 **Email:** brec@ukzn.ac.za
Website: http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

The following Committee members were present at the meeting that took place on 12 June 2012:

Prof D Wassenaar	Chair
Prof R Bhimma	Paediatrics & Child Health
Prof S Collings	Psychology
Prof A Coutsoudis	Paediatrics & Child Health
Dr U Govind	Private Pract. - Gen. Practitioner
Dr R Green-Thompson	Obstetrics and Gynaecology
Dr Z Khumalo	KZN Health (External)
Ms T Makhanya	Community Medicine
Dr K Naidoo	Family Medicine
Prof D J Pudifin	Medicine
Prof L Puckree	External - DUT
Prof V Rambiritch	Pharmacology
Dr M A Sathar	Medicine
Dr D Singh	Anaesthetics
Dr S Singh	Dentistry
Prof J Tsoka-Gwegweni	Public Health

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

PROFESSOR D R WASSENAAR
Chair: Biomedical Research Ethics Committee

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16 May 2014

Ms. S Roberts
Department of Occupational Therapy
University of KwaZulu-Natal

Dear Ms Roberts

PROTOCOL: Kineso Taping® of the Metacarpophalangeal joints and its effect on Hand Function in people with Rheumatoid Arthritis. REF: BFC183/12

We wish to advise you that your letter dated 28 April 2014 requesting approval of Amendments for the above study (addition on new sites for this study) has been noted and approved by the sub-committee of the Biomedical Research Ethics Committee.

The following has been approved:

- Addition of three sites (Sunnyside Park Homes, Jacaranda Lodge and the Marian Home for the Aged) that have provided permission letters.

This approval will be **ratified** by a full Committee at its next meeting taking place on 10 June 2014.

Yours sincerely

Mrs A Marimuthu
Senior Administrator Biomedical Research Ethics Committee

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07 August 2014

Ms. S Roberts
Department of Occupational Therapy
University of KwaZulu-Natal

Dear Ms Roberts

PROTOCOL: Kineso Taping® of the Metacarpophalangeal joints and its effect on Hand Function in people with Rheumatoid Arthritis. REF: BFC183/12

We wish to advise you that your letter dated 20 July 2014 requesting approval of Amendments for the above study (addition on new sites for this study) has been noted and approved by the sub-committee of the Biomedical Research Ethics Committee.

The following has been approved:

- Addition of sites (Amberfield, PAFTA, Alison Homes Trust and Aryan Benevolent Fund) that have provided permission letters.

This approval will be **ratified** by a full Committee at its next meeting taking place on 09 September 2014.

Yours sincerely

Mrs A Marimuthu
Senior Administrator Biomedical Research Ethics Committee

APPENDIX 4
RECERTIFICATION APPLICATION APPROVAL NOTICE – BREC

UNIVERSITY OF
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22 August 2014

Ms. S Roberts
Department of Occupational Therapy
University of KwaZulu-Natal

Dear Ms Roberts

PROTOCOL: Kineso Taping® of the Metacarpophalangeal joints and its effect on Hand Function in people with Rheumatoid Arthritis. REF: BFC183/12

RECERTIFICATION APPLICATION APPROVAL NOTICE

Approved:	22 August 2014
Expiration of Ethical Approval:	21 August 2015

I wish to advise you that your application for Recertification dated 07 August 2014 for the above protocol has been noted and approved by the Biomedical Research Ethics Committee (BREC) at a meeting that took place on **12 August 2014** for another approval period. The start and end dates of this period are indicated above.

If any modifications or adverse events occur in the project before your next scheduled review, you must submit them to BREC for review. Except in emergency situations, no change to the protocol may be implemented until you have received written BREC approval for the change.

Yours sincerely

Mrs A Marimuthu
Senior Administrator: Biomedical Research Ethics

APPENDIX 5
PARTICIPANT LETTER WITH INFORMED CONSENT

Dear Sir/Madam

TITLE OF THE RESEARCH PROJECT: Kinesio Taping® of the metacarphophalangeal joint and its effect on hand function in people diagnosed with Rheumatoid Arthritis.

My name is Sarah Roberts and I am an Occupational Therapist completing my Masters in Upper Limb Rehabilitation at the University of KwaZulu Natal. My supervisor is Doctor Serela Ramklass.

You are being invited to consider taking part in a research project. I am completing my research on a comparison of two therapy techniques (Kinesio Taping® and Joint Protection) for 128 people who have rheumatoid arthritis in their hands. All participants will be from different Retirement Villages in Howick and Pietermaritzburg, KwaZulu Natal. The research is being partly funded by the University of KwaZulu Natal (college of Health Sciences) and the Kinesio Taping® association is providing some of the materials for the study.

Please read the information presented here which will explain the details of this project and feel free to ask the study staff any questions about any part of this project that you do not fully understand. Your participation is **entirely voluntary** and you are free to say no to participating in this research. If you say no, this will not affect you negatively in any way whatsoever in terms of the research or your standing at this Retirement Village. You are also free to withdraw from the study at any point, even if you do agree to take part.

I am asking you to participate in this research because you are a person who is experiencing the effects of rheumatoid arthritis, specifically in your hands. My research is about helping people manage the effects of rheumatoid arthritis in terms of what they need to do with their hands. More precisely, I would like to know if different therapy interventions focused on the joint where your fingers meet the palm of your hand (the metacarpophalangeal joint) have any effect on your pain, the extent you can move your fingers (range of motion), the strength of your hands (grip strength) and on your ability to use your hands to do everyday tasks. The two interventions that I will be looking at are:

- joint protection workshops where joint protection principles and energy conservation principles will be discussed and implemented; and
- making use of a tape over the above mentioned joints (Kinesio Taping®).

If you agree to be part of the research I will be asking you to participate for a seven week period. This will not be everyday over those seven weeks but the time I will ask you to set aside may range from thirty minutes to two and a half hours per week on one specific day of the week. The amount of time would be approximately: - week 1 – 1 hour; week 2 – half an hour; week 3,4,5,6 – one or two hours dependant on the intervention you receive and week 7 – half an hour. Should you receive the tape I would also see you for a brief period (ten minutes) on another day to remove the tape. During this time I would firstly be asking you a number of details such as your age, gender, background and a colleague of mine would complete a brief assessment of your pain, movement and strength in your hands. I would also ask that this assessment of pain, movement and strength be completed once a week (included in the time above). In addition I would ask you to complete a questionnaire three times during the seven weeks on how you use your hands during the weeks.

Your participation in this study is voluntary and you may withdraw at any time. The information that you give me will be kept anonymous and at no time will I give out your personal or medical information. No one except myself and a research assistant will know what you have said. Your personal information will remain confidential and your name will not appear anywhere in the articles and reports written from the study. All records from the study will be kept in a locked filing cabinet for a period of 5 years after which they will be destroyed.

This study has been ethically reviewed and approved by the UKZN Biomedical Research Ethics Committee (approval number BFC 183/12).

Your responsibilities will be to:

- Agree to willingly participate in this project by providing information on your symptoms of rheumatoid arthritis prior to, and during, the seven week time frame.
- Sign a consent form and by signing this form:
- Know that even after you sign the consent form, you are under no obligation to volunteer any information if you are not comfortable in this or willing to do so
- Be as clear as possible with your experiences in order to make it possible to support you in the process
- Ask the research team any questions about anything that you might want to know about the project and/or your participation in the project, especially if you experience any concerns whatsoever.

You will not be paid to take part in this research. Benefits of this project could be better explained by viewing it as something that may improve the symptoms of rheumatoid arthritis in the hands of people suffering from this disease. Also, results of this study can be used by both international and national therapists to improve intervention strategies for assisting clients who experience the effects of rheumatoid arthritis. Following the research I will give you feedback on my findings in a workshop.

There are no serious risks in taking part in this research but it is important that if you have any of the following conditions, that you do not make use of the tape: cancer, cellulitis, open wounds on your hands, infections in your hands, deep vein thrombosis, kidney disease, congestive heart failure, vasculitis, pericarditis, myocarditis, ischaemic heart disease, pleuritis, Felty's syndrome, polyneuropathy, mononeuropathy, scleritis, episcleritis and glomerulonephritis. Should you not have one of these conditions, the materials to be used are not harmful with the only possible discomfort being an allergic reaction. We will first test the tape on your skin to see whether this may occur and you would therefore not be required to continue with the study. Following the trial strip of tape, all participants using the tape will be continually monitored for any reactions. All participants and nursing staff at the Retirement Villages will be shown the use and care of the tape as well as provided with Milk of Magnesia should an allergic reaction occur.

I would recommend that if you decide to be part of the research, that you inform your general practitioner / physician of your participation.

You can contact me, my supervisors or the Biomedical Research Ethics Committee on the below contact numbers if you have any further queries or encounter any problems.
You will receive a copy of this information and consent form for your own records.

Once again, thank you for your time

Yours sincerely

Sarah Roberts
BSc. Occupational Therapy
Address: 117 Mbubu Rd, Boughton, 3201
Telephone: 033 344 3417
Fax: 088 033 344 3417
Cell: 082 462 0578
Email: eduarch@mweb.co.za

SUPERVISORS:
Dr Serela Ramklass
Address: University of KwaZulu Natal, Medical Administration, Medical School, Medical School Building.
Telephone: 031 260 4123; 082 654 8936
Email: ramklasss@ukzn.ac.za

Professor Robin Joubert
Address: University of KwaZulu Natal, Occupational Therapy Department, Westville Campus.
Telephone: 0312607953; 0834821799
Email: joubertr@ukzn.ac.za

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Telephone: 27 31 2604769
Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

Number _____

Declaration by participant

By signing below, I _____ agree to take part in a research entitled "Kinesio Taping® of the metacarphophalangeal joint and its effects on hand function in people diagnosed with Rheumatoid Arthritis".

I declare that:

- I have read, or have had read to me, this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurized into taking part.
- I may choose to leave the study at any time and will not be penalized or prejudiced in any way.
- If I have any questions regarding my rights as a participant or have any other questions relating the research I can contact the Biomedical Research Ethics Administration, Research Office, Westville Campus, Govan Mbeki Building, Private Bag X 54001, Durban, 4000 (Tel: 27 31 2604769 - Fax: 27 31 2604609, Email: BREC@ukzn.ac.za)

Signed at _____ on (*date)* _____

Signature _____

Consent for completing the questionnaire

Signed at _____ on (*date)* _____

Signature _____

Consent for follow up assessments over the seven weeks

Signed at _____ on (*date)* _____

Signature _____

Consent for intervention (joint protection workshops or Kinesio Taping®)

Signed at _____ on (*date)* _____

Signature _____

Declaration by the investigator

I *(name)* _____ declare that:

- I explained the information in this document.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research as discussed above.
- I have recommended to the participant that he/she informs their primary physician.
- I have given this participant time to read, understand and question the information before giving consent. This has included time out of my presence and time to consult with friends and/or family.

Signed at _____ on (*date)* _____

Signature _____

APPENDIX 6
SCREENING QUESTIONNAIRE

Number _____

SCREENING QUESTIONNAIRE

Thank you for agreeing to participate in this screening assessment.

Please would you answer the following questions:

What year was your rheumatoid arthritis first diagnosed? _____

Please circle the following answers:

Do you have rheumatoid arthritis in your hands?	Yes	No
Do you suffer from any of the following conditions:		
• Dupuytrens	Yes	No
• Cancer	Yes	No
• Cellulitis	Yes	No
• Deep vein thrombosis	Yes	No
• Kidney disease (glomerulonephritis, other)	Yes	No
• Any heart conditions (congestive heart failure, ischaemic heart disease, pericarditis, myocarditis, other)	Yes	No
• Diabetes	Yes	No
• Osteoarthritis	Yes	No
• Vasculitis	Yes	No
• Pleuritis	Yes	No
• Felty's syndrome	Yes	No
• Neuropathies (polyneuropathy, mononeuropathy)	Yes	No
• Scleritis	Yes	No
• Episcleritis	Yes	No
Have you had any previous major hand injuries?	Yes	No
Have you had any previous hand surgery?	Yes	No
Have you ever had a stroke?	Yes	No
Have you any open wounds on your hands at the moment?	Yes	No
Can you straighten all of your fingers fully?	Yes	No
Do you have pain in your hands from the rheumatoid arthritis?	Yes	No
Are you receiving any therapy (physiotherapy, occupational therapy, chiropractic intervention) for your hands at the moment?	Yes Please specify:	No
Have you been involved in any formal joint protection programs / are you using any joint protection principles?	Yes Please specify:	No

Are you participating in any other research study around rheumatoid arthritis at the moment? Yes No

Please could you indicate on the line below (x) what your pain has been like on an average day during the past 6 months:

No pain Pain as bad as it could be

APPENDIX 7
BACKGROUND INFORMATION FORM

Number _____

BACKGROUND INFORMATION

Please provide the following information about yourself. (Please circle one answer for each question).

1. Are you right handed or left handed?
1. Right handed
2. Left handed
3. Both

2. What is your gender?
1. Male
2. Female

3. What is your age?
1. 50 – 55 years of age
2. 56 – 60 years of age
3. 61 – 65 years of age
4. 66 – 70 years of age
5. 71 – 75 years of age
6. 76 – 80 years of age

4. What is your racial background?
1. Black
2. Coloured
3. Indian
4. White
5. Other (Please specify) _____

5. When were you first diagnosed with rheumatoid arthritis?(Please specify year) _____

6. Have you previously been diagnosed with osteoarthritis in your hands?
1. Yes
2. No

APPENDIX 8
MICHIGAN HAND OUTCOMES QUESTIONNAIRE

Number _____

MICHIGAN HAND OUTCOMES QUESTIONNAIRE (MHQ)

Date:

Instructions: This survey asks for your views about your hands and your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer ***EVERY*** question by marking the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

I. The following questions refer to the function of your hand(s) ***during the past week***. Please circle one answer for each question). Please answer ***EVERY*** question, even if you do not experience any problems with the hand and/or wrist.

A. The following questions refer to your ***right*** hand.					
	Very good	Good	Fair	Poor	Very poor
1. Overall, how well did your ***right*** hand work?	1	2	3	4	5
2. How well did your ***right*** fingers move?	1	2	3	4	5
3. How well did your ***right*** wrist move?	1	2	3	4	5
4. How was the strength in your ***right*** hand?	1	2	3	4	5
5. How was the sensation (feeling) in your ***right*** hand?	1	2	3	4	5
B. The following questions refer to your ***left*** hand.					
	Very good	Good	Fair	Poor	Very poor
1. Overall, how well did your ***left*** hand work?	1	2	3	4	5
2. How well did your ***left*** fingers move?	1	2	3	4	5
3. How well did your ***left*** wrist move?	1	2	3	4	5
4. How was the strength in your ***left*** hand?	1	2	3	4	5
5. How was the sensation (feeling) in your ***left*** hand?	1	2	3	4	5

II. The following questions refer to the ability of your hand to do certain tasks ***during the past week***. (Please circle one answer for each question). If you do not do a certain task, please estimate the difficulty with which you would have in performing it.

A. How difficult was it for you to perform the following activities using your ***right*** hand?						
		Not at All Difficult	A Little Difficult	Somewhat Difficult	Moderately Difficult	Very Difficult
1.	Turn a door knob	1	2	3	4	5
2.	Pick up a coin	1	2	3	4	5
3.	Hold a glass of water	1	2	3	4	5
4.	Turn a key in a lock	1	2	3	4	5
5.	Hold a frying pan	1	2	3	4	5
B. How difficult was it for you to perform the following activities using your ***left*** hand?						
		Not at All Difficult	A Little Difficult	Somewhat Difficult	Moderately Difficult	Very Difficult
1.	Turn a door knob	1	2	3	4	5
2.	Pick up a coin	1	2	3	4	5
3.	Hold a glass of water	1	2	3	4	5
4.	Turn a key in a lock	1	2	3	4	5
5.	Hold a frying pan	1	2	3	4	5
C. How difficult was it for you to perform the following activities using ***both of your hands***?						
		Not at All Difficult	A Little Difficult	Somewhat Difficult	Moderately Difficult	Very Difficult
1.	Open a jar	1	2	3	4	5
2.	Button a shirt/blouse	1	2	3	4	5
3.	Eat with a knife/fork	1	2	3	4	5
4.	Carry a grocery bag	1	2	3	4	5
5.	Wash dishes	1	2	3	4	5
6.	Wash your hair	1	2	3	4	5
7.	Tie shoelaces/knots	1	2	3	4	5

III The following questions refer to how you did in your ***normal work*** during the ***past four weeks***. (Please circle one answer for each question).

	Always	Often	Sometimes	Rarely	Never
1. How often were you unable to do your work because of problems with your hand(s)?	1	2	3	4	5
2. How often did you have to shorten your work day because of problems with your hand(s)?	1	2	3	4	5
3. How often did you have to take it easy at your work because of problems with your hand(s)?	1	2	3	4	5
4. How often did you accomplish less in your work because of problems with your hand(s)?	1	2	3	4	5
5. How often did you take longer to do the tasks in your work because of problems with your hand(s)?	1	2	3	4	5

IV. The following questions refer to how much ***pain*** you had in your hand(s) ***during the past week.*** (Please circle one answer for each question).

A. The following questions refer to ***pain*** in your ***right*** hand.

1. How often did you have pain in your ***right*** hand?
1. Always
2. Often
3. Sometimes
4. Rarely
5. Never

If you answered ***never*** to ***question IV-A1*** above, please skip the following questions and go to the next page.

2. Please describe the pain you had in your ***right*** hand.
1. Very mild
2. Mild
3. Moderate
4. Severe
5. Very severe

	Always	Often	Sometimes	Rarely	Never
3. How often did the pain in your ***right*** hand interfere with your sleep?	1	2	3	4	5
4. How often did the pain in your ***right*** hand interfere with your daily activities (such as eating or bathing)?	1	2	3	4	5
5. How often did the pain in your ***right*** hand make you unhappy?	1	2	3	4	5

B. The following questions refer to ***pain*** in your ***left*** hand.

1. How often did you have pain in your ***left*** hand?
1. Always
2. Often
3. Sometimes
4. Rarely
5. Never

If you answered ***never*** to ***question IV-A1*** above, please skip the following questions and go to the next page.

2 Please describe the pain you had in your ***left*** hand.
1. Very mild
2. Mild
3. Moderate
4. Severe
5. Very severe

	Always	Often	Sometimes	Rarely	Never
6. How often did the pain in your ***left*** hand interfere with your sleep?	1	2	3	4	5
7. How often did the pain in your ***left*** hand interfere with your daily activities (such as eating or bathing)?	1	2	3	4	5
8. How often did the pain in your ***left*** hand make you unhappy?	1	2	3	4	5

VI. A. The following questions refer to the appearance (look) of your ***right*** hand ***during the past week***. (Please circle one answer for each question).

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. I am satisfied with the appearance (look) of my ***right*** hand.	1	2	3	4	5
2. The appearance (look) of my ***right*** hand sometimes made me uncomfortable in public.	1	2	3	4	5
3. The appearance (look) of my ***right*** hand made me depressed.	1	2	3	4	5
4. The appearance (look) of my ***right*** hand interfered with my normal social activities.	1	2	3	4	5

VI. B. The following questions refer to the appearance (look) of your left hand ***during the past week***. (Please circle one answer for each question).

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. I am satisfied with the appearance (look) of my ***left*** hand.	1	2	3	4	5
2. The appearance (look) of my ***left*** hand sometimes made me uncomfortable in public.	1	2	3	4	5
3. The appearance (look) of my ***left*** hand made me depressed.	1	2	3	4	5
4. The appearance (look) of my ***left*** hand interfered with my normal social activities.	1	2	3	4	5

VI. A. The following questions refer to your satisfaction with your ***right*** hand ***during the past week***. (Please circle one answer for each question).

	Very satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Very Dissatisfied
5. Overall function of your ***right*** hand.	1	2	3	4	5
6. Motion of the fingers in your ***right*** hand.	1	2	3	4	5
7. Motion of your ***right*** wrist.	1	2	3	4	5
8. Strength of your ***right*** hand.	1	2	3	4	5
9. Pain level in your ***right*** hand.	1	2	3	4	5
10. Sensation (feeling) of your ***right*** hand.	1	2	3	4	5

B. The following questions refer to your satisfaction with your ***left*** hand ***during the past week***. (Please circle one answer for each question).

	Very satisfied	Somewhat Satisfied	Neither Satisfied nor Dissatisfied	Somewhat Dissatisfied	Very Dissatisfied
1. Overall function of your ***left*** hand.	1	2	3	4	5
2. Motion of the fingers in your ***left*** hand.	1	2	3	4	5
3. Motion of your ***left*** wrist.	1	2	3	4	5
4. Strength of your ***left*** hand.	1	2	3	4	5
5. Pain level in your ***left*** hand.	1	2	3	4	5
6. Sensation (feeling) of your ***left*** hand.	1	2	3	4	5

Thank you very much for completing this questionnaire.

ASSESSMENT FORM

Number _____

Date: _____
Time: _____

MCP Ulnar deviation

	Right hand			
	Index finger	Middle finger	Ring finger	Little finger
Assessment 1				
Assessment 2				
Assessment 3				
Mean				
Checked				

	Left hand			
	Index finger	Middle finger	Ring finger	Little finger
Assessment 1				
Assessment 2				
Assessment 3				
Mean				
Checked				

Grip Strength

	Right hand	**Left hand**
Spacing 2		

Visual Analogue Scale

Please rate your pain levels over the past week (mark with an x)

No pain _____ Pain as bad as it could be

Please can you indicate (put an x over the area) where the pain in your hand is: