The influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st carpo-metacarpal joint: a pilot study for an experimental pre-test/post-test design.

By: Marti Simpson

211559463

March 2014

Author's Declaration

I, Mrs Marti Simpson, declare that 'The influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st carpo-metacarpal joint: a pilot study for an experimental pre-test/post-test design', is my own work and that all sources that were used or quoted have been indicated by means of complete references. This study has not been submitted in any form to another university or institution.

_____ _____

Mrs. Marti Simpson Date

Acknowledgements

I would like to thank the following people who assisted and supported me and without whom this study would not have been possible:

- Mrs. Verusia Chetty, my supervisor, for her generous support and guidance throughout the past few years.
- Mrs. Tasha Pilling, my HOD at Edendale Hospital, who accommodated and supported me throughout the process of this research.
- My colleagues at Edendale Hospital who were always very supportive and understanding.
- My parents, who always believe in me.
- My daughter, Hannah, who provides balance and priorities in my life.
- My understanding husband, Jean, who cheered me on throughout and who celebrates with me at the end.
- My living God, for His abundant blessings and grace.

Acronyms and Abbreviations

BREC: Biomedical Research Ethics Committee

CM: Centimetre

GEE: Generalized Estimating Equations

HPCSA: Health Professional's Council of South Africa

IP joint: Interphalangeal joint

JPE: Joint Protection Education

KG: Kilograms

MHQ: The Michigan Hand Outcomes Questionnaire

NRS: Numeric Rating Scale

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

ROM: Range of Motion

UKZN: University of KwaZulu-Natal

VAS: Visual Analogue Scale

VRS: Verbal rating scale

%: Percentage or number of parts per hundred

Glossary

ABDUCTOR POLLICIS LONGUS MUSCLE: The muscle is an extrinsic muscle of the thumb with the function of abducting the thumb.

ASSISTIVE DEVICE: A device used by individuals with impairments, enabling them to perform tasks that they were formerly unable to do or had great difficulty accomplishing.

CONSERVATIVE MANAGEMENT: Intervention modalities designed to avoid operative procedures.

OSTEOARTHRITIS: A progressive degenerative joint disease resulting in gradual loss of joint cartilage.

STRENGTHENING: A therapeutic modality used to increase the force production in muscles; these programs can be isotonic or isometric in nature.

1st CMC JOINT: First carpo-metacarpal joint.

Abstract

Introduction: Elderly females are predominantly left impaired by the degenerative impact which osteoarthritis has on the 1st CMC joint. Research supports the successful implementation of early stage conservative management.

Aim: To determine the viability of performing a full scale study to investigate the influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st CMC joint.

Objectives: Validating data gathering instruments; evaluating methods and procedures used for recruiting, randomization; retaining, assessing and facilitating compliance of participants. Evaluation of the data capturing process. Required resources and sample size for a scientifically valid full scale study was estimated.

Method: The pilot study made use of the quantitative research design proposed for a full scale study. Tools such as cost sheets and compliance logbooks were implemented along with qualitative components such as feedback questionnaires and field notes. Three retirement homes participated; 25 residents qualified to participate of which 15 were allocated to the experimental group and 10 to the control group. The experimental group participated in an 8 week exercise program; while the control group received an assistive device. Both the experimental and control groups were assessed at baseline; four weeks and after eight weeks. The assessment battery included the Kapandji index for thumb opposition, voluntary isometric total grip, 2-point pincer, 3-point pincer and key grasp strength, Visual Analogue Scale for pain and the Michigan Hand Outcome Questionnaire (MHQ).

Data analysis: Data was captured by the researcher; the MHQ and feedback questionaires were independantly completed by the partiticpants. Data cleansing was conducted manually where corectness was verified by a third uninvolved party. Quantitative data was summarized and tested with the

Generalized Estimating Equations (GEE) to detect possible changes over time. Inferential analysis and comparisons of results for the experimental and control groups could not be made. The researcher detected themes and subthemes within the qualitative data.

Results/Discussion: Recruitment techniques' response rate did not exceed 27%; qualitative data sets identified influencing factors An inclusion age of 60 years and older were suggested and to extend the research to various ethic groups. A large enough sample group for randomization was not obtained. Recommended adjustments to the assessment battery: using an adjusted MHQ as the full MHQ includes unapplicable questions; using a Numerical Rating Scale (NRS) for pain potentially being more user friendly for an elderly population; and an additional abduction active range of motion goniometer assessment for the thumb is recommended as the Kapandji scale for opposition provided limited information concerning the range of motion of the 1st CMC joint. The calculated cost per participant was R1921.60 for the control group and R3179.79 for the experimental group. Human resources were calculated at 64.2% of the entire budget. Compliance was affected by poor memory and health. Population attrition rates were calculated at an average of 48%. The feedback questionaires indentified personal gain and the feeling of contributing to a research initiative as the predominant themes for retaining the target population.

*Conclusion:*The conducted pilot study can be used to define the parameters necessary to conduct then mentioned full scale research study, as well as assist with research designs envolving a similar target population. One more pilot study is recommended prior to a full scale study addressing topics such as including diverse races; recommended additional assessment tools and intervnetion components.

Table of Contents

List of Tables

List of Appendices

Chapter 1: Introduction

1.1 Background and rationale

Elderly females are predominatly left impaired by the degenerative impact that osteoarthritis of the 1st carpo-metacarpal joint (herein after referred to as the 1st CMC joint) has on their level of function (Colditz & Koekebakker, 2010; Dahaghin et al., 2005; Rogers & Wilder, 2007). The disabling impact of osteoarthritis of the 1st CMC joint places a considerable amount of strain on health resources, as it is the second most prone site for hand surgery (Colditz & Koekebakker, 2010; Mennen & van Velze, 2008; Pai, Talwalkar & Hayton, 2006; Swigart, 2008).

The progressive nature of osteoarthritis of the 1st CMC is predominantly assigned to contributing mechanical factors (Colditz & Koekebakker, 2010; Dahaghin et al., 2005; Rogers & Wilder, 2007). Besides the palmar beak ligament as primary support structure of the 1st CMC joint (Colditz & Koekebakker, 2010; Van Heest & Kallemeier, 2008); the 1st CMC joint also relies strongly on the stability offered by its surrounding muscles; with specific reference to the abductor pollicis longus muscle (Najima, Oberlin, Alnot & Cadot, 2005; Pai et al., 2006).

Research identified that In order to address the high frequency of impairment and residual hand surgery focus has to shift to conservative management of early stage 1st CMC joint osteoarthritis (Wajon & Ada, 2005). Even though research has indicated that strengthening programs can be used to address chronic pain, stiffness, hand function and weakness (Mennen & van Velze, 2008); it is also a modality supported more by expert opinion than valid research projects (Rogers & Wilder, 2009). Available literatureare also not specific about the principles required for successfully implementing of these strengthening programs (Valdes & Marik, 2010; Ye, Kalichman, Spittle, Dobson & Bennel, 2011).

A research project studying a specified strengthening program for the abductor pollicis longus muscle and its influence on the symptoms exerperienced by individuals presenting with ealry stage osteoarthritis of the 1st CMC joint will contribute to existing literature pertaining to the succesful

conservative management of individuals suffering from osteoarthritis of the 1st CMC joint (Wajon & Ada, 2005).

Available literature however is not only lacking information on strengthening programs for the discussed condition; but also vital information required to ensure a viable research design. Literature specifically lacks information pertaining to the elderly population whom needs to be accessed during a full scale research study. Target population information which needs to be obtained prior to a full scale study includes appropriate strategies for recruiting; retaining and facilitating compliance; appropriate intervention principles as well as assessment tools for specific variables will also have to be established. A pilot study is essential to obtain the necessary information to ensure a viable research design for a full scale research project.

1.2 Aim

The aim of this pilot study is to determine whether it would be viable to perform a full scale study to investigate the influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st CMC joint.

A full scale study would be a hypothesis testing study with an experimental pre-test/post-test research design. The proposed pilot study's aim is to refine the research proposal in order to ensure a viable full scale study.

1.3 Objectives

The objectives of the pilot study are the following (Moore, Carter, Nietert & Stewart, 2011; Kilanowski, 2011; Van Teijlingen & Hundley, 2001):

- To validate data gathering instruments to be used during a full scale study.
- To evaluate the efficiency of methods used for recruitment of participants.
- To evaluate the efficiency of methods used for randomization of participants.
- To evaluate the efficiency of methods used to retain participants in the study.
- To evaluate the efficiency of methods used for compliance with intervention modalities.

- To evaluate the efficiency of assessment procedures to be used during a full scale study.
- To evaluate the process of data capturing.
- To estimate what resources will be required in order to perform a full scale study.
- To use the data gathered during the pilot study to estimate the variablity in outcomes, in order to determine an adequate sample size necessary to perform a scientifically valid full scale study.

1.4 Significance

The predominant significance of the pilot study was that it was designed to determine whether a full scale research project with an experimental pre-test/post-test design would be viable, with reference to the topic of addressing the influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st CMC joint. The parameters for a full scale research project were also determined by the results of the conducted pilot study. Aspects of these results could also be used to assist in future research projects using similar research designs.

Even though the pilot study did not deliver any statistically significant data, the results obtained during the research project add to the discussion of various topics on which very limited information is available within literature, as well offering further valuable information. In preparation for the pilot study, no literature could be found on the recruitment and retention of elderly Caucasian females within a South African context. The only information which was able to be located pertained to the elderly within an American population; results from this pilot study could add to the discussion of including elderly Caucasian females as a target population within the context of research. Information concerning this target population could also be used to assist future research with a similar target population and research design. Literature was also very scarce concerning strengthening programs for early stage osteoarthritis of the 1st CMC joint as an intervention modality;

especially considering the exact principles used during such strengthening programs.

Chapter 2: Literature Review

2.1 Introduction

During the compilation of the literature review, a variety of primary and secondary sources (textbooks and journal articles) were consulted. Google Scholar, UKZN Online Libraries, Science Direct, PubMed and Medline online databases were searched using the following keywords: osteoarthritis 1st CMC joint; biomechanics 1st CMC joint; conservative management; strengthening programs and assistive devices. The literature sources dated from 2000-2012 with the exclusion of 9 sources dating from 1976-1999 which were predominantly in reference to kinesiology and pathophysiology of 1st CMC joint osteoarthritis.

2.2 Osteoarthritis of the 1st carpo-metacarpal joint

Osteoarthritis is a degenerative joint condition generally associated with the elderly (Colditz & Koekebakker, 2010). Of the various joints usually affected by osteoarthritis, the 1st CMC joint is the hand joint which is second most prone to develop this condition; making this the most common site for hand surgery (Colditz & Koekebakker, 2010; Mennen & van Velze, 2008; Pai et al., 2006; Swigart, 2008) and one of the primary musculoskeletal causes of disability in Western countries (Dahaghin et al., 2005).

Osteoarthritis of the 1st CMC joint has the second highest indication of associated hand dysfunction compared to the metacarpo-phalangeal joint, with the highest indication (Dahaghin et al. 2005). It, however, has to be considered that osteoarthritis of the metacarpo-phalangeal joint is usually associated with primary systemic osteoarthritis; usually involving multiple joints which could be the reason for higher indications of hand dysfunction (Dahaghin et al., 2005).

In comparison, osteoarthritis of the 1st CMC joint is usualy defined as being either primary or secondary in nature (Dahaghin et al.,2005; Mennen & van Velze, 2008). It has been argued that osteoarthritis of the 1st CMC joint is mostly secondary in nature; making mechanical factors the primary contributor in developing this condition (Dahaghin, Bierma-Zeistra et al., 2005). Secondary osteoarthritis is typically monoarticular and is mainly due to cartilage damage

(Dahaghin et al., 2005; Mennen & van Velze, 2008). Some studies, however, differ from this view stating that there is no significant evidence to claim that osteoarthritis of the 1st CMC joint can predominantly be defined as secondary osteoarthritis (Mennen & van Velze, 2008; Pai et al., 2006).

While the exact environmental, biomechanical and physiological factors contributing to osteoarthritis of the 1st CMC joint are yet to be defined (Egan & Brousseau, 2007); the studies considering prevalence of the condition indicated that the pathology is especially prominent in Caucasian populations (Zhang et al., 2002). It has to be taken into consideration that even though research on this topic has predominantly been done within a Western context, studies indicated that 25-40% of individuals over the age of 55 years have radiographic evidence of osteoarthritis of the 1st CMC joint (Colditz & Koekebakker, 2010; Mennen & van Velze, 2008; Rogers & Wilder, 2007; Swigart, 2008; Ye et al., 2011). It is also apparent that the condition is generally associated with the elderly, as another study indicated that 60-70% of persons over the age of 65 years seek medical attention for osteoarthritis of the 1st CMC joint (Rogers & Wilder, 2007). The statistics amongst the elderly increase exponentially with increasing age (Colditz & Koekebakker, 2010; Mennen & van Velze, 2008).

Women are more prone to osteoarthritis of the 1st CMC joint, as 1 in 4 elderly women develop this condition, compared to 1 in 12 elderly men (Colditz & Koekebakker, 2010). Furthermore, 75% of women between the ages of 60 and 70 years present with radiographic indications for osteoarthritis of the 1st CMC joint (Boustedt & Nordenskiöld, 2009). It is believed that the 1st CMC joint of a female is more prone to develop osteoarthritis than that of a male's, due to the male's 1st CMC joint being more congruent in comparison to the female joint. Increased laxity of this joint found in postmenopausal women has also been seen as a contributing factor, as 30% of this population presents with radiological changes (Colditz & Koekebakker, 2010; Pai et al., 2006).

Despite advances in the understanding of this disease; researchers still struggle to correlate structural markers of the disease with symptoms experienced by the individual (Dahaghin et al. 2005).

2.2.1 Symptoms and their effect on the individual's functional capacity

Osteoarthritis of the 1st CMC joint is usually associated with localised swelling, tenderness with palpation of the joint and localised pain of the involved joint. The individual may experience a gradual decrease in strength while performing functional grasps; as well as stiffness or laxity of the affected joint (Colditz & Koekebakker, 2010; Mennen & van Velze, 2008; Swigart, 2008).

Pain, limited range and decreased muscle strength has a deteriorating effect on an indvidual's functional capacity (Ye et al., 2011). It was found that even though pain levels experienced by individuals could not be correlated with the stage of 1st CMC joint osteoarthritis (Glickel, 2001); it had the biggest contribution to the deterioration of an individual's functional capacity; to such an extent that a definite correlation exists between an individual's localised pain experience and their functional capacity, when presenting with osteoarthritis of the 1st CMC joint (Boustedt & Nordenskiöld, 2009; Colditz & Koekebakker, 2010; Pai et al., 2006; Swigart, 2008; Ye et al., 2011).

The correlation between the pain experienced by an individual and their functional capacity can be better comprehended when considering the excessive strain placed on the 1st CMC joint's articular surface when performing functional grasps. The total grasp primarily, followed by the key pinch, generates excessive constraining and axial rotational forces on the articular surface of the 1st CMC joint to such an extent that the key pinch is seen as the posture of deformity for the 1st CMC joint (Cooney & Chao, 1977; Mennen & van Velze, 2008).

2.2.2 Diagnosing osteoarthritis of the 1st CMC joint

Diagnosing osteoarthritis of the 1st CMC joint is based on the findings of radiographic assessments, clinical assessments or both (Ye et al., 2011). Even though a radiographic classification system has been designed for osteoarthritis of the 1st CMC joint, it is important to note that symptoms do not usually correlate with radiographic findings, as a radiographic finding can be positive in the presence or absence of symptoms (Colditz & Koekebakker, 2010; Mennen & van Velze, 2008; Swigart, 2008; Zhang et al., 2002). Radiographic findings

can therefore not predict the severity of symptoms experienced or the level of functional impairment present in any individual suffering from osteoarthritis of the 1st CMC joint.

A clinical assessment can involve the following components (Colditz & Koekebakker, 2010; Pai et al., 2006):

- Palpating the joint for inflammation.
- The grind test is used to assess the quality of the articular surfaces. Pain and crepitus indicate a positive test for 1st CMC joint osteoarthritis. A positive test with the absence of pain during wrist movements indicates isolated osteoarthritis of the 1st CMC joint.
- Pain with radial and ulnar deviation of the wrist, but not with the grind test, may indicate isolated osteoarthritis of the scapho-trapezial-trapezoid joint.
- Scapho-trapezial-trapezoid joint osteoarthritis is, however, a diagnosis associated with 1st CMC joint osteoarthritis, where they can occur simultaneously, resulting in pain with both the above mentioned assessments (Mennen & van Velze, 2008).
- The crank test is used to assess joint quality and translation laxity.
- The distraction test indicates inflammation of the joint; when localised pain or discomfort of the 1st CMC joint is relieved as a result of traction is applied to the joint.
- Pain or tenderness during palmar compression of the 1st CMC joint indicates inflammation.
- Squaring off of the base of the 1st Metacarpal can be observed with some individual's presenting with osteoarthritis of the 1st CMC joint.
- An adduction-flexion deformity of the 1st Metacarpal can be observed with the condition.
- The individual complains of localised pain at the 1st CMC joint (Colditz & Koekebakker, 2010).
- Hand diagrams can be used to indicate the location of pain (Zhang et al., 2002).

The differential diagnoses when presenting with pain at the base of the thumb include: Median nerve compression (Carpal Tunnel Syndrome co-exists with 43% of osteoarthritis of the 1st CMC joint, due to synovial hypertrophy); De Quervain's tenosynovitis (due to increased exerted forces in the tendons of the 1st extensor compartment) (Colditz & Koekebakker, 2010; Pai et al., 2006; Swigart, 2008); rheumatoid arthritis, the presence of uric acid crystals, chronic regional pain syndrome (Mennen & van Velze, 2008), trigger thumb and osteoarthritis of the metacarpo-phalangeal joint of the thumb (Swigart, 2008).

2.3 Biomechanics of the 1st CMC joint

This section includes a discussion on the anatomy of the 1st CMC joint and the biomechanical effect on the stability of this joint. An overview of the 1st CMC joint anatomy will include its articular surfaces, ligmants and musculature.

2.3.1 1st CMC joint articular surfaces

The joint consists of 2 shallow, saddle shaped articular surfaces which provide movement in 3 planes (Swigart, 2008), also providing interosseous stability as it has close contact across the whole joint while in a neutral position (Colditz & Koekebakker, 2010; Pai et al., 2006). Its interosseous stability decreases with movement, relying primarily on ligaments and tendons to stabilise the joint in order to prevent subluxation (Colditz & Koekebakker, 2010).

The joint is prone to develop osteoarhritis as the 1st Metacarpal base's articular surface is 34% larger than the trapezium; concentrating the pressure distribution onto the trapezium's articular surface (Colditz & Koekebakker, 2010). Point loading takes place on the joint surface when the joint subluxes or rotates. Repetitive point loading leads to gradual degeneration of the cartilage of the joint's articular surfaces (Pai et al., 2006).

2.3.2 Ligaments of the 1st CMC joint

Due to the thumb's range of motion and limited interosseous stability at the 1st CMC joint; the stability of ligaments is essential during functional tasks (Swigart, 2008). Of the 7 ligaments supporting the 1st CMC joint, the palmar beak ligament is seen as the most important when considering 1st CMC joint stability (Colditz & Koekebakker, 2010; Van Heest & Kallemeier, 2008). It maintains

relation between the articular surfaces of the 1st Metacarpal and the trapezium; preventing dorsal subluxation of the Metacarpal base on the trapezium (Colditz & Koekebakker, 2010).

The inbuilt laxity of the palmar beak ligament is believed to be one of the key contributing factors, as its laxity leads to dorsal subluxation of the 1st Metacarpal on the trapezium during point loading (Colditz & Koekebakker, 2010; Egan & Brousseau, 2007). This dorsal subluxation takes place on a repetitive basis during activities of daily living and results in gradual degeneration, inflammation of the joint and progressive incongruent articular surfaces. Degeneration also increases palmar beak ligament laxity; the integrity of the beak ligament is directly correlated with the status of the articular surface of the 1st CMC joint (Colditz & Koekebakker, 2010; Egan & Brousseau, 2007; Pai et al., 2006; Vincent & Pellegrini, 1991). The palmar beak ligaments' strength also decreases with ageing (Najimai et al., 2005); which explains the high incidence of 1st CMC joint osteoarthritis in the elderly.

2.3.3 Muscles affecting the 1st CMC joint

There are 8 muscles affecting the thumb; 4 extrinsic muscles and 4 intrinsic muscles (Colditz & Koekebakker, 2010). These muscles have different effects on the 1st CMC joint, depending on their lever arms and line of pull. It has to be noted that the muscles of the thumb work synergistically to each other. Even though complete isolation of a thumb muscle is not possible, movement can be facilitated to involve a major muscle group (Kendall, McCreary, Provance, Rodgers & Romani, 2005).

The 3 extrinsic muscles with an effect on the 1st CMC joint are abductor pollicis longus, extensor pollicis longus and extensor pollicis brevis (Colditz, 2000; Colditz & Koekebakker, 2010). The extrinsic muscle action allows for extension and abduction of the thumb; therefore serving as a protagonist of the thenar muscles. The distal attachments provide little mechanical advantage to the 1st CMC joint itself (Colditz., 2000; Colditz & Koekebakker, 2010).

The abductor pollicis longus muscle is seen as an important stabiliser of the 1st CMC joint (Pai et al., 2006); even though it inserts at the base of the 1st CMC

joint, providing a short lever arm to the joint axis (Colditz & Koekebakker, 2010). The abductor pollicis longus causes abduction and slight extension of the 1st CMC joint and performs against resistance with added pressure against the lateral surface of the distal end of the 1st Metacarpal in the direction of adduction and flexion of the 1st CMC joint.

The 4 intrinsic muscles to be discussed are flexor pollicis brevis, abductor pollicis brevis, adductor pollicis and opponense pollicis. The intrinsic, excluding opponense pollicis, inserts on the 1st proximal phalange causing a dominant flexion load on the 1st CMC joint; often resulting in a flexion and adduction deformity of the 1st CMC joint (Colditz, 2000; Colditz & Koekebakker, 2010).

Cooney and Chao performed a study in 1977 where muscle involvement was described during various functional grasps. It was found that the abductor pollicis longus is one of the muscles which exerts the most force during grasp; followed by abductor pollicis brevis, opponense pollicis/ flexor pollicis brevis and lastly, adductor pollicis (Cooney & Chao, 1977).

2.4 The progress of osteoarthritis of the 1st CMC joint; a biomechanical point of view

The structures which are important for joint stability are the articular surface, ligaments (including joint capsule) and tendons (Pai et al., 2006). The three mentioned structures are discussed in depth.

As a result of the 1st CMC joint being loaded towards flexion, the 1st Metacarpal base constantly leans towards dorsal subluxation on the trapezium; especially during dynamic flexion/adduction of the 1st CMC joint. The palmar beak ligament is the checkrein to prevent subluxation. It was found that repetitive strain to this already lax ligament gradually increases its laxity, resulting in a decrease of joint stability (Colditz, 2000).

As joint stability decreases, the 1st CMC joint will be subjected to progressively more dorsal subluxation. Dorsal subluxation causes point loading on the articular surface, resulting in incongruent articular surfaces and, therefore, the development of osteoarthritis of the 1st CMC joint (Pagalidis, Kuczynski & Lamb, 1981; Pai et al., 2006). Repetitive dorsal subluxation and continuous

damage to the articular surface contributes to the pain experienced by an individual suffering from osteoarthritis of this joint (Colditz & Koekebakker, 2010).

Osteoarthritis of the 1st CMC joint is associated with deformities, as dorsal subluxation alters the line of pull of the involved muscles. These deformities involve: radial deviation of 1st metacarpophalangeal joint due to an adduction contraction of the thumb; as well as a hyperextension deformity of the thumb due to the flexion and adduction of the 1st Metacarpal, resulting in a straighter line of pull of extensor pollicis longus and brevis (Colditz, 2000).

During the initial stages of 1st CMC joint osteoarthritis it was found that while performing a pinch grasp, the laxity of the palmar beak ligament and the strong pull of adductor pollicus causes the 1st metacarpal base to sublux dorsally. This is in contrast to the advanced stages of osteoarthritis which are noted by the 1st web space already being in a fixed contracture, with the 1st metacarpo-phalangeal joint compensating into hyperextension (Mennen & van Velze, 2008).

Degeneration leads to gradual dorsal subluxation of the 1st Metacarpal base which may result in an adduction deformity of the thumb; decreasing the 1st web space. Palmar beak ligament instability is usually followed by a painful 1st CMC joint due to synovitis; this is followed by loss of articular cartilage (initially in the palmar regions; gradually spreading to involve the whole joint); osteophytes form around the articular surface in an attempt to increase the surface area; the subluxed posture results in a adduction contracture of the 1st CMC joint (Swigart, 2008). In order to compensate for this decreased range, the 1st metacarpo-phalangeal joint hyperextends into a Swan-neck posture. The portrayed posture can progress to the point of permanent deformity (Egan & Brousseau, 2007; Mennen & van Velze, 2008; Pai et al., 2006).

The stages of osteoarthritis of the 1st CMC joint can be determined based on the radiographic assessment of a true lateral view of the 1st CMC joint (Egan & Brousseau, 2007; Pai et al., 2006):

- Stage I: Normal articular contours; joint space widening due to effusion or synovitis secondary to ligamentous laxity of basal joint and dorsal subluxation.
- Stage II: Joint space narrowing, some subchondral sclerosis, joint debris and osteophytes <2mm (Pai et al., 2006); or <5mm (Egan & Brousseau, 2007).
- Stage III: Narrowed 1st CMC joint space or complete loss of joint space; severe subchondral sclerosis; joint debris and osteophytes >2mm (Pai et al., 2006); or >5mm (Egan & Brousseau, 2007). The scapho-trapezial joint is normal.
- Stage IV: Indications mentioned in stage III including scapho-trapezial joint narrowing and sclerosis.

2.5 Conservative management of 1st CMC joint osteoarthritis

It is vital to develop efficient intervention modalities for osteoarthritis of the 1st CMC joint, as the number of elderly people affected by this pathology is growing (Rogers & Wilder, 2009).

The pharmacological and surgical intervention components are steadily growing more evidence-based, whereas the rehabilitative intervention components need to rise up and meet the very same challenge (Rogers & Wilder, 2009).

Treatment of osteoarthritis of the thumb initially focuses on conservative management (Pai et al., 2006). The main goals of rehabilitation aim at improving strength and range of motion, as well as decreasing pain in order to increase general hand function (Ye et al., 2011).

It is generally accepted that individuals with stage IV osteoarthritis of the 1st CMC joint (as described by Swigart, Eaton, Glickel and Johnson, 1999) are less likely to respond to conservative management compared to stages I-III, where conservative management can attempt to decrease pain, improve strength, improve contractures and improve general hand function (Wajon & Ada, 2005). Surgical intervention is indicated when conservative intervention fails and when

pain, deformity and weakness significantly interferes with functional performance (Swigart, 2008; Pai et al., 2006; Egan & Brousseau, 2007).

Rehabilitative intervention can imply the following when considering osteoarthritis (Mennen & van Velze, 2008; Zhang et al, , 2007; Pai et al., 2006): Joint protection education which aims to decrease the load exerted on the joint cartilage; strengthening of supportive muscles to increase joint stability and to decrease pain; maintenance of joint mobility to promote joint lubrication; assistive devices; a splint for joint stability during activity; using heat to decrease pain and increase circulation; using cold when joints are inflamed; and massage, which may be indicated for temporary relief of symptoms (Swigart, 2008; Egan & Brousseau, 2007).

2.5.1 Splinting

Splinting the 1st CMC joint with osteoarthritis attempts to substitute for an inadequate palmar beak ligament, therefore decreasing dorsal subluxation of the 1st CMC joint during high resistant activities requiring thumb involvement (Colditz & Koekebakker, 2010; Egan & Brousseau, 2007).

Interventions with splints are found to have a high to moderate evidence level to decrease pain and increase function (Valdes & Marik, 2010); research however indicated that unclarities remain considering aspects of this modality. The literature is also not clear on which design is most effective (Colditz, 2000; Colditz & Koekebakker, 2010; Egan & Brousseau; 2007; Zhang et al., 2007).

Furthermore, it was found that splinting does not completely eliminate arthritic symptoms such as inflammation and pain as the splint is not worn long enough to allow the palmar beak ligament to shorten (Colditz, 2000; Colditz & Koekebakker, 2010; Swigart et al., 1999; Weiss, Lastayo, Mills & Bramlet, 2000). It was also noted that splinting can lead to weakening of an individual's pinch strength and the thenar eminence (Weiss et al., 2000; Pai et al., 2006; Egan & Brousseau, 2007); however, some studies proved differently (Valdes & Marik, 2010).

2.5.2 Strengthening programs as intervention modality for 1st CMC joint osteoarthritis

Strengthening programs are used to increase the force production in muscles; these programs can be isotonic or isometric in nature (Kisner & Colby, 2007).

Isotonic muscle contractions are frequently used during general muscle activity and are concentric and eccentric in nature (Meij, Meyer, Van Papendorp & Viljoen, 2004). Isotonic muscle contractions refer to a muscle contracting against a constant force from a normal resting length to a shortened or a stretched state, respectively (Meij et al., 2004).

When attempting to improve the strength and speed of contractions, muscle fibers must be contracted just prior to the point of fatigue as this facilitates hypertrophy of the type II (white) muscle fibers (Meij et al., 2004). When performing strenous muscle contractions up to the point of muscle fatigue, muscle fibers will be less effective at contracting (Meij et al., 2004).

Fatigue correlates with blood and oxygen supply to the muscle, as well as the accumulation of products present with anaerobic metabolism; such as lactic acid (Meij et al., 2004). A fatigued muscle presents with weakness as the fibers become less responsive in the presence of lactic acid; as well as resulting in possible cramping of the involved muscle (Meij et al., 2004).

Blood supply to a muscle decreases during strenous exercise due to the contracting force of the muscle. Rhythmic motion is therefore required to facilitate blood supply to the relevant muscle fibers and in doing so decreasing the build up of lactic acid; therefore delaying muscle fatigue to set in while exercising a particular muscle (Meij et al., 2004).

Even though the physiology of strengthening muscle fibers has been described in literature, the efficacy of strengthening exercises specifically for 1st CMC joint osteoarthritis has not been thoroughly studied as yet. Strengthening is, however, seen as an established treatment modality; as for many other painful chronic conditions (Zhang et al., 2007; Rogers & Wilder, 2007). Using exercises as an isolated treatment modality is also supported predominantly by

expert opinion (Zhang et al., 2007). There is moderate evidence found by Valdes and Marik (2010) which supports the effective use of hand exercises in attempting to improve grip strength, hand function, range of motion and pain reduction.

The theory behind 1st CMC joint strengthening exercises is that the exercises address muscle imbalance in an attempt to decrease dorsal subluxation; in doing so the treatment modality slows down the degeneration of the joint (Mennen & van Velze, 2008). Even though literature indicates some success using strengthening as a modality when treating osteoarthritis of the 1st CMC joint; there are some studies indicating no results, except for an increase in general hand strength (Ye et al., 2011).

When considering osteoarthritis of the 1st CMC joint and the process of selecting a muscle for strengthening purposes, the literature indicates various options.

Strengthening of the following muscles are advised by Mennen and van Velze (2008): 1st dorsal interossei, abductor pollicis longus and brevis, flexor pollicis longus and brevis. Specific emphasis has been placed on strengthening the thenar muscles; as well as exercises where muscle balance can be addressed by means of a place and hold key grasp exercise (Boustedt & Nordenskiöld, 2009; Egan & Brousseau, 2007; Mennen & van Velze, 2008; Pai et al., 2006; Swigart, 2008).

An abduction exercise regimen was also described by Wajon and Ada (2005). The strengthening program made use of palmar abduction against gravity in a smooth, controlled motion (Wajon & Ada, 2005).

The weakness in existing literature pertaining to 1st CMC joint osteoarthritis is that is unclear on the precise principles required to perform an effective strengthening program with specific regard to frequency, duration, intensity and the program's specific effect on symptoms experienced by the individual (Valdes & Marik, 2010; Ye et al., 2011). The results obtained from research studies making use of strengthening as a modality for the condition at hand and relating it to the influence it has on the symptoms experienced has been

poor; this could however be a result of research projects using strengthening programs with inadequate intensity to actually obtain significant results (Ye et al., 2011).

A strengthening program with more prescribed principles and relative influence on symptoms experienced with osteoarthritis of the hand has, however, been described by Rogers and Wilder (2009), who made use of progressive resistance strengthening principles.

Strengthening principles based on progressive resistance exercise remained almost unchanged since they were described by DeLorme and Watkins nearly 60 years ago (Kisner & Colby, 2007). The general principles are as follows:

- The strengthening program is based on an individual's repetition maximum. This is the maximum amount of resistance against which an individual can perform 8-12 repetitions of a prescribed movement pattern, throughout the whole available range of motion, before fatigue sets in. The repetition maximum must be established by a therapist.
- The individual's repetition maximum is the resistance required when performing the strengthening exercises.
- Strengthening exercises must be performed for 1-3 sets of 8-12 repetitions per set for each exercise session.
- Sufficient rest must be allowed between exercises to allow the muscle fibres to recover. Breaks of 2-3 minutes should therefore be taken between sets; with 1-2 days rest between exercise sessions (therefore performing exercises only 2-3 days a week) (Rogers & Wilder, 2009).
- If the muscle can perform the designated load for 3 sets, without tiring, it is an indication that the muscle fibres have adjusted to the load and that repetition maximum can be increased. It can, however, take up to 4 weeks for muscle fibres to adjust to the load.

The program has a fatigue precaution; where exercise needs to be postponed once muscle fatigue sets in. The precautions are also extended to spasticity, as

well as acute conditions such as fractures and healing tissue (Kisner & Colby, 2007).

When considering using a progressive resistant strengthening program within an elderly community, several components need to be addressed. Progressive resistant programs appear to be safe across many borders, even though transient muscle soreness has been frequently reported, this is however not unexpected when participating in intense exercise regimes, but should be seen as a precaution with the participation of an elderly community (Kisner & Colby, 2007).

Recent reviews have, however, emphasized the potential health benefits of including progressive resistant programs as part of the promotion of physical activity in a community (Kisner & Colby, 2007).

The criticism against this program is that there are very few guidelines regarding who can be included in such a program or not and also whether the elderly maintain any benefits from the strengthening program once the program has ceased (Kisner & Colby, 2007).

2.5.3 Joint protection education (JPE) and the use of assistive devices

Research concerning JPE and the provision of assistive devices indicates moderate evidence to support results in pain reduction and improved hand function (Valdes & Marik, 2010).

Joint protection was originally designed for individuals with rheumatoid arthritis and then adapted for osteoarthritis (Boustedt & Nordenskiöld, 2009). The intervention includes education on: hand anatomy, osteoarthritis, theoretical and practical information on pain and its management, as well as alternative methods in performing activities of daily living such as the use of assistive devices. Information groups appear to be essential to ensure the success of these intervention modalities (Egan & Brousseau, 2007).

Chapter 3: Methodology

3.1 Research design

The study design used is a triangulated or mutual validation process using both quantitative and qualitative methods, where the findings of the latter strengthens the results from the former (Kroll, Neri, & Miller, 2005). Qualitative and quantitative research are viewed from certain perspectives as a shared value to research(Hernon & Schwartz, 2009). Multiple method research is fairly novel in rehabilitation , however Creswell (2002) has attempted to theoretically formalise the mixed method design in his authorship of Research Design: Quantitative, qualitative and mixed methods approaches (J. Creswell, 2002). Mixed methods involve the collection of data concurrently or sequentially for the purpose of a single study. Sequential explanatory research strategy or mutual validation method using qualitative methods secondary to quantitative data collection to provide more in-depth information about the findings of the latter (J. Creswell, 2002; Kroll, et al., 2005) has been the design modified for this used for this study

Framed within a positivistic paradigm, the pilot study made use of the same experimental pre-test/post-test research design which would be used in a proposed quantitative full scale study. A qualitative paradigm was added which allowed the researcher to reflect on the elements of change within the findings of the pilot study. Elderly females presenting with early stage osteoarthritis of the 1st CMC joint who qualified to participate in the research project were randomly allocated to either an experimental group or a control group. The experimental group participated in an 8 week exercise program; while the control group received an assistive device. Both the experimental and control groups were assessed at baseline, four weeks into the intervention period and after eight weeks, at the conclusion of the intervention period. Tools such as cost sheets and compliance logbooks were implemented along with qualitative components such as feedback questionnaires and the researcher's field notes.

3.2 Sampling procedure

3.2.1 Retirement homes

In an attempt to facilitate a higher recruitment rate, potential retirement homes were pre-screened before entering into conversation with the applicable gatekeepers (Warren-Findlow, Prohaska & Freedman, 2003). The pre-screening focused on identifying retirement homes with an adequate population of Caucasian females over the age of 65 years. There was also an element of convenience sampling in that only retirement homes located in Pietermaritzburg were contacted, in an attempt to assist the researcher with the logistics of the research project. Research has indicated that weather patterns might have a minimal effect on the symptoms experienced by women, especially those who present with osteoarthritis in their hands (Wilder, Hall & Barrett, 2008). Selecting retirement homes which are situated in the same region ensured participants were being exposed to similar weather patterns.

In view of upholding an ethical standard the retirement homes will not be named and will be referred to in coding: namely Home A, Home B and Home C.

Two retirement homes identified during the pre-screening process, after which the respective matrons were consulted during separate meetings in January 2013. Verbal consent to allow the retirement home's residents to be invited to participate in the research study was obtained during the meetings; this verbal consent was provisionally based on the pending ethical clearance.

Written informed consent was granted by the respective matrons and board of directors after the research study obtained provisional ethical clearance from the Biomedical Research Ethics Committee (BREC) on the 22nd May 2013. BREC provided final ethical clearance on the 19th June 2013, after written consent from the separate retirement homes was submitted to the committee.

Home A presented with a population of 175 residents at the time of the research study; of these, 100 were women and 37 were identified by the staff as potential candidates for the research study. Home B presented with a population of 164 residents of which 117 were women and 84 were identified as potential candidates for the research study.

The two retirement homes provided both independent and frail care boarding facilities to their residents. The retirement homes offered a variety of central and easily accessible venues where information sessions and therapeutic group sessions could conveniently be held.

Following the recruitment and screening procedure, an adequate sample size could not be obtained from the two noted retirement homes. In addition, a third retirement home had to be approached in order to obtain the remainder of the required sample population. The third retirement home was also selected based on convenience sampling and was comparable to the two initial retirement homes (Warren-Findlow et al., 2003). Home C's matron provided written informed consent on the 4th July 2013; after which BREC provided additional ethical clearance for the new research site. Home C had 106 residents at the time of the research study, of which 43 were identified by the staff as being eligible for potential participation.

After final ethical clearance was granted by BREC, the recruitment process for potential participants commenced (REF: BF053/13).

3.2.2 Recruiting procedure

The researcher used various methods to advertise the research project amongst the residents of the 3 noted retirement homes. The researcher only allowed 2 weeks to advertise and recruit potential participants for the research study. This short period between the recruitment and intervention phases was due to time constraints, but has also been indicated by literature as being a facilitating factor for improved retention rates amongst elderly participants in research projects (Katula et al., 2007).

Mass media methods were not indicated as the research project took place amongst the elderly at a local level and this method's response rate would not have been worth its cost factor (Stoy et al., 1995; Katula et al., 2007).

Each retirement home was given two A1 sized color posters which were placed at eye level; one in the reception area and the other in the common dining hall. The respective matrons approved the two sites as ideal to catch the attention of the majority of residents. Smaller A4 posters with similar information were also

placed at the entrances of the various wards. Furthermore, information pamphlets were distributed under the doors of the rooms of eligible residents, as identified by the respective staff (Warren-Findlow et al., 2003).

All posters and information pamphlets were printed in an acceptable and easily legible font, considering the needs of the elderly; it furthermore contained information prescribed for a target population at high risk for disability (Stoy et al. , 1995; Katula et al., ,2007). The following information was included in the pamphlets:

- Theme: Are you female and do you suffer from Osteoarthritis of the thumb OR a painful thumb?
- Details of affiliation with the University of KwaZulu-Natal.
- Personal health benefits of participating in the research project.
- Contact details of researcher; supervisor and the applicable matron.
- Invitation to an information meeting: venue, time and date.
- Images: Thumb with indication of pain at the base of the thumb; as well as the emblem of the University of KwaZulu-Natal.

In an attempt to decrease recruitment bias by only including printed advertisements understandable only to those who are literate, the researcher also made use of the retirement homes' announcement system, where available; visual cues were also used on pamphlets and posters; and the researcher also reinforced the word-of-mouth method amongst residents (Warren-Findlow et al., 2003; Stoy et al.,, 1995). The respective matrons were asked to assist with referring residents to the researcher who were known to present with osteoarthritis of the 1st CMC joint (Warren-Findlow et al., 2003; Stoy et al., 1995). The above mentioned methods of advertising were important to facilitate a process of self-selection; as these individuals usually present with a higher retention rate throughout the research project (Stoy et al., 1995).

Recruitment predominantly focused on an interpersonal approach. This approach was important as the target population was small and residents were

unfamiliar with both the proposed research project as well as the impact which osteoarthritis of the 1st CMC joint has on their day to day living (Unson et al., 2004). The interpersonal approach was also used as a means to facilitate communication and trust between the researcher and residents (McHenry et al., 2012). A community approach is staff intensive but literature indicates that the response rate is higher for small communities (Stoy et al., 1995).

As part of the interpersonal approach, two information desk opportunities per retirement home were attempted by the researcher. The information desk was placed at the entrance of each dining hall and contained posters, pamphlets, a sign-up sheet and the personal approach of the researcher.

Each of the various methods of advertising invited participants to an information meeting. During the information meeting, the details of the research project were discussed and the meeting was concluded with a group discussion. The group discussion was an important component, as literature indicates that the elderly mistrust their own judgment when considering participation in research projects and require the input of fellow community members and leaders before making important decisions (Stoy et al., 1995). The information meeting therefore also emphasized the relevant matron's approval for conducting the research project at the specified retirement home (Stoy et al., 1995). The information meeting was also used as an opportunity to obtain written informed consent from potential participants, as well as providing an opportunity to facilitate the initial and final screening process. Two to three information meetings were scheduled per research site in an attempt to increase the response rate to advertisements for the research project (Warren-Findlow et al., 2003).

The information meeting also emphasized both the personal health benefits and other personal benefits applicable to participation in the research project (Stoy et al., 1995). The participants also gained personal benefit from the information meeting as the researcher also offered basic hand assessments and referrals to other health professionals as a service to those residents who were interested. This service was only advertised by word-of-mouth and

assisted the researcher in accessing the target population (McHenry et al., 2012).

3.2.3 Informed consent for potential participants

Potential participants who showed an interest in participating in the research project received an information letter including the details of the proposed research project; these information letters were available from the researcher; the matron and at the information meetings. They also had at least 2 opportunities 2 weeks prior to the start of the research project to attend information meetings concerning the research project, as well as the means to contact the matron, researcher and supervisor concerned for more information. Potential participants were informed about the aims of the study, the process which it would follow, voluntary participation, confidentiality of data, withdrawal from the study, as well as all the relevant ethical considerations.

Potential participants who wanted to participate in the research project had to sign an informed consent letter prior to or on the day of commencing the screening procedure. None of the potential participants were illiterate; but two had to be verbally assisted and guided by the researcher due to mild visual impairments.

3.2.4 Sample group

After signing the informed consent letter, interested potential participants were purposefully selected based on an inclusion and exclusion criteria; this was done in an attempt to increase the external validity of the study (Chevalier, Mejjad & Babini, 2000). The inclusion and exclusion criteria were divided into an initial and final screening procedure.

The initial screening was conducted on all interested potential participants by means of a self-administered questionnaire, during which demographic information was also obtained. Potential participants who met both initial inclusion and exclusion criteria then had to undergo a final screening opportunity. The final screening was conducted by an occupational therapist with training as a hand therapist; the occupational therapist performed a clinical

assessment to ensure compliance with the remaining inclusion and exclusion criteria.

Table 1: Inclusion and exclusion criteria

Initial screening	**Final screening**
Inclusion criteria	
Women; as this is the target population predominantly affected by osteoarthritis of the 1st CMC joint (Colditz & Koekebakker, 2010; Dahaghin et al., 2005; Rogers & Wilder, 2007).	Positive grind test.
65 years and older.	A radiograph diagnosis is not compulsory; but can be taken into consideration if obtained.
Local pain can be indicated on a diagram of the upper limb.	Stage I-III osteoarthritis of the 1st CMC joint.
Visual analogue scale (VAS) of minimum 3cm for 1st CMC joint pain.	
Exclusion criteria: Osteoarthritis Research Society International's recommended exclusion criteria (Rogers & Wilder, 2009).	
Initial screening	**Final screening**
Hand therapy or exercises 6 months prior to study.	Rheumatoid disease (chondrocalcinosis, psoriatic arthritis, hemochromatosis, secondary osteoarthritis).
Hand joint injections 6 weeks prior to study	All active diseases of the hands such as tendonitis, post-fracture pain, scarring and neurological diseases).
Prior hand surgery: joint replacement or instrumentation of the hand.	Tenderness at the scaphotrapezial joint; as this suggests stage IV osteoarthritis.

Planned hand surgery during the course of the trial.	NSAIDS and analgesics can be allowed during intervention but must be stated as a variable.
Participation in another interventional trial.	A history of major hand trauma.
Current use of therapeutic hand cream.	Conditions with similar symptoms, namely: De Quervain's tendonitis, Carpal tunnel syndrome, Scapholunate instability, Trigger thumb.
Frail care.	Multiple joint involvement as it is advised that the 1st CMC joint should be affected in isolation as it will increase the reliablity of assessing the effects of the intervention on a functional level, as well as pain levels.
Diagnoses of dementia and Alzheimers.	
The respective matrons provided final authorization on the list of participants who qualified to participate in the research project (Warren-Findlow et al., 2003).	

Randomization of the sample was crucial to increase the internal validity of the study (Ye et al., 2011). Twelve participants per retirement home were randomly selected from the group of participants who were positively identified by the screening procedure. The randomly selected 12 participants made up the respective retirement home's subgroup (Chevalier et al., 2000; Moore et al., 2011). Randomization was decided by representing each participant with a number drawn on identical pieces of paper; the first 12 numbers drawn from a hat were then assigned to the respective retirement home's subgroup.

The retirement home's subgroups were then randomly allocated to either serve as the experimental group or the control group of the research project i.e. the abductor pollicis longus strengthening group or the control group receiving a basic standard of care. Randomization of selecting the retirement home allocated to either the experimental group or the control group was obtained by drawing the name of a retirement home from a hat; the first name drawn from the hat was assigned to be the experimental group.

Two treatment modalities were therefore not performed simultaneously at one of the research sites; this was done in order to avoid contamination. In an attempt to prevent bias, the participants were kept blinded to the expected outcome of the study (Ye et al., 2011). Each group therefore worked as an independent sample; but would still function as related samples. The experimental sub-group were enrolled in the abductor pollicis longus strengthening programe, while members of the control subgroup each received an assistive device.

3.3 Data gathering instruments

The pre- and post-test assessment battery was conducted prior to the intervention; after four weeks of intervention and after eight weeks. It was designed to make use of both performance based outcome measures and self-report scales, as they work in a supplementary fashion (Ye et al., 2011). The Occupational Therapist who performed the assessments was experienced and trained in the assessment and remained constant throughout all the assessments. The assessment procedures also remained standard throughout, with regard to area, time of day, instructions and the systematic recording of results. The Occupational Therapist performing the assessment battery was blinded to which intervention program was being run at which retirement home, as this was important to the rigor of the study (Ye et al., 2011; Wajon & Ada, 2005).

The assessment battery included the following assessments: active range of motion of the thumb; the visual analogue scale; voluntary isometric grip strength; voluntary isometric two-point, tripod and key pinch strength as well as the Michegan Hand Outcomes Questionaire. The researcher also made use of

compliance logbooks, feedback questionaires, cost sheets and field notes as data gathering instruments.

3.3.1. Active range of motion of the thumb

The Kapandji index for opposition of the thumb was used as a standardised assessment, due to the unreliablity of goniometer assessments for the range of motion of the 1st CMC joint (Cooney, Lucca, Chao, & Linsheid, 1981; Lefevre-Colau et al., , 2003).

The Kapandji index uses anatomical landmarks to grade thumb opposition from 1-10; with 10 indicating full opposition (Lefevre-Colau et al, 2003):

- 1: Thumb tip to palmar aspect of index finger proximal phalange.
- 2: Thumb tip to palmar aspect of index finger middle phalange.
- 3: Thumb tip to palmar aspect of index finger distal phalange.
- 4: Thumb tip to palmar aspect of middle finger distal phalange.
- 5: Thumb tip to palmar aspect of ring finger distal phalange.
- 6: Thumb tip to palmar aspect of little finger distal phalange.
- 7: Thumb tip to palmar aspect of little finger middle phalange.
- 8: Thumb tip to palmar aspect of little finger proximal phalange.
- 9:Thumb tip to just distal to transverse palmar crease; aligned with MC head of little finger.
- 10: Full opposition with thumb tip touching just proximal to transverse palmar crease; aligned with MC of little finger.

3.3.2. Visual Analogue Scale (VAS)

The VAS was used as a pain outcome measure for the research project, due to its suitability in experimental research designs (Colditz & Koekebakker, 2010; Wajon & Ada, 2005; Boustedt & Nordenskiöld, 2009; Ye et al., 2011). The VAS makes use of a 10cm horizontal line where 0 corresponds with no pain and 10 represents the worst pain imaginable. The VAS was used to record pain at the

1st CMC joint during participation in activities, intervention programs, assessments and at rest (Wajon & Ada, 2005).

3.3.3 Voluntary isometric grip strength

The Jamar hand held dynamometer is a standardised test considering gender, dominance and age and was used to assess participants' grip strength due to its suitability in a experimental pre- and post-test research design (Colditz & Koekebakker, 2010). The standard positioning for the assessment was used, where the participants were required to be seated with a flexed elbow at approximately 90°; the forearm was held parallel to the floor and in a neutral position, considering pro and supination. The forearm and dynamometer remained unsupported (Rogers & Wilder, 2009). The assessing Occupational Therapist used position two on the Jamar hand held dynamometer. The assessing Occupational Therapist gave each participant 3 trials; each trial lasted 3-4 seconds, during which the participant squeezed the dynamometer as hard as possible. The highest score out of 3 was recorded, as well as the mean being calculated and recorded (Rogers & Wilder, 2009; Wajon & Ada, 2005). This assessment for grip strength was discontinued if a participant expressed any reluctance to participate due to pain experienced (Wajon & Ada, 2005).

3.3.4 Voluntary isometric two-point, tripod and key pinch strength

A standardised pinch gauge, suitable for use in an experimental pre- and post-test research design was used with the same standardised position as the Jamar hand held dynomometer (Colditz & Koekebakker, 2010; Wajon & Ada, 2005; Rogers & Wilder, 2009). The pinch gauge was used to assess the strength of the isometric two-point, tripod and key pinch strength in kilograms (Rogers & Wilder, 2009). The highest score out of 3 was recorded, as well as the mean being calculated and recorded (Rogers & Wilder, 2009; Wajon & Ada, 2005). This assessment was discontinued if a participant expressed any reluctance to participate due to pain experienced (Wajon & Ada, 2005).

3.3.5 The Michigan Hand Outcomes Questionnaire (MHQ)

The Michigan Hand Outcomes Questionnaire (MHQ) is a validated 37 item questionaire which makes use of Likert scales. The questionnaire includes scales for the following sections: overall hand function, activities of daily living,

pain, work performance, aesthetics and individual satisfaction with hand function (Gwynne-Jones, Penny, Sewell & Hughes, 2006). The MHQ was developed as a clinically meaningful outcome measurement tool for assessing the subjective level of disability experienced by individuals presenting with chronic conditions of the hand (Gwynne-Jones et al., 2006). The MHQ has been used as an outcome measurement tool in experimental pre- and post-test research designs, as well as in a previous research project where osteoarthritis of the 1st CMC joint was considered; the MHQ was therefore selected as a suitable questionnaire for the assessment battery (Gwynne-Jones et al., 2006).

The MHQ was completely filled out in order to ensure accurate data. The questionnaire was predominantly self-administered, or where necessary, administered by means of an administrator; each questionnaire took approximately 15 minutes to complete.

3.3.6 Compliance logbook

A compliance logbook was completed for each participant after each exercise session was performed. The logbook required the date, name and signature of the individual; time of session; resistance used; and repetitions per sets, as well as rest periods between sets. The logbook also indicated the participant's VAS score, before, during and after the exercise session; as well as any reasons for participants not completing the required exercise regime.

A compliance logbook was also completed for participants from the control group to indicate their attendance of sessions; complaints regarding use of the assistive device and to report whether the device is used accurately and regularly.

At the start of the various sessions the logbook was completed by means of a structured interview, after which participants signed to verify their attendance and the information. The logbook had 3 sections; one was completed prior to the session; another while the session was taking place and the last section was completed after the exercises were performed.

3.3.7 Feedback questionnaire with participants

During the final assessment opportunity, the remaining participants were given a feedback questionnaire with predominantly open ended questions. The feedback questionnaire was completed after the final assessment opportunity and completed questionnaires were placed in a box before leaving the venue. This feedback questionnaire was designed to record the subjective opinions of the remaining participants concerning various topics relating to their participation within the pilot study. The following topics were addressed:

- Accessibility of venues.
- Assessment sessions.
- Intervention sessions.
- Variables which could have had an influence on symptoms experienced.
- Contamination amongst subgroups within the sample population.
- Recruitment strategies.
- Retention strategies.

3.3.8 Cost sheet

Literature indicates that monitoring the costs during each phase of the research process is a critical component of attempting to calculate and interpret research costs (Katula et al., 2007). The researcher therefore used a cost sheet to record the costs as they occurred during the pilot study. The cost sheet was then used in retrospect to compare the projected costs of the research project to the actual calculated costs. It was also used to calculate the costs involved to perform a particular phase of the research project, as well as to determine how much it cost, per participant, to participate in each of the phases. The noted calculations were then used to calculate the projected cost to perform a full scale research project. The cost sheet will serve as motivation for funding when commencing a full scale research project.

3.3.9 Researcher's field notes

The researcher also kept daily field notes to record observations made during the progress of the research project.

3.4 Procedure

3.4.1. Pre-pilot study

A pre-pilot study was held 2 months prior to the pilot study. The pre-pilot study included 3 elderly Caucasian ladies who were independent from the noted retirement homes. They were selected based on convenience sampling as they were known to the researcher. The 3 participants assisted with participating in the screening and data gathering instruments intended for the pilot study; the pre-pilot duration was 1 week.

The pre-pilot study was used to determine whether any adjustments were necessary for the intended pilot study. The 3 participants participated in assessment and therapeutic procedures and completed the self-report tools; after which they were given the opportunity to provide relevant feedback to the researcher. The researcher also took field notes during the pre-pilot procedure. The pre-pilot study focused on evaluating the following components:

- Quality and clarity of instructions provided during assessments.
- Data gathering instruments.
- Correct usage of self-report questionnaires.
- Data recording methods.
- Ambiguous items which might affect the sensitivity of the data.

3.4.2. Assessment

Assessments were performed at baseline; 4 weeks into the intervention and at 8 weeks post commencement of the intervention. Assessments were performed on all the participants included in both the experimental group and the control group.

Assessments were performed during the mornings on the dates below:

- 15/07/2013: Baseline assessment.
- 19/08/2013: Week 4 assessment.
- 13/09/2013: Week 8 assessment.

Participants were given the MHQ 4 days before the scheduled assessment date; instructions relating to the questionaire were verbally repeated to ensure participants could fill out the questionaire independently. Participants were requested to complete the questionaire a day before the scheduled assessment; no monitoring system was however set in place to ensure and establish the date of completing the questionaire. All questionaires were handed back to the researcher on the day of assessment; the questionaires were checked by the researcher to ensure all questions were answered. Participants were assisted to complete the questionaire when they indicated the need to be assisted or if questions were left unanswered. As indicated by the literature and established by the pre-pilot procedure, the entire MHQ took approximately 15 minutes to complete (Gwynne-Jones et al., 2006).

The individual assessment was performed on an appointment basis. The total duration of each individual assessment was approximately 15 minutes (as established during the pre-pilot procedure):

- The participant was orientated to the assessment session and to the fact that the assessing Occupational Therapist was blinded to the received intervention. Five minutes was allocated to this component.

- The individual clinical assessment was estimated to take 10 minutes. The assessment consisted of: VAS for pain at rest; active range of motion of the thumb; voluntary isometric grip strength, as well as the voluntary two-point, tripod and key pinch strength.

3.4.3. Intervention programs

The intervention modalities were in line with current practice and were chosen by making use of a extensive literature review in order to increase external validity of the research (Chevalier et al., 2000). Even though some studies exposed the experimental group to both the intervention modalities offered to the control group, as well as the experimental intervention modality, it was decided not to combine intervention modalities in an attempt to more accurately assess the effect which a strengthening program had on early stage osteoarthritis of the 1st CMC joint (Ye et al., 2011). In order to accommodate the

elderly population, the intervention programs took place for a duration of 8 weeks, as literature indicated that muscle fibers can take up to 4 weeks to adjust to a prescribed load of an exercise program, and even longer with the elderly (Kisner & Colby, 2007).

The Occupational Therapist who provided the intervention was trained in the specification of each intervention program offered (Wajon & Ada, 2005). The Occupational Therapist remained constant throughout the research process.

3.4.3.1 Abductor pollicis longus strengthening program

The strengthening program was facilitated in a group format where the 12 participants of the subgroup met twice a week for an exercise group which was scheduled for a duration of 40 minutes. The group followed the format below:

- 10 minutes: Orientation to session
- 20 minutes: Exercise program
- 10 minutes: Completion of compliance logbook

The exercise group concluded at the end of each session with refreshments being served and the opportunity to socialize. Such refreshments took the dietary requirements of the participants into consideration.

After establishing a convenient time for participants, it was decided to perform the exercise group every Tuesday and Thursday afternoon from 13h30 – 15h30. The first exercise session was scheduled on the 23rd July 2013. If an appointment could not be kept, an opportunity was granted to rebook an individual appointment for the exercise session; these additional time slots were on Monday and Wednesday afternoons after 16h00, or on a Saturday.

A progressive resistance strengthening program was followed; complying with the following principles:

- The Occupational Therapist determined each individual's repetition maximum. The repetition maximum is the maximum resistance that the chosen muscle action can withstand for a total of 8-12 repetitions. A

total of 60% of the repetition maximum is then used as the initial load to use when commencing muscle strengthening (Kisner & Colby, 2007).

  - Elastic bands with similar tension were used as a medium of resistance throughout the research project. The elastic strands applied a small amount of tension; making it possible to use and adjust these throughout the research project for both the weakest actions through to the strongest action at the end of the study. The elastics were pulled from the strap to the transverse palmar crease on the ulnar border of the hand; a similar distance was used to pull the elastic away from the hand in the same plane as the palm; applying a 90° angle of pull to the 1st MC joint at the starting position.

- Proximal stability was essential when attempting strengthening. Participants were seated while performing the exercises; their elbow and forearm was supported while performing the exercise; while the forearm was kept in a neutral position between supination and pronation.

- The abductor pollicis longus action cannot be completely isolated as it works in close synergy with the extrinsic extensors of the thumb, as well as with the abductor pollicis brevis muscle of the thumb. To ensure dominant abductor pollicis longus action, the following movement pattern was required (Kisner & Colby, 2007):

  - When attempting to activate the proposed muscle in isolation, the desired posture of the thumb is maintained IP joint and MCP joint flexion; while having a starting position where the 1st CMC joint is pulled into a more adduction/flexion posture from which abduction and slight extension of the 1st MC at the 1st CMC joint could be performed. An attempt was made to maintain flexion of the MCP joint and IP joint throughout the whole range of motion in an attempt to minimise synergistic muscle action.

  - In order to apply resistance when performing the required movement pattern, pressure was applied against the lateral

surface of the distal end of 1st MC in the direction of adduction and flexion.

- A strap made from a soft elastic fabric was designed and applied in an attempt to simulate the above noted requirements for posture; movement pattern and applied resistance. The strap was anchored around the head of the 1st MC while positioning snugly in the 1st web space. When the thumb was pulled into the desired starting position, the strap only reached the head of the 5th MC on the palmar surface of the hand. The elastic bands were attached to the end of the soft strap; therefore starting opposite the 5th MC head.

- A small velcro flexion strap was also part of the design which attached onto the soft strap; it assisted with a maintained IP joint flexion posture.

- The described movement pattern was then performed throughout the whole range of motion for 8-12 repetitions; while applying the calculated load.

- Various methods were used to facilitate participants to perform the correct movement pattern:

  - The correct movement pattern was demonstrated by the Occupational Therapist, using her own hand.

  - This included passively guiding the movement pattern on the relaxed hand of a participant.

  - Verbal cues were used to guide participants in performing the correct movement pattern; such as asking them to attempt to flatten the base of their palm, while pulling their thumb away from the palm.

  - Landmarks and visual cues were also used, where the researcher would hold her finger above the head of the 1st MC in the desired direction that the participant should move her thumb; the

participant was then told to reach towards the landmark with the head of their 1st MC.

- Sets of 8-12 repetitions were performed 1-3 times a day.
- Exercises were only conducted twice a week, allowing a minimum of 1 day of rest between exercise days. A smaller frequency of exercise days was chosen to allow elderly participants adequate time to recover from any potential muscle strain.
- If a participant did not experience any fatigue throughout the whole exercise session, it was implied that the muscle fibres adjusted to the applied load. The Occupational Therapist would then re-determine the participant's repetition maximum and recalculate the required load. This procedure allowed for a gradual increase in prescribed resistance. It was expected that the time frame to adjust to a specific grade of resistance could take up to 4 weeks before having the opportunity to increase the resistance.

3.4.3.2 Control group

The issue of an assistive device as the chosen intervention modality provided to the control group, was determined by both ethicial considerations as well as the attempt to decrease the risk of a placebo effect (Rogers & Wilder, 2007). A jar opener, serving as an assistive device, was issued to each member of the control group, as literature indicated it to be a recognised intervention modality considering osteoarthritis of the thumb (Rogers & Wilder, 2007; Ye et al., 2011). The opening of a jar is recognised as an activity of daily living which causes extensive pain with osteoarthritis of the 1st CMC joint. A jar opener decreases the force that needs to be exerted by the thumb when opening a jar; therefore decreasing stress and pain inflicted to the 1st CMC joint during activity performance (Rogers & Wilder, 2007; Ye et al., 2011).

The participants of the control group were issued a jar opener during an information group held on the 22nd July 2013. The information group was planned for a duration of 30 minutes and was aimed at ensuring proper working knowledge necessary for incorporating the assistive device into their day to day

living. The use of the assistive device was demonstrated to them and various size jars were also made available to practice the technique, under the guidance and supervision of a trained Occupational Therapist. All participants had to demonstrate the accurate use of the assistive device at the end of the meeting. A follow-up appointment could be made with participants who demonstrated a substandard method of using the assistive device. Participants were encouraged to contact the researcher in the case of any uncertainties. The information session was also followed by refreshments.

The information group was repeated on the 19th August 2013, after being assessed 4 weeks post commencement of the intervention.

The compliance logbook was completed during each contact session.

3.4.4 Retention strategies

Various retention strategies were employed to facilitate compliance of participants to their intervention programs:

- The waiting period between recruiting and the intervention phase was kept at a minimum (Katula et al., 2007).
- The exercise program was easily adjustable to ensure participants did not over-exert themselves (Warren-Findlow et al., 2003).
- Group dynamics were used by structuring intervention groups in a group format.
- The intervention sessions were held at a central; safe and easily accessible venue at the respective retirement homes (Warren-Findlow et al., 2003; Stineman et al., 2011).
- Feedback sessions concerning the general progress of the study were provided after 4 weeks of the intervention. A final feedback session was also scheduled during which the results of the research project were discussed with the participants (Warren-Findlow et al., 2003).
- Participation in the research project was cost-free and did not require participants to use their own transportation (Katula et al., 2007; Stoy et al., 1995). The researcher attempted to ensure personal benefit for participants of the research project (Stoy et al.., 1995):

- Assessments and referrals of hand conditions were facilitated by the researcher.
- Refreshments were offered at the intervention sessions; these refreshments were in accordance with participants' pre-established dietary requirements.
- Information concerning osteoarthritis was made available throughout the research project.
- An information session was scheduled to take place in conjunction with the final feedback session in December 2013; the session included a holistic approach to the conservative management available for osteoarthritis of the thumb, as well as referrals to the applicable service providers to assist with further management of the condition.

Various strategies were implemented to assist participants to attend their scheduled appointments:

- Participants were issued a roster indicating all their tentative dates for their future appointments, for both assessments and intervention purposes (Rogers & Wilder, 2009).
- Participants could indicate whether the researcher should contact them telephonically in order to remind them to attend their appointments.
- For assessment appointments, the following strategies were implemented:
  - If a participant could not attend an appointment, 2 more opportunities were provided to reschedule the appointment.
  - Participants were telephoned a week prior to the appointment to establish the most convenient date and time for the majority of participants; participants who couldn't attend on these dates or times were given alternative appointments, where possible.
  - Participants were personally issued with appointment cards to remind them of the decided date, time and venues.
  - Participants were reminded by means of text messages on the morning of the assessment; and if they were running 10 minutes late for the scheduled appointment they were telephoned as well.

- For intervention appointments, the following strategies were implemented:
    - If participants could not attend an appointment, they were given another appointment option for an individual intervention session.
    - By having the exercise sessions on the same day and time each week, a routine was established which assisted with attendance.
    - The appointments were reinforced by individual text messages on the morning of the appointment, as well as by making telephone calls to participants when they were running 10 minutes late.

3.5 Data analysis

The hypothesis is that pain levels, function and strength of functional grasps will not improve when making use of an abductor pollicis longus strengthening program when treating early stage osteoarthritis of the 1st CMC joint. The hypothesis could not be tested by means of inferential analysis, due to the small sample population of the pilot study (Moore et al., 2011).

Data cleaning was conducted manually by having a third uninvolved party verify the captured data with the data sets. Statistical analyses were conducted using the Statistical Package for Social Scientists (SPSS version 21) for Windows. The purpose of the data analysis was to summarize the data collected and to test for changes in some of the variables over time. Since the pilot study made use of a small sample size, the patterns in the data could not be clearly calculated and the results of the tests were not very reliable. Comparisons of results for the experimental and control groups could also not be made. The Generalized Estimating Equations (GEE) method (Liang and Zeger, 1986) was applied to test for changes over time; the Geepack package from the R software was used to perform the applicable tests.

Qualitative data captured by means of the feedback questionnaires; components of the compliance logbook and researcher's field notes were used to detect themes and sub-themes within various categories of the conducted pilot study namely: recruitment strategies, assessment tools, intervention modalities, retention strategies as well as general procedures used and arrangements made,

3.6 Ethical considerations

The protocol of the study was presented to and approved by the ethics committee of the Faculty of Health Sciences at the University of the KwaZulu-Natal. The protocol was subsequently submitted to the Biomedical Research Ethics Committee (BREC) which granted provisional approval for the research project on the 22nd May 2013. Final ethical approval was granted once written informed consent was obtained from the relevant gatekeepers, namely the respective matrons and boards of directors of the retirement homes. Final ethical approval was granted by BREC on the 19th June 2013, after which the recruitment process for potential participants commenced (REF: BF053/13).

Interested potential participants recruited for the research project attended an information meeting during which all the implications of the research project were explained to them. The potential participants were informed about the aim of the research project, procedures to be used, logistics concerning their participation, possible pain or discomfort, risks, benefits involved with participating in the research project, as well as information on how the recorded data would be used. No participants were forced to participate in the research project and were free to withdraw from the research project at any time if they wished to do so. Potential participants were also given an in-depth information letter including all of the relevant information regarding the research project. All potential participants had to sign informed voluntary consent in order to participate in the research project.

The matron and sisters in the various wards were informed about the research project as well as the time frame within which the study was to be performed. The safety of participants during the research project was addressed in the following manner:

- Potential participants who presented with any underlying diagnosis during the screening period, as well as during the research itself, were referred to the appropriate service provider.
- Participants were allowed to continue their use of prescribed medication; even if it held relation to 1st CMC joint osteoarthritis.

- Regular assessments throughout the research project allowed the researcher to take note of any adverse reactions which participants presented with. In situations where a participant presented with adverse reactions, the prescribed intervention was either adjusted or discontinued.
- Participants had telephonic access to the researcher and intervening Occupational Therapist in order to report any adverse reactions if necessary; participants could also freely communicate with the receptionist to make telephonic contact if and when required.
- The Occupational Therapists interacting with the participants were trained and had experience in the relevant assessment and intervention components relevant to the research project.
- Both the assessing and intervening Occupational Therapists were registered with the Health Professional's Council of South Africa (HPCSA).
- A system was in place to arrange referrals to an applicable health care provider in the case of aggravation of symptoms.

In an attempt to prevent any further burden to participants:

- The screening, assessment and intervention components were all addressed in the main building of the retirement home, thus ensuring no travel costs for the participants.
- Participants were seen on an appointment basis. They were not occupied for longer than 40 minutes for both assessment and intervention purposes.

Data was dealt with in a manner to protect confidentiality and anonymity of participants:

- Data was and will be stored on a computer to which only the primary researcher has access.
- Data was made available to the supervisor of the research project.
- Data sources will be kept in a locked cabinet to ensure confidentiality for a minimum of 5 years.

- The participants' names were protectedas individuals were represented by codes.
- Retirement home names were also represented with codes.

Participants were informed of the findings of the research project. They were also offered the opportunity to participate in the intervention modality which they didn't initially participate in.

Chapter 4: Results

The results of the pilot study will look at the procedures used for sampling the retirement homes, recruiting participants with advertising methods and information meetings held. The results will also address informed consent, screening and sampling procedures as well as randomization. Results applicable to data gathering instruments; including the following components of the assessment battery: active range of motion of 1st CMC joint, VAS, muscle strength assessments and the MHQ. Compliance logbooks, cost sheets, feedback questionaires and researchers field notes will also be stated amongst the results obtained.

The objectives of the pilot study will be addressed throughout the noted results; which will later be further explored in the discussion. The objectives of the pilot study cantered around evaluating methods and procedures used; with specific regard to recruitment, randomization, retention strategies, facilitation of compliance, assessment and intervention procedures, data capturing procedures, resource estimation and determining an adequate sample size.

4.1 Sampling procedure

4.1.1 Retirement homes

The researcher telephonically contacted retirement homes in Pietermaritzburg and arranged meetings with the respective gatekeepers as part of a pre-screening process to identify suitable research sites pertaining to the research project (Warren-Findlow et al., 2003). The first three retirement homes contacted were identified as suitable research sites. The size of the target population residing within the respective retirement villages ensured an adequate sample size to conduct the pilot study with.

Table 2: Target population residing within each retirement home.

Retirement home	**Total residents**	**Total female population**	**Total number of females over the age of 65yrs**
Home A	175	100	37
Home B	164	117	84
Home C	106	Information not obtained	43

Table 3: Total potential participants screened and qualified within each retirement home.

	Frequency of screened population	**Percent of screened population**	**Frequency of qualifying population**	**Percent of qualifying population**
Home A	12	40%	10	40%
Home B	15	50%	12	48%
Home C	3	10%	3	12%
Total	30	100%	25	100%

The researcher's field notes indicated that the respective matrons' keenness to accommodate the research project was due to a lack of research available

pertaining to the geriatric community of South Africa. All applicable gatekeepers provided informed written consent to allow the researcher to conduct the research project amongst their residents. The retirement homes also made central and accessible venues available within their main buildings from which the various phases of the research project could be conducted.

The close proximity of the research sites made potential contamination a matter of concern. In an attempt to estimate the risk of potential contamination, the researcher consulted with matrons from the respective retirement homes and noted that minimal contact was perceived to exist between the 3 retirement homes. During the initial screening process, none of the potential participants reported any existing contact with the other retirement homes. The risk of potential contamination of intervention modalities therefore appeared small prior to commencing the research project. The feedback questionnaire completed by the experimental group at the 8 week assessment opportunity confirmed the low risk of contaminations as participants reported that they did not have any contact with any of the other groups or retirement homes during the course of the research project. The responses to the feedback questionnaire also indicated that the experimental group participants didn't make use of any assistive devices during the 8 week time frame.

4.1.2 Recruiting procedure

4.1.2.1 Advertising methods used

The researcher used a two week period for advertising the research project within the respective retirement homes. Participants who filled out the feedback questionnaire at the 8 week assessment opportunity identified two weeks, in retrospect, as an appropriate timeframe during which the research project was advertised. The participants stated that a duration of two weeks would assist elderly residents not to forget about the information meeting and research project opportunity; a longer period could result in potential interested residents not attending these opportunities due to poor memory, rather than disinterest. One participant, however, mentioned that longer periods would be more suitable when addressing a more active and independent community, as this would allow participants to adjust their diary to allow for adequate time to be set

aside to ensure their participation in the research project. A variety of advertising techniques were utilized by the researcher during the 2 week period.

The respective matrons were requested to refer suitable residents to the researcher for screening purposes. Advertising also prompted residents to collect an information letter from the receptionist or matron, which provided in-depth information pertaining to the research project. The researcher's field notes, however, indicated that only 3 residents from one of the homes collected these information pieces. The receptionist at each retirement home also assisted by keeping a contact list of the interested residents who reported to her; the majority of interested residents, however, did not utilize this list. The researcher's field notes indicated that residents were skeptical to give out their personal contact details if they were unsure whether they were definitely interested in participating in the research project; it was noted that once they were definitely interested in participating they did not hesitate to make their contact information known to the researcher.

Each retirement home had two A1 size posters as previously described; these were placed in the reception area and common dining hall area, respectively. An A4 sized poster was also placed at the entrance of each of the wards. The posters remained in place for 2 weeks before they were removed.

Home B and Home C were the only two retirement homes with an announcement system. The receptionists managed the frequency of announcements made in an attempt to advertise the research project. Home B made 1 announcement prior to the first scheduled information meeting and Home C made daily announcements prior to the first information meeting.

The researcher held an information desk at the entrances of the common dining halls, during which residents were approached and invited to the scheduled information meetings. Due to the higher concentration of active residents within the Home A, the researcher hosted the information desk twice during their supper dining opportunity. The researcher also attempted to hold lunch time information desks twice at Home B and Home C.

The staff of the retirement home provided the researcher with a list of female residents who were Caucasian and over the age of 65 years. The researcher only used this list to distribute pamphlets to the identified residents. Residents did not have post boxes which the researcher could utilize; the pamphlets were therefore placed underneath the doors of the listed residents.

The researcher also attempted to involve residents who were seen as key role players in existing activity programs within the retirement homes; it was attempted to either enroll them as potential participants or to have them promote the research project during the various activity programs. This approach, however, was less successful according to the researcher's field notes as it was noted that the key players already had full daily schedules which they had committed themselves to.

The feedback questionnaire completed by the participants of the experimental group at the 8 week assessment session had several questions pertaining to the advertising techniques used by the researcher. Four out of the remaining eight participants identified the following methods of advertising as successful strategies used within their retirement homes: word-of-mouth, information desk at the dining area, as well as the posters. The pamphlets underneath residents' doors were also noted by 3 participants and only 1 participant from the remaining 8 participants indicated that referrals from the Matron were an effective strategy.

The contact rate was calculated by dividing the number of participants contacted by the number of the total target population. The contact rate for Home A was calculated at 32.4%; Home B at 17.9% and Home C at 6.9%.

The response rate was calculated by multiplying the contact rate by the co-operation rate. Home A presented with a response rate of 27%; Home B with 14.32% and Home C with 6.9%.

Each the residents from the noted retirement homes were exposed to all of the various methods of recruitment. The combined effort of recruitment resulted in various numbers of residents responding. The researcher's field notes,

however, recorded various numbers of residents specifically indicating their attention and responding to specific advertising techniques:

- Contact list at the receptionist: 6 Participants
- Referrals from matron: 13 Participants
- Posters: 9 Participants
- Pamphlets: 13
- Announcements: 3 Participants
- Information desk: 11 Participants

According to the cost sheet, the costs for recruiting participants were totalled at R 5886.56; averaging R196.22 per recruited participant. When analyzing the costs versus the number of participants responding to the recruitment technique, the following could be derived:

- Information desk: R169.69 per participant
- Posters: R126.33 per participant
- Referral and contact list: R42 per participant
- Pamphlets: R10.08 per participant

The residents who showed an interest in the research project didn't exclusively present with osteoarthritis of the 1st CMC joint. Several residents who approached the researcher did not present with the stated condition at all and sought advice for various other conditions. According to the researcher's field notes, osteoarthritis of the knees, back and IP joints of digits, besides the thumb, were the most common alternative conditions reported. Other reported conditions were as follows: dermatological conditions of the hand; peripheral neuropathy; trigger thumb; carpal tunnel syndrome; Dupuytron's contractures; De Quervain's tenosynovitis, Parkinson's disease; and hemiplegia due to strokes.

The interested residents were assessed by an Occupational Therapist, where applicable. They were then given the option to be referred to a health institution applicable to them which would be able to assist with the reported conditions, not related to the planned research project. Three of the potential participants who presented with acute conditions were willing to be referred to health institutions in their area. Ten of the interested residents who presented with chronic conditions have received some sort of multi-disciplinary intervention in the past and precautions; pain management and general advice concerning their condition were only reinforced by the Occupational Therapist within the related scope of practice.

The researcher's field notes indicated that two residents who were initially interested in participating in the research project decided not to participate as they were under the impression that their advanced age would inhibit them from experiencing any form of improvement in their symptoms.

The activity levels of participants are an important factor when considering retention and compliance of an individual. Of the interested population of 30 individuals, 12 subjectively reported very active lifestyles; they also reported that this could have a negative influence on their participation in intervention sessions during the study. Of the interested population, 6 were not residents at the retirement homes; 3 were workers and 3 were volunteers. The 6 individuals, however, indicated a keen interest to participate in the study and after obtaining approval from the respective matrons, the individuals were allowed to participate in the screening phase of the research project. Of the 6 individuals, 2 volunteers and 1 worker qualified to participate in the research project and were included in the sample population.

Participants who completed the feedback questionnaire indicated that all participants decided to join the research project with the hope of benefitting from the research by experiencing a possible decrease in their symptoms; 3 of the 8 participants noted that the opportunity to participate in a research project motivated their enrolment (the researcher's field notes indicated that some of the participants who were interested in the research process referred to relatives who were previously or currently involved with tertiary education),

while 2 participants were also motivated by the opportunity to learn more about the condition.

4.1.2.2 The information meeting

The researcher decided to host three information meetings per retirement home (excluding Home C where only one information meeting was scheduled due to time constraints), as residents continuously forgot the date, time and venue, or were reluctant to attend due to preference for their personal routines. As there were several information meetings held per research site, the information on the posters and pamphlets continuously changed to keep residents updated.

The noted reasons also resulted in only a few residents arriving on time for the scheduled meetings; most of the residents arrived late which resulted in the meetings being much longer than the expected 40 minute duration. The researcher's field notes indicated that some residents arrived up to one and a half hours late for the scheduled meeting.

The researcher had to change the approach of the information meeting to address residents as they arrived at the venue; averaging approximately five per group. All the information relating to the research project therefore had to be repeated several times per information meeting. According to the researcher's field notes, the amount of time spent per meeting, as well as the one-on-one contact with residents, which was required from the researcher, contributed to the information meetings being very resource intensive. In an attempt to utilize the amount of resources more effectively, the researcher decided to combine the meeting with the informed consent; initial screening opportunity and final screening opportunity. The researcher's field notes indicated that groups with a maximum of three residents worked more effectively due to an enhanced personal approach when information was addressed; these small groups also enabled the researcher to assist residents with the informed consent and screening procedure. The smaller groups further leant themselves to accommodating residents with either visual or hearing difficulties more effectively.

All the previously noted recruitment techniques were utilized to invite residents of the retirement homes to attend the main recruitment opportunity; namely the

information meeting. The cost of the information meetings totalled R2500; making it the most expensive recruitment method. However, due to the whole recruited population attending the information meetings, the total cost per person was relatively low at R71.43 per participant.

4.1.3 Informed consent of potential participants

Thirty residents provided informed consent to be screened and to participate in the research project.

4.1.4 Sample population

From the 30 screened participants, 25 residents qualified to participate in the research project as part of the sample population. The initial screening procedure excluded 3 participants from the research project; 2 due to being too young for the study and the other being due to a VAS score which was too low. The final screening procedure excluded another 2 participants from the research project; one due to the osteoarthritis of the 1st CMC joint having progressed too far and another due to the absence of the condition.

4.1.4.1 Initial screening procedure

It was found that on the initial screening checklist, the two questions pertaining to frail care and dementia were not applicable for potential participants to answer. After consulting with the respective matrons, it was noted that residents residing in frail care are not necessarily frail and could still maintain active and relatively independent lifestyles. The researcher adjusted the approach by accepting the screening of potential participants residing in frail care who showed an interest in participating in the research study. The researcher, however, sent the list of all participants qualifying for the research study to the respective matrons to pre-authorize residents' participation, with specific regard to frail care and dementia. Even though two of the screened participants resided in frail care, none of the 30 screened participants were excluded from the sample population by the matron due to dementia or frailness.

The inclusion criteria included Caucasian individuals; the original motivation for this specification was due to the high prevalence of osteoarthritis of the 1st CMC joint amongst this race. Two African potential participants indicated an interest

in the research project but were not included in the sample population due to them meeting several applicable exclusion criteria.

Originally, potential participants younger than 65 years of age were excluded from the research project. The researcher decided to change the inclusion criteria to 60 years and older, as there were several potential participants already residing in the retirement homes at the age of 60, who were interested in participating in the research project; there were also several staff members and volunteers older than 60, but younger than 65 years, who were highly motivated to participate in the study. Altering this inclusion criterion resulted in the sample population being increased by 3 participants, increasing the size of the group from 22 to 25 participants. The mean age for both the screened population and sample population was 76 years, with the majority of the population aged between 60 and 80 years.

Table 4: Age distribution of the screened and sample population.

Age	**Frequency of screened population**	**Frequency of sample population**
<60	2	0
60-70	7	7
71-80	9	9
>80	12	9
Total	30	25

Most of the potential participants' home language was English; the exceptions to these were 7 Afrikaans participants. The participants who were not home language English speakers did not require translation of material, as all participants grew up and were schooled in Pietermaritzburg and were very well spoken in either language. They were, however, offered the option of having translated material; which they all declined.

The initial screening form only provided being Diabetic as an option for dietary requirements; during the course of the research project, participants reported

various other conditions: one participant was a vegetarian; another two had strict requirements concerning exclusion of certain food groups such as nuts. The initial screening form was therefore inadequate to represent the dietary requirements of the participants.

Potential participants could fill out the initial screening form predominantly independently, while using a font size of 14. Some of the potential participants struggled to use the hand diagram as a tool to indicate the area in which they experience pain; all the potential participants also had to be assisted with initially completing the Visual Analogue Scale (VAS), as they were all unfamiliar with the assessment tool.

The VAS score originally asked for participants to record the pain experienced at the 1st CMC joint at rest. Hardly any of the potential participants experienced pain at rest; which would have caused the majority of potential participants not to qualify for the study, as a minimum of 3cm on the VAS was required. The researcher adjusted the question referring to pain experienced while actively using the hand during the past week.

The mean VAS score for the screened population was 4.81 cm compared to the sample population's mean score of 5.22 cm. One participant was excluded from the research project due to a VAS score of less than 3cm. The researcher, however, decided to include one of the potential participants in the research project who presented with a VAS score of 2 (exclusion criteria); this decision was based on the participant reporting a history of a high pain threshold despite reporting and presenting with definite symptoms of osteoarthritis of the 1st CMC joint.

The majority of potential participants struggled with the visual component of the VAS; a lot of them (even after instructed) would first give a verbal indication and then follow it up by indicating on the VAS (being uncertain whether their visual cue actually indicated their verbal feedback).

4.1.4.2 Final screening procedure

The final screening form was completed during a hand assessment and a structured interview conducted by an experienced Occupational Therapist. The

majority of participants reported pain while performing the key grasp; the final screening form, however, did not provide the option to record this observation and could only be noted in the researcher's field notes.

Table 5: Description of the screened population's medical histories in the context of the final inclusion criteria

Positive assessments	**Frequency**	**Percent**
Grind test: pain or grind	26	96.3
Lax ligament	22	81.5
Inflammation in joint	25	92.6
Deformities of thumb	11	40.7
Active hand diseases: tendonitis	1	3.7
Conditions: Trigger thumb	1	3.7
Localized pain	27	100
Pain with wrist deviation: Mild	6	22.2
Pain with wrist deviation: Severe	1	3.7
Medication: NSAIDS	2	7.4
Medication: Analgesics	14	51.9
Participated in hand therapy during the last 6 months	0	0
Received injections in their hands during the past 6 weeks	0	0
Total	27	100

4.1.4.3 Randomization

After the final sample population was established, 3 participants from the Home A stated that they were not able to participate in an intervention program which

would take place twice a week, due to their existing schedules and responsibilities. The researcher decided that an attempt to retain participants' randomization of the retirement homes to either the control group or the experimental group was not viable. The 10 Home A participants were consequently selected as the control group for the study, and Home B participants were selected as the experimental group of the study, with 12 participants.

The researcher was concerned about retention of participants within the Home B's sample population, which presented with a higher concentration of borderline frail participants. The researcher therefore decided to rather include the 3 participants from the Home C sample population within the experimental group instead of supplementing the smaller population of Home A.

Randomization of participants was not feasible as the number of potential participants who qualified to participate in the research project was not adequate and all participants had to be utilized as the sample population.

4.2 Data gathering instruments

The assessment form which was originally designed had to be adjusted after conducting the baseline assessment. Minor changes were required, such as including space for the name and signature of the Occupational Therapist performing the assessments; as well as including space for indicating which thumb needed to be assessed.

4.2.1 Active range of motion of the thumb

The Kapandji index recordings indicated 7 cases which were unchanged and 5 cases which indicated an improved active opposition ROM of the thumb. The hypothesis of an equal number of unchanged and improved cases cannot be rejected (p-value = 0.5).

Opposition ROM, as the only means of thumb ROM assessment, was found to be inadequate, as minimal numbers of participants were assessed as having a significantly impaired opposition ROM. It was, however, observed that participants presented with a decreased 1st web space; or a decrease in abduction and extension ROM of the thumb. An alternative method of

assessing 1st CMC ROM would have aided the researcher in assessing improvements in abduction ROM as subjectively reported by participants; this ROM was, however, not assessed and improvement can therefore not be verified.

It was interesting to note that a number of the participants had very good opposition scores; and could easily touch thumb pulp with index and middle finger pulp; although they struggled to perform a 2 point and 3 point pincer grasp. The moment that they added pressure to the posture of the thumb, some experienced pain or could not exert force due to verbalized 1st CMC joint instability. It can therefore be queried whether opposition ROM is a relevant assessment to perform when addressing 1st CMC joint osteoarthritis and its relation to functional components.

4.2.2 Visual Analogue Scale (VAS)

Initially the researcher intended to use the VAS at the beginning of the assessment battery in order to assess pain experienced by the participants at the 1st CMC joint at rest. During the screening process it was noted that participants experienced minimum pain at rest and that the VAS score would have had minimum statistical value. The researcher therefore adjusted the baseline assessment form to record the VAS at the end of the assessment form, recording the pain experienced by a participant while performing the assessment battery components.

Table 6: Descriptive statistics for numerical variables of the VAS assessments.

	N	Minimum	Maximum	Mean	Std. Deviation
VAS: Baseline assessment	15	0	10	3.647	3.0116
VAS: 4 week assessment opportunity	14	1	7.5	4.557	1.723
VAS: 8 week assessment opportunity	13	0	7	2.638	2.3824

Table 7: Generalized Estimating Equation (GEE) test for changes in VAS score over time

Variable	Estimate	Z	Comment
VAS	-0.1176	1.079	No change

According to the researcher's field notes, several observations were made concerning the response of participants to the VAS. The participants preferred using a Verbal Analogue Scale instead of a visual scale. In the case of participants struggling to respond to the VAS scale, both the visual and verbal components were recorded and then compared. For assessment data capturing purposes, the VAS score was used, while the verbal scale was used for compliance logbook purposes.

The researcher's field notes further queried the validity of the VAS as the researcher noted that some of the participants projected existing defense mechanisms into the response they gave using the VAS. A resident would state a VAS score of 5 on one day and would then return the following day stating that they actually meant a score of 1 or 2. The researcher only recorded the initial response to the VAS on the day of assessment. The researcher also felt that some residents would give a VAS score which they thought would assist the researcher; as they would ask whether they gave the correct score after assessment opportunities. Some residents would also state that they had no pain (VAS score "0"); but after engaging in conversation, it would be clear that they actually did experience localized pain at the specified joint.

4.2.3 Muscle strength assessment

The standardized procedure of assessing the voluntary isometric grip strength; two-point, tripod and key pinch strength were utilized at all times. During the assessments, all three attempts were recorded, as well as the median and highest scores. Some of the participants who indicated pain while performing the strength assessments struggled to perform a 2 point, 3 point pincer and key grasp as they verbalized 1st CMC joint instability as soon as they added pressure to the maintained posture.

The data analysis used the highest recorded score of out of three attempts and compared them at baseline, the 4 week assessment opportunity and the 8 week assessment opportunity.

Table 8: Descriptive statistics for numerical variables of the voluntary isometric grip strength assessment.

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Baseline assessment	15	6	22	14.533	4.9261
4 week assessment opportunity	14	2	24	11.857	6.0365
8 week assessment opportunity	13	6	20	12.846	4.7231

Table 9: Generalized Estimating Equation (GEE) test for changes in voluntary isometric grip strength over time.

Variable	**Estimate**	**Z**	**Comment**
Voluntary isometric grip	-0.2218	2.4615 Significant at the 5% level of significance (1.96 $\leq$ test statistic < 2.58)	Decrease over time

Table 10: Descriptive statistics for numerical variables of the voluntary isometric 2 point pincer strength assessment.

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline assessment	15	1	6	3.133	1.8942
4 week assessment opportunity	14	0	4	1.821	1.3951
8 week assessment opportunity	13	0.5	6	2.385	1.6852

Table 11: Generalized Estimating Equation (GEE) test for changes in voluntary isometric 2 point pincer over time

Variable	Estimate	Z	Comment
Voluntary isometric 2 point pincer	-0.0992	1.8272 Significant at the 10% level of significance (1.645 $\leq$ test statistic < 1.96)	Decrease over time

Table 12: Descriptive statistics for numerical variables of the voluntary isometric 3 point pincer strength assessment.

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline assessment	15	1	8	3.7	2.2741
4 week assessment opportunity	14	0	6.5	2.25	2.0263
8 week assessment opportunity	13	0.5	7	2.615	1.9807

Table 13: Generalized Estimating Equation (GEE) test for changes in voluntary isometric 3 point pincer over time

Variable	Estimate	Z	Comment
Voluntary Isometric 3 point pincer	-0.1410	2.5291 Significant at the 5% level of significance (1.96 $\leq$ test statistic < 2.58)	Decrease over time

Table 14: Descriptive statistics for numerical variables of the voluntary isometric key grasp strength assessment.

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline assessment	15	1.5	6	3.6	1.5492
4 week assessment opportunity	14	0.3	4.5	2.304	1.4747
8 week assessment opportunity	13	0.5	4.5	2.615	1.3095

Table 15: Generalized Estimating Equation (GEE) test for changes in key grasp over time

Variable	Estimate	Z	Comment
Voluntary Isometric key grasp	-0.1279	4.1674 Significant at the 0.1% level of significance (3.29 ≤ test statistic)	Decrease over time

4.2.4 The Michigan Hand Outcomes Questionnaire (MHQ):

The researcher did not change the wording of any of the questions set out in the MHQ. It was, however, noted that some of the questions were not applicable to the majority of the target population.

The researcher consequently adjusted the MHQ in the following manner:

- After performing the baseline assessment, the researcher adjusted the MHQ. Instead of participants completing the entire MHQ questionnaire, they were only asked to complete the sections relating to the hand

selected for involvement in the intervention and assessment components of the research project. The bilateral hand function components were also included within the selection of questions.

- After the 4th week assessment opportunity, the MHQ questions were further decreased after the researcher noted that participants predominantly marked certain questions as “not applicable”. As a result, the following questions were excluded from the questionnaire:
    - I.2; I.3 and 1.5: The questions address symptoms unrelated to the relevant diagnosis.
    - II.5: The activity of using a pan was not in the scope of daily chores for participants.
    - III: The section on work was not applicable to a retired population.
    - V.2-4: The researcher felt it unnecessary to include 4 questions pertaining to the appearance of the hand alone, in comparison to various other symptoms experienced by the sample population.
    - VI.2; VI.3 and VI.6: These questions address symptoms unrelated to the relevant diagnosis.

The MHQ uses several questions relating to hand function throughout the questionnaire. There are two questions on general hand function; one at the beginning of the questionnaire and the other at the end of the questionnaire; there is also a section dedicated to gathering information on a participants’ performance during specific daily chores.

Table 16: Descriptive statistics for numerical variables for MHQ questions recording participants' subjective perceptions of their general hand function (Question I.1).

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline assessment	15	4	15	8.2	3.121
4 week assessment opportunity	15	4	10	6.8	1.935
8 week assessment opportunity	13	4	11	7.23	2.522

The MHQ question pertaining to the subjective perception of how participants experienced their general hand function indicated that only case number 25 from the experimental group showed a steady improvement over the time period.

The subjective perception of general hand strength over the time period only slightly improved with case number 30 from the experimental group; with no note worthy changes amongst the other cases.

When using the GEE tests for changes over time, the summary of the subjective perception of the participants' ability to perform specific daily chores indicated that no changes were detected in any of the cases over the time period.

The MHQ question on the subjective perception of participants regarding their ability to open a jar indicated that there was little change over the time period, with the exception of case number 17 from the experimental group, whose score worsened and case numbers 18 and 26 also from the experimental group, whose score was noted to improve.

Table 17: Descriptive statistics for numerical variables on participants' subjective perception of their ability to open a jar.

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline assessment	15	7	24	14.33	4.761
4 week assessment opportunity	15	6	18	12.27	3.494
8 week assessment opportunity	13	8	18	13.15	3.555

The MHQ question concerning general hand function at the end of the questionnaire indicated a marked improvement amongst case numbers 22, 29 and 30 from the experimental group and 10 and 11 from the control group.

The data analysis of the MHQ pertaining to the general subjective perception on pain experienced in the affected hand indicated that besides case number 25 from the experimental group, who showed a slight improvement over time, and case number 30, also from the experimental group, who showed a considerable improvement, other participants presented with little change over the given time period. When considering the frequency and intensity of pain, case number 25 from the experimental group was the only participant presenting with improvements, with case number 23, also from the experimental group being the only participant who worsened over the given time period. The MHQ question relevant to pain interfering with sleep indicated that only case number 30 from the experimental group presented with improvement over this time period. The MHQ question referring to pain interfering with daily chores indicated that case number 2 from the experimental group got worse and case numbers 18 and 30, also from the experimental group, improved over the time period. Case number 18 from the experimental group recorded worse scores over the period of time on the question relating to

pain decreasing happiness over the time period. The MHQ concludes with general questions on aspects such as pain, where case numbers 26, 29 and 30 from the experimental group and case number 8 from the control group presented with an improvement in pain experienced over the given period of time.

The question relating to participants' satisfaction with the appearance of their hand over the time period indicated an improvement with case numbers 8 and 13 of the control group, as well as case number 30 from the experimental group.

The MHQ question pertaining to participants' subjective perception concerning their satisfaction with their hand strength indicated an improvement with case numbers 22, 26 and 29 from the experimental group and case numbers 10 and 13 from the control group, over the given time period.

Except for cases 8, 9, 10 and 11 (where improvements were noted) there was little change over the time period.

4.2.5 Compliance logbook

Compliance logbooks with similar subdivisions were designed for both the experimental and control groups. At the start of each intervention session, the logbook was completed by means of a structured interview, after which participants signed to verify their attendance and the information recorded. The logbook was comprised of 3 sections; one was filled in prior to the intervention program; another was completed while the exercises were performed; and the last was filled in after the exercises were performed. The logbook was adapted after the 4 week assessment opportunity; the following amendments were made:

- The logbooks were adjusted in order to assist with the practicalities of processing data, by means of an improved coding system.
- In an attempt to monitor participants' pain experience, VAS scores were incorporated in the following capacity: at rest prior to the intervention modality; during activity throughout the past week; during and after the

intervention modality (either while using the assistive device or during the exercise).

- A component was also added to monitor variables, such as activity participation, which might have had an influence on the pain experienced by individuals.

- The logbook was amended by adding components to monitor the quality of the intervention technique used, as well as a component to evaluate whether participants would be able to perform the intervention modality independently.

The logbooks were very accurate in noting the percentage of participants attending, as well as the theme patterns for not attending intervention sessions.

Occurrences of the various reported pain bearing activities identified by participants were recorded by means of the logbook. Activities such as crocheting and knitting, as well as activities requiring tight or big grasps, were recorded most frequently by participants as pain bearing activities. Opening jars; opening taps and gardening related tasks were moderately reported. Various leisure activities were less frequently recorded.

Logbook records indicated that 2 participants identified weather as a factor contributing to their pain experience. One participant included the details of her increase in pain after discontinuing pain medication in her logbook; the increased pain subsided after a week.

The weather in Pietermaritzburg in the 5 days prior to the various assessment opportunities did not differ extensively and could therefore not have had a significant influence on recorded assessments. The average temperatures in Pietermaritzburg for the given time period were 4.75-21.6 °C 5 days before baseline assessment, 4-22.4 °C before the 4 week assessment opportunity and 9.2-24.4°C before the 8 week assessment opportunity.

The compliance logbooks for the experimental group were also used to calculate the quality of the technique used during the exercise sessions. The

logbooks recorded the following compliance to the following progressive resistant strengthening principles:

- Exercise sessions were offered twice a week with at least one day of rest in between. Attendances of exercise sessions were adequate. During the 1st 4 weeks of intervention, 50% of the population attended 100% of the intervention sessions; with 30% of the population attending 75 %. During the last 4 weeks of the intervention session, 60% of the population attended 88% of the intervention sessions, 20% attended 100% of the sessions and only 10% attended 63% of the sessions. The mean attendance percentage during the 1st 4 weeks of the exercise program was recorded at 90% for the experimental group and 88% during the last 4 weeks of the intervention program. When performing a paired t-test for difference between mean percentage attendances for the 2 time periods, t = 0.949 with p-value 0.185, i.e. there is no significant difference between the means.

- Three sets of 10 repetitions each were completed, with 2-3 minute rest times between these sets. The repetition maximum for each participant was calculated and used at 60% when resistance during the exercise regime was calculated. The compliance logbook for the experimental group indicated a definite increase in the repetition maximum; with a mean repetition maximum of 7.8 at the 1st session, moving up to 16.8 during the 8th session and being noted at a mean repetition of 43.78 during the final exercise session.

- In an attempt to perform the exercise regime with a flexed IP joint, it was found that 30% of the participants could perform the exercises with a flexed IP joint 100% of the time; where 40% could not perform the exercises with a flexed IP joint 100% of the time. The relation between the ability to perform the exercise with a flexed IP joint and the ability to strengthen the involved muscle was not calculated.

4.2.6 Cost sheet

The cost sheet indicated that the projected cost for the pilot study was a total of R 54 315.41. However, the researcher, absorbed R 29 970 of the cost by acting as a research officer and conducting the intervention sessions as an Occupational Therapist.

Table 18: The cost of the research project with regards to each phase of the research project, as well as per participant:

Phase of research project	**Calculated cost**	**Number of participants involved**	**Average cost per participant**
Pre-screening phase	R999.50	3 Retirement homes	R333.17 per retirement home
Informed consent for retirement homes	R711	3 Retirement homes	R237 per retirement home
Recruitment procedure	R5886.56	30	R196.22 per person
Informed consent of participants	R100	30	R3.33 per person
Initial screening	R870	30	R29 per person
Final screening	R1458	28	R52.07 per person
Baseline assessment	R4084.05	25	R163.36 per person
Four week assessment	R3891.05	23	R169.18 per person
Eight week	R2120.25	13	R163.10 per

assessment			person
Control group intervention	R3866	10	R386.60 per person
Experimental group intervention Weeks 1-4 Weeks 5-8	R24671.8 R13418.30 R11253.50	15 12 9	R1644.79 per person over 8 weeks R1118.19 per person over first 4 weeks R1250.39 per person over last 4 weeks
Feedback sessions	R5657.20	30	R188.57 per person
Total:	**R53931.41**		

The cost of the pilot study, per person, was calculated at a total of R1921.60 per control group participant and R3179.79 per experimental group participant.

The most expensive contributing factors to the cost of the pilot study were staff, as they consumed a total of 64.2% of the calculated costs for the pilot study. The following is a breakdown of the employed staff and the percentage of the overall costs which each required: Research officer, 22.6% (61.3 hours at R200 per hour); Occupational Therapist for intervention sessions, 33% (56.5 hours at R320 per hour); and Occupational Therapist for assessments, 8.6% (17.7 hours at R320 per hour).

Refreshments accounted for 17% of the total costs; assistive devices for a further 8% and travelling expenses made up 5% of the total costs. The researcher received funding from the University of KwaZulu-Natal and therefore

had to make use of vendors affiliated with the institution. The vendors quoted as follows:

- Refreshments: R320 per platter (serving 10) and R5 per person for coffee or tea.
- R183 per assistive device.

4.2.7 Feedback questionnaires

The feedback questionnaire was completed by the remaining 8 participants of the experimental group at the 8 week assessment opportunity. Participants answered all the relevant questions after having the importance of honest feedback reinforced by the researcher. Only one participant required assistance to complete the questionnaire, due to a visual impairment. The participants' responses were integrated amongst the various categories discussed.

4.2.8 Researcher's field notes

The researcher kept a weekly journal in an attempt to record subjective observations made while the research project was conducted. The notes were integrated throughout the results and discussion sections of the dissertation.

4.3 Procedure

4.3.1 Pre-pilot study

The pre-pilot study was performed on three elderly Caucasian females. After participating in a simulation process of the assessment components with the various data collection tools, the participants in the pre-pilot study were not able to identify any necessary adjustments required. No ambiguous items were identified by these participants. However, they required some guidance with the use of the VAS. The researcher subsequently designed a poster to demonstrate the use of the VAS to participants and to serve as a visual aid while facilitating the recording of VAS scores amongst participants.

4.3.2 Assessment

The baseline assessments were performed on 10 participants on the 15th July 2013; on a further 10 participants on the 16th July 2013; on 4 other participants

on the 19th of July 2013 and on the remaining 1 participant on the 20th July 2013.

For the 4 week assessment opportunity, 13 participants were assessed on the 19th August 2013 and 1 participant was assessed on the 22nd August 2013 (the assessment performed on this participant was carried out by the Occupational Therapist who performed the intervention programs, as the assessor could not be rescheduled for another appointment). The 8 week assessment opportunity was performed on 13 participants on the 13th September 2013.

All the assessments took place during the morning, except for the following cases:

- Baseline assessment opportunity; 19 July 2013; 4 participants (case numbers: 13, 28, 29 and 30). This was the only occasion during which these 4 particular participants were assessed in the afternoon; all remaining assessments were performed during the morning.

- During the 4 weeks assessment opportunity, the participant with the case number 22 was assessed during the afternoon of 22 August 2013; this was the only occasion during which this participant was not assessed in the morning.

The Occupational Therapist who performed the assessments had experience in hand therapy and was completing her Master's degree in Hand Therapy. The assessor remained the same throughout the research project; except for one occasion during which an additional appointment could not be rescheduled for the 4 week assessment opportunity and had to be conducted on the afternoon of 22 August 2013 by the Occupational Therapist who was conducting the intervention programs.

The researcher informed participants and the assessing Occupational Therapist about the importance of maintaining a blinded research project. Three participants, however, informed the assessing Occupational Therapist which intervention modality they would be participating in during the baseline assessment opportunity. The research project was therefore not blinded as intended.

The MHQ was hand delivered to all the relevant participants 4 days prior to the various assessment opportunities. During the delivery of questionnaires, the researcher reinforced the importance of completing the questionnaire with each participant. An average of two participants per assessment opportunity forgot to fill out their questionnaires prior to the appointment. The researcher held extra questionnaires at the assessment venue to accommodate such participants. Two participants had to be assisted with completing the MHQ due to their visual impairments; this was done by means of a structured interview conducted by the assessing researcher.

The researcher did not create a sufficient system to monitor completion of the MHQ during baseline and week 4 assessment opportunities; this resulted in participants stating their completion of the questionnaire where there were actually sections left completely unanswered. The researcher contacted 4 participants telephonically in an attempt to complete the missing components of the questionnaire. A system was set in place for the 8 week assessment opportunity, during which the completion of each question was verified by the researcher while the participant was being assessed. In the case of any incomplete answers, the researcher facilitated the participant in providing an answer or indicating that it was “not applicable”.

Participants who completed the feedback questionnaire were asked how long the adjusted MHQ questionnaire took them as part of the assessment performed at week 8 of the research program. Four out of the eight participants noted that the questionnaire took them approximately 10 minutes to complete; some participants took approximately 15 minutes; with one exception of a participant taking 20 minutes to complete the questionnaire. Participants indicated that they understood all the questions posed by the MHQ questionnaire.

The assessment with the Occupational Therapist took on average 10 minutes per participant to complete. The researcher booked three participants every 30 minutes, during which time they were orientated to the study; the MHQ was collected and the assessment was performed. This system ensured a minimal waiting time before assessments; it also assisted with accommodating

participants' personal schedules, which in turn, facilitated attendance of appointments. Where possible, the researcher also attempted to group individuals together with friends, in an attempt to facilitate attendance by means of positive group dynamics.

4.3.3 Intervention program

4.3.3.1 Abductor pollicis longus strengthening program

The exercise program was hosted every Tuesday and Thursday afternoon during the duration of the intervention. The first exercise session took place on 23 July 2013. If participants could not attend the intervention appointments, individual sessions were attempted to be arranged either on Monday or Wednesday afternoons, or alternatively on Saturdays. If the Occupational Therapist did not manage to arrange an alternative appointment for the extra opportunities, the exercise logbook was marked as unattended, with the relevant excuse noted. Once a participant had missed four consequent exercise sessions, the participant was recorded as having withdrawn from the research project; this was then discussed with the relevant participant, where possible.

Initially the researcher scheduled all the participants for the same time slot in an attempt to host an exercise group. The researcher's field notes indicate that the participants were not motivated to participate in a large group of approximately 10-12 participants. Participants reported to the researcher that the inflexible time slot complicated their personal routines and appointments; some participants also preferred attending appointments where certain participants would not be present due to previous disagreements amongst residents, unrelated to the research project.

The researcher adjusted the arrangements at the third week of the intervention period by allowing participants to arrive at any point during the time slot which was most convenient for them. This complicated the logistics for the researcher as there would be sessions where participants would not arrive for a whole hour; with the majority then arriving 10 minutes before the end of the intervention session. The researcher designed a schedule for participants at the beginning of the 5th week of intervention; three participants were scheduled per 30 minute time slot. Participants were placed in a time slot based on the

researcher's previous field notes concerning patterns and preference of attendance times. Friends and participants who were well acquainted with one another and who enjoyed amicable relationships , were allocated to be in the same groups in an attempt to maintain some form of positive group dynamics as a facilitator for attendance. The newly designed exercise schedule was more convenient, as the Occupational Therapist could invest more individual time with each participant. The evenly spaced out appointments also allowed for more diligent exercise and complete logbook entries. The smaller groups allowed for a more individual approach which became increasingly important as self reporting was inadequate amongst participants and techniques in independent exercise performance were lacking.

The participants who completed the feedback questionnaire stated that they understood all the verbal instructions provided by the Occupational Therapist during the exercise sessions. They indicated that the exercise session took them between 10 and 15 minutes to complete.

Various components were noted in the researcher's field notes on considering the method used in an attempt to strengthen the abductor pollicis longus muscle. These included the following:

- The soft elastic fabric strap which anchored around the head of the 1st MC was comfortable for participants. Various lengths were available to accommodate the various hand sizes of participants. There were also left and right handed straps which were altered to be narrower on one side; allowing a more comfortable fit in the 1st web space.

- Initially there was a soft strap to assist with keeping the IP joint in a flexed posture; participants experienced this as an uncomfortable component. The flexion strap was discontinued for all participants during the 1st exercise session. A small number of participants could maintain IP joint flexion actively while performing the prescribed movement pattern without pain. This group of participants was allowed to use this movement pattern while performing the strengthening program; as long as they continued to be pain free during performance. This group

therefore managed to strengthen the abductor pollicis longus in increased isolation.

- The majority of participants could not perform the above noted movement pattern, either due to pain, poor motor planning abilities or due to IP joint deformity. These participants could not actively maintain IP joint flexion while performing the strengthening program. A general abductor exercise movement pattern was used; this pattern allowed strengthening of the synergistic muscle group responsible for abduction and extension of the thumb.

The researcher's field notes indicated that participants struggled to perform exercises independently in terms of technique; angle of pull; speed; and potentially overexerting themselves. Some of the participants, however, reported on the feedback questionnaire that they felt that they would be able to perform the exercise sessions independently of the Occupational Therapist; the majority indicated that they would require some supervision from an Occupational Therapist to assist them to make the necessary adjustments and to ensure that they implemented the correct method.

On considering the scheduling of exercise sessions, the participants who completed the feedback questionnaire predominantly indicated that they preferred exercise sessions only twice a week; they also preferred sessions to take place in the afternoon, as most of the activities taking place in the retirement homes are scheduled during the mornings. Two participants, however, indicated preferring morning sessions due to their existing weekly routine and commitments.

4.3.3.2 Control group

The first intervention group for the control group took place during the afternoon of 22 July 2013; and the 2nd session took place on the 19th August 2013 (after conducting the 4 week assessment opportunity). The compliance logbook was filled in during each contact session.

Participants from the control group were each issued a jar opener during the first intervention session. The intervention was scheduled as a group activity for the 10 participants. According to the researcher's field notes, participants arrived late for the scheduled session. The Occupational Therapist changed her approach by attending to participants as they arrived at the venue. The intervention session was therefore much longer than the estimated 30 minutes. The Occupational Therapist, however, managed to ensure that the participants possessed proper working knowledge of incorporating the assistive device into their day to day living by having the method of using the assistive device demonstrated to them and having participants practice the technique on various size jars.

All the participants, except for one, managed to demonstrate the accurate use of the assistive device at the end of the meeting. The one participant who could not demonstrate the correct method of use was individually followed up by the Occupational Therapist to ensure proper working knowledge and correct technique. Participants were encouraged to contact the researcher in the case of any uncertainties.

The information group was repeated on the 19th of August 2013, after being assessed at 4 weeks of intervention. The information group was adapted by scheduling two participants at a time.

4.3.4 Retention strategies

The researcher amended several retention strategies. Initially the focus was on having large groups of approximately 10 participants attending an intervention session simultaneously; the researcher had to adjust this approach as it was noted that the participants preferred smaller groups of 2-3 participants. The smaller groups were then used from the 5th week of intervention as a medium of facilitating group dynamics, in order to increase retention rates. A stronger group dynamic was noted in the researcher's field notes, as smaller groups allowed for friendships to develop and improve. The smaller groups added to improving the therapeutic relationships between participants and assisted the Occupational Therapist with performing the intervention sessions.

According to the experimental group's compliance logbooks, there were 179 appointments made for intervention sessions during the course of the 8 week intervention period. Of the 179 appointments, 147 were either seen during their original appointment time or wereable to be rescheduled. Of the 179 appointments made for the experimental group's intervention sessions, 18% were not attended and were not able to be rescheduled (exercise compliance logbook percentages are all rounded off to zero decimal points). Participants identified several factors which interfered with their ability to attend assessment or intervention sessions:

- Poor memory was one of the most common excuses for missing appointments, noted both in the compliance logbooks as well as the completed feedback questionnaires. The exercise compliance logbook identified forgetfulness as the predominant contributing factor, at 48%. The participants who completed the feedback questionnaire indicated that they managed to remember the sessions predominantly due to the text message reminders which were sent by the researcher to encourage them to attend the sessions; half of the participants indicated that the fact that the sessions formed a weekly routine assisted in their attendance; one participant also indicated that fellow participants aided in reminding her to attend sessions.

- Poor health was noted as a common excuse for not attending appointments; this was prevalent in both the feedback questionnaire and seen by the fact that 26% of the missed appointments in the exercise compliance logbook were attributed to poor health.

- The feedback questionnaires and compliance logbook entries noted that alternative arrangements or plans (unforeseen circumstances) would take preference over existing appointments. According to the exercise compliance logbook, 11% of the appointments were missed due to appointments within the participant's own personal schedule.

- A total of 7% of the noted reasons were due to participants preferring to rest rather that attending the intervention session.

- Care giving responsibilities, such as accompanying others to hospital visits or offering moral support towards family and fellow residents, took preference to appointments. Family responsibilities accounted for 7% of exercise appointments which were not attended, according to the exercise compliance logbooks.

During the feedback questionnaire, participants were questioned regarding what motivated them not to withdraw from the research project; several aspects were identified. Three out of the 8 participants had a continued hope to experience a decrease in symptoms; only 2 of the 8 mentioned that a decrease in pain experienced at the beginning of the intervention motivated their continued participation in the research project; 3 participants were motivated by the opportunity to contribute to research; 3 noted that the therapeutic relationship they developed with the Occupational Therapist motivated their continued participation, and lastly, the continued learning experienced by participants was noted by 4 out of the 8 participants as being the predominant source of motivation when they considered their continued participation in the research project.

The refreshments offered during the research project met the dietary requirements of the participants, as indicated by the feedback questionnaire; the participants also indicated a preference for savoury refreshments as well as smaller snacks such as nuts and biltong. The researcher's field notes, however, indicates that three participants mentioned dietary requirements at the end of the research project which they did not have the opportunity to declare at the beginning of the research project when background information was being collected; the requirements exclude nuts and meat. The majority of participants indicated that refreshments were not required as the sessions were all scheduled close to their lunchtime. However, they indicated that having refreshments at the group sessions was enjoyable and made the session more casual and friendly.

The participants who participated in the feedback questionnaire indicated that the venues at the retirement centres were appropriate for the sessions, as well

as being easily accessible; it took from a minimum of 2 minutes to a maximum of 10 minutes to arrive at the venue.

Table 19: The number of participants participating at various points in the research project

Phase	**Number of participants in experimental group**	**Number of participants in control group**	**Total number of participants**
Informed consent			30
Initial screening			30
Final screening			28
Participants qualifying for research project	15	10	25
Baseline assessment	13	10	23
4 week assessment opportunity	10	5 *	15
8 week assessment opportunity	8	5	13
* One participant could not attend the 4 week assessment opportunity and was only assessed at the 8 week assessment opportunity; therefore only four were assessed.			

Table 20: The attrition rates were as follows during the following time frames

Time period	**Experimental group**	**Control group**	**Total sample population**
Informed consent to screening phase			0%
Screening phase to the baseline assessment opportunity	13.3%	0%	8%
Baseline assessment to 4 week assessment opportunity	23.1%	50%	34.8%
4 week assessment opportunity to 8 week assessment opportunity	20%	0%	13.3%
Screening phase to 8 week assessment opportunity	46.7%	50%	48%

The 14 participants who withdrew from the research project provided the following reasons:

- Four of the participants did not wish to continue with the research project.
- Three participants withdrew due to poor health.
- Two participants' weekly schedules were deemed to be too busy to accommodate the intervention program.
- Two withdrew due to family crises which demanded their ongoing attention.
- One withdrew as she was leaving the retirement home for a month.

Chapter 5: Discussion

The discussion will be used to critically reflect on various components of the pilot study in the context of existing related research in the field. The discussion will address various procedures and tools used for aspects such as the sampling of retirement homes; recruiting procedures, informed consent, sampling the target population, screening procedures and randomization. Data gathering instruments such as active range of motion of the thumb, VAS, muscle strength assessments, the MHQ, compliance logbook, feedback questionaire and the use of the researcher's,field notes will also be reflected on. In an attempt to ensure thorough discussion throughout the components procedures such as the pre-pilot process, assessments, intervention programs, retention strategies and data analysis will also be discussed.

5.1 Sampling procedure

5.1.1 Retirement homes

The pre-screening process used by the researcher assisted with identifying retirement homes in Pietermaritzburg at which a high prevalence of osteoarthritis of the 1st CMC joint was expected to be found. The identified retirement homes had to prescribe to the following regularities:

- Located in Pietermaritzburg
- High ratio of residents being Caucasian women over the age of 65 years
- Provide an accessible and safe venue within the main building from which the various phases of the research process could be conducted (Warren-Findlow et al., 2003).

Due to the small target populations addressed, the pre-screening phase proved to be vital in increasing the response rate and to prevent wasting resources by attempting to access the broader retired community of Pietermaritzburg. This finding is in line with previous research studies where pre-screening for small target populations has been proven to increase response (Warren-Findlow et al., 2003).

The researcher was fortunate that all three retirement homes which were initially contacted met the inclusion criteria and the relevant gatekeepers agreed to participate in the research project. The lack of research available on the geriatric community of South Africa served as a common incentive for Matrons agreeing to the research project; this must be duly noted when contacting future retirement homes to participate in a full scale research project.

If a vastly bigger population is, however, required it is advisable to first broaden the research project to neighbouring towns such as Hilton and Howick which present with similar weather patterns and similar populations within their retirement homes; before altering the description of the population with respect to gender, age or individuals not residing in a retirement home (Wilder et al., 2008). It would be important that the description of the research sites should remain similar when conducting a full scale research project as it would assist in correlating data and decrease the number of variables, (Warren-Findlow et al., 2003). There are a number of variables which have to be taken into account concerning individuals not residing in a retirement home These include factors such as contamination; compliance and increased costs of logistics. In the case of conducting a full scale research project, a central control system will have to be devised, as it would be vital to effectively coordinate a project where multiple research sites and staff members are envolved; central contol systems has been proven succesful in similar research projects with bigger sample populations (Katula et al., 2007).

The researcher could be required to broaden the research project to retirement homes presenting with a high ratio of women over the age of 65 years, who represent races other than Caucasian. The costs involved in recruiting a more diverse population would, however, be significantly more than the projected costs for existing strategies, as all the components and phases of the research project would have to be adjusted to accomodate various cultures and languages.

In the case of attempting a full scale research project it would be advisable for the researcher to create a partnership with PADCA (Pietermaritzburg and District Council for the Care of the Aged). PADCA is a Pietermaritzburg based

organisation with whom the majority of retirement homes in Pietermaritzburg are affiliated; the organisation is known and trusted within the elderly community. If the partnership with PADCA is known to potential participants, it could aid in enhancing the research project's face amongst respective Matron's as well as with the elderly within the target population; this would, in turn, facilitate recruitment and retention rates. Partnering with PADCA could therefore increase the validity of the research project within a community as it is a well known organization functioning within the target population; an increase in validation of the research projects has been apparent in literature when the research project partnered with a well known organization functioning within the target population (Stoy et al., 1995).

The pre-screening procedure should not only be used to gather background information from the retirement home in connection with the size of the potential target population but also to collect data on the average reading level and level of visual impairment of its residents. As per previous literature pre-screening could assist the researcher to adjust advertising techniques to address the target population prior to implementation (Warren-Findlow et al., 2003).

The low risk of contamination between retirement homes could be due to the residents being frailler than the average pensioner still living independently in a home. This frail nature of residents results in minimum traffic and contact opportunities between retirement homes. This contributes to the discussion on the pre-screening inclusion criteria of retirement homes compared to accessing alternative target populations where the risk of contamination could be higher.

5.1.2 Recruiting procedure

After having being granted access to the target population, the researcher's recruitment themes were similar to those of previously conducted research projects which targeted similar populations. The focus was to facilitate communication and trust between the target population and researcher (McHenry et al., 2012).

5.1.2.1 Advertising methods used

It could be seen that the 2 week period of advertising for the research project was ideal for a target population who usually presented with poor memory and

low activity levels. The researcher's field notes indicated that the recruitment of participants was substantially less during the last scheduled information meeting; it was also noted that no extra potential participants reported to the researcher after the 2 week period. It could therefore be derived that for a small target population such as the selected retirement homes, a 2 week period is adequate to reach the majority of the potential participants and to meet the saturation point of eligible participants. It could also be noted that potential participants reporting to the researcher was substantially lower at Home C where a 1 week advertisement period was used and only 1 information meeting was held due to time constraints.

It would be advised that a longer advertisement period should be used at retirement homes presenting with larger populations of residents or with residents presenting with more active lifestyles; this would be necessary to allow the responses of potential participants to reach a saturation level. The selected duration for advertising should, however, still bear in mind the benefits derived from keeping the advertising period as short as possible. The researcher should consider all components before defining an advertisement period for a full scale research project (Katula et al., 2007).

The contact rate for Home A was much higher than that of Home B; this could be due to the target population of Home A being more active in comparison to that of Home B which presents with a higher percentage of frail residents. Home C's contact rate was extremely low in comparison to the other retirement homes; this could be due to the shortened advertising period used by the researcher. The calculated response rates were influenced by the contact rates in the same way as the response rates.

The central preventative theme used in all the advertising techniques could be enhanced in an attempt to increase the response rate within a high risk population as it has been proven successful by previous research attempts (Katula et al., 2007). Instead of initially phrasing a question to ask whether an individual suffers from a painful thumb; emphasize should rather be placed on stating the impairment caused by osteoarthritis of the 1st CMC joint once it has progressed.

Underlying themes which could be highlighted during the advertising campaign were identified as follows:

- Personal benefit was identified as one of the predominant motivators for participants to enrol in the research project; this is in line with previous research also identifying the key role of the mentioned component (Stoy, Curtis, Kimberly, Dameworth, Dowdy, Hegland, Levin & Sousoulas, 1995; McHenry, Insel, Einstein, Vidrine, Koerner & Morrow, 2012). The personal benefits were as follows: cost free hand assessment, referral and advice by an Occupational Therapist; cost free preventative intervention opportunities, receiving an assistive device and refreshments

- Recruitment and retention were benefitted by accessing target populations who had an existing reference system to research projects, either due to personal higher levels of education or due to family members with a history of conducting research projects.

None of the advertising techniques were presented in isolation and residents at the retirement homes were exposed to all of the same techniques. More focused strategies of recruitment resulted in more costly procedures but higher response rates; previous research also indicated that this strategy is usually more effective within similar smaller target populations (Warren-Findlow et al., 2003). Recruitment costs varied amongst strategies used and were associated with the duration at which the strategy was implemented; the supplies used and the staff utilized; the researcher therefore has to consider the success and cost factors of each of the various recruitment techniques in an attempt to refine them for consideration for a full scale research project (Patrick, Pruchno & Rose, 1998). The total recruitment cost for the pilot study was calculated at 10.8% of the entire expenditure; averaging at R196.22 per recruited participant.

An interpersonal approach proved to be a more successful method of recruiting potential participants than a mass media approach; this success refers back to previous research projects which indicated an interpersonal approach as ideal when targeting smaller target populations, such as elderly women who are ignorant of their high risk profile pertaining to a certain diagnosis (Unson et al.,

2004; McHenry et al., 2012; Stoy et al., 1995). The information desk and information meetings were therefore useful opportunities for the researcher to make face-to-face contact with the potential target population; this strategy has been indicated to improve success with recruitment. The method is, however, very resource intensive as the information desk and information meeting required the services of a research officer.

The referral or contact list's average cost per participant was R42 and can therefore be seen as a low cost, but also a reliable method in recruiting potential participants from the described target population. Even though the contact rate of this method was very low; the participants identified via this technique presented with a high response rate and low attrition rate. This could be due to the participants placing their names on the contact list presenting with elements of self-report; which previous research projects noted to correlate with similar responses and attrition rates (Stoy et al., 1995). The involvement of the matron also probably assisted with identifying participants with a definite history of osteoarthritis of the 1st CMC joint and with a history of actively seeking help for the condition. The matron's involvement would also have aided in improving the target population's perception of the research project; which in turn may have facilitated the participants viewing the researcher as trustworthy (Stoy et al., 1995). Pamphlets distributed under eligible residents' doors proved to be a low cost; reliable method of advertising the research project. More emphasize could be placed on word of mouth techniques by making more pamphlets available to the interested population, in order for these to be distributed amongst their acquaintances.

The advertisements predominantly focused on literate information; this could have resulted in recruitment bias occurring; thus excluding a more diverse sample population (Stineman et al., 2011). A more diverse approach to advertisements could decrease the amount of recruitment bias in future research studies.

5.1.2.2 The information meeting

The longer allocated time for the information meetings were resource intensive but the convenience factor may have assisted the researcher to recruit more

participants as also noted by previous research projects (Warren-Findlow et al., 2003; Stineman et al., 2011). The researcher adapting to incorporating informed consent and screening at the same occasion assisted in decreasing the potential of running more costs at a later stage. In an attempt to facilitate recruitment the researcher aimed at structuring information meetings in such a way that potential participants felt secure and informed (McHenry et al., 2012).

5.1.3 Informed consent of potential participants

The researcher's field notes indicated that some of the participants forgot about the details of the research project as time passed. This resulted in some of the participants being unaware of what to expect at the next stage of the research project. In an attempt to accommodate ethical considerations it can be advisable to divide the informed consent into different sections for participants; previous research projects mentions successful implementation of only informing and obtaining consent prior to a new phase; therefore making sure participants are well informed before progressing to the next phase (Katula et al., 2007).

5.1.4 Sample population

The sample size for a full scale research project should take the following into consideration: event rates; attrition rates; recruitment feasibility and intervention feasibility (Katula et al., 2007).

Due to the Caucasian inclusion criterion of the pilot study, a diverse sample population was not obtained. However, when considering a full scale preventative research project, a minority group of 25% will be required (Katula et al., 2007). Several considerations have to be made in order to obtain and sustain such a diverse population. There are, however, few research projects available pertaining to recruitment and retainment strategies of elderly women in minority groups (with specific regard to America); but especially when considering South Africa, as no applicable literature was found. Research projects aiming at addressing the lack of available literature pertaining to this topic is important as it would assist the future researchers in designing tailor made recruitment strategies which would improve response rates and decrease the cost factor pertaining to recruiting potential participants (Stoy et al., 1995).

In order to facilitate a more diverse sample population, the research project as a whole needs to be considered. Employing a more diverse staff could facilitate a more diverse population as indicated in previous research addressing diverse sample populations (Warren-Findlow et al., 2003). Previous literature indicated that focus group discussions will have to be used prior to a full scale study to establish recruitment, retention and intervention programs suitable for racially diverse populations (Stineman et al., 2011).

In order to obtain a diverse sample population, diverse recruiting techniques should be utilised (Gilliss et al., 2001). Recruiting techniques for populations including frail; elderly; minority groups have been found to be resource intensive as the advertisement techniques need to be adapted to be culturally appropriate considering contact methods and educational material (Stineman et al., 2011). However, research indicates that even though recruiting minority groups is more costly; retaining the participants results in the same costs applicable to the majority of the sample population (Katula et al., 2007; Wallace & Pahor, 2007; Warren-Findlow et al., 2003).

5.1.4.1 Initial screening procedure

The sample size was increased from 22 to 25 participants by allowing volunteers and workers affiliated with the retirement home to participate. The inclusion of these participants did not interfere with the logistics of the research program as they were all situated at the retirement homes during the time slots when the research project was conducted; their participation therefore did not increase the cost factor of the research project. The participant who was a worker had to withdraw from the research project as her work duties could not be synchronized with the research program. The risk of contamination could be increased if volunteers offered their services at various other retirement homes; this was not the case with the volunteers included in this study. It is therefore advised that volunteers can be allowed to participate within the framework and assessments regarding their inclusion or exclusion in the research project in the case of them not volunteering at other retirement homes; if the research program will not interfere with their existing volunteering duties and if the respective matron provides approval.

It is advisable to exclude the questions relating to frail care and Dementia from the screening questionnaire; but to add a final approval process where the respective matron provides final approval of participants who qualifying to participate in the research project; the final approval will indicate whether a participant can be considered as frail or suffering from Dementia.

The inclusion criteria for age should be changed to include potential participants from 60 years and older, as it has proven to increase the sample population, as well as including volunteers at the retirement homes who might indicate an interest in participating in the research project (Katula et al., 2007). As the average age of participants was 76 years of age, including participants who are younger will create a more diverse population as well as reducing the relatively high mean age of the sample population. A population younger than 60 years could potentially have a decreased response rate as they are usually employed and not officially retired (Warren-Findlow et al., 2003). It was decided not to establish an exclusion criterion based on progressed age; even though the effects of strengthening programs decrease with this population (Kisner & Colby, 2007). By including participants presenting with progressed age, this would increase the percentage of high risk population within the sample population; making the research project more feasible (Katula et al., 2007).

In an attempt to accomodate multiple dietary requirements the initial screening, the question designed to gather information on dietary requirements should be open-ended, in order to allow participants to record dietary requirements relevant to participants, rather than being limited by predefined choices.

In an attempt to produce statistically significant data, it is advisable to continue using a VAS score of minimum 3 as inclusion criteria for a full scale research project; the pain score should change, however; instead of recording pain at rest the score should reflect pain with activity during the past week. The VAS as a measurement tool used amongst the elderly will be discussed with the remaining data gathering instruments.

The background information obtained during the initial screening phase could be utilized more effectively. By making the background information more detailed, the researcher could design a system with which subgroups within the

sample population could be identified before commencing the intervention phase of the research project (Katula et al., 2007). The subgroups must be used to categorize participants who might present with a profile indicated by literature to be at high risk to either present with poor compliance during the research project or to withdraw from the research project. The researcher can then implement strategies to provide extra support to these participants in an attempt to decrease attrition rates.

Background information needs to be more substantial:

- Including a more extensive list of chronic illnesses experienced by potential participants could assist in predicting compliance to exercise programs; literature indicated that participants presenting with additional chronic illnesses compared to the norm are less likely to comply to exercise programs (Warren-Findlow et al., 2003; Katula et al., 2007). The list of chronic illnesses should ideally be recorded on both a self-report list as well as being confirmed by the participant's physician, as previous literature indicated that participants subjectively over estimate the presence of chronic illnesses (Warren-Findlow et al., 2003). Contacting the health providers of participants would, however, be an additional ethical consideration of the research project.

- The initial screening should also include a question on how the potential participant perceives the quality of her own health. A poor perception of a potential participant's own health could be associated with poor compliance to exercise programs (Warren-Findlow et al., 2003).

- The initial screening should also be used to obtain background information on the level of education and reading level of participants. This information would be important to attempt to adjust all remaining communication material to a reading level applicable to each individual; or to make allowance for having an assistant facilitating individual centered communication (Warren-Findlow et al., 2003).

- The background information should also include whether a participant is married; widowed; single or in a relationship, as this also has an

influence on attrition rates. Previous research projects indicated that participants in a long term relationship are more likely to withdraw from the research project in comparison to single or widowed participants who uses the intervention programs to engage in social interaction opportunities (Warren-Findlow et al., 2003).

5.1.4.2 Final screening procedure

The final screening form's section on recording pain experience should add an option to record pain experienced while performing a key grasp.

5.1.4.3 Randomization

It is unfortunate that the performed pilot study did not recruit a large enough sample population to allow for randomization of both the retirement homes as well as the sample population. This is however a component which would remain crucial when performing a full scale research project as randomization of the sample will increase the internal validity of the study (Ye et al., 2011). The researcher must however find a balance when considerering the logistics and retention strategies of the research project in comparison with the importance of randomization.

5.2 Data gathering instruments

During the pilot study the researcher noted that some of the participants presented with a poor ability to self-report; this was either due to unfamiliarity with assessment tools, visual impairments or the inability to remember instructions. This variable can have a significant influence on the quality of data retrieved during a full scale research project. In an attempt to address the variable of poor self-report abilities, potential participants' self-reporting abilities need to be assessed prior to the research project (Katula et al., 2007). The researcher can then use the assessment as an inclusion or exclusion criteria for the research project. Assessing the self-report abilities of a potential participant could be conducted by the researcher designing a brief and non-essential self-report questionnaire which potential participants have to complete between the timeframe of the initial screening opportunity and the final screening opportunity (Katula et al., 2007). The researcher can then establish which potential participants have the ability to self report and which do not. Instead of using the

information as an inclusion criterion, the researcher might choose to use the information to provide additional support to the identified potential participants.

5.2.1 Active range of motion of the thumb

The initial consideration for an active of range of motion assessment tool for the 1st CMC joint excluded the use of a goniometer, as previous research indicated it to be an unreliable method for the proposed joint (Cooney et al., 1981). No assessment methods could be identified by the researcher which allow for the 1st CMC joint to be assessed in isolation The researcher decided to obtain a standardised active range of motion assessment tool for the total active range of motion for the thumb. The Kapandji index for opposition was therefore chosen as a standardised instrument for assessing the total active range of motion of the thumb in opposition and not the 1st CMC joint in isolation (Lefevre-Colau et al., 2003).

As the hypothesis of an equal number of unchanged and improved Kapandji index scores of participants cannot be rejected (p-value = 0.5); it would be advisable to keep the Kapandji index as part of the assessment battery. However, as the early stages of osteoarthritis of the 1st CMC joint are associated with a progressive decline in range of motion of the 1st CMC joint; resulting in a contracted 1st web space during the progressed stages (Ye et al., 2011;Mennen & van Velze, 2008); the Kapandji index, even though standardised, was found to be an inadequate assessment tool for the proposed research project. In addition, it is proposed to assess 1st CMC joint abduction by means of a goniometer; even though the reliability may be questioned (Cooney et al., 1981).

The standardized technique for assessing 1st CMC joint abduction with a goniometer positions the participant in a seated position, with the forearm in a mid position between pronation and supination; the ulnar border of the hand supported by a table. The wrist, 1st CMC joint, MCP joint and IP joint must be in a 0 ° neutral position. The assessor stabilizes carpals and the 2nd metacarpal to prevent wrist motion. The fulcrum of the goniometer rests on the lateral aspect of the radial styloid process. The proximal arm of the goniometer is positioned across the lateral midline of the 2nd metacarpal (with the midpoint of the 2nd

MCP joint serving as a landmark); the distal arm is positioned across the lateral midline of the 1st metacarpal (with the midpoint of the 1st MCP joint serving as a landmark). The prescribed motion requires the 1st MC being actively moved away from the palm of the hand performing abduction of the 1st CMC joint (Norkin & White, 2009).

The described technique would assist the researcher to objectively record any improvement in the active range of motion of the 1st web space, as experienced by participants. It would be interesting to note whether the active range of this motion assessment tool will correlate with the subjective reports of improved range of motion, as was found and recorded by the exercise control logbooks during the conducted pilot study.

5.2.2 Visual Analogue Scale (VAS)

When considering the target population of elderly females who are prone to present with mild impaired memory, the VAS scores obtained during the assessment opportunities would have been more reliable than the scores obtained during the compliance logbook opportunities (Ware, Epps, Herr, & Packard, 2006).

The VAS is one of the most common pain assessment scales used in literature and was consequently chosen as an assessment tool for the proposed research project (Hjermstad et al., 2011). When considering the researcher's field notes, the reliability of the VAS scores in the context of the pilot study is questionable in relation the target population; the observation is similar to the findings of previous studies which have found that the VAS has a higher percentage of participants not being able to use the scale, especially the elderly (Hjermstad et al., 2011; Brunelli et al., 2010). Previous research projects confirmed participants' poor ability to conceptualize the pain experience using the VAS; as well as presumptions that elderly communities respond better to using words to express and record their pain intensities (Ware et al., 2006).

Consequently, alternative pain assessment scales, with comparable reliability and viability should be considered in the context of performing a full scale research project. Literature indicated the VAS, Numeric Rating Scale (NRS)

and Verbal Rating Scale (VRS) to be both valid and reliable subjective assessment tools to record pain (Brunelli et al., 2010).

Most individuals can only discriminate up to 9 levels and the level of in depth discrimination obtainable from the VAS is therefore not a necessity when considering pain intensity assessment scales (Hjermstad et al., 2011). A more crucial point of concern is considering adequate sensitivity of the chosen assessment tool; the sensitivity of the implemented pain scale is crucial to detect any differences in pain experienced by participants as an effect of intervention modalities being researched and compared (Breivik et al., 2008). The sensitivity of an assessment tool is even more crucial if the baseline assessments of participants' pain levels are generally low or mild (as in the case of the described target population) (Breivik et al., 2008). Previous literature noted that the VAS and NRS are equally sensitive for subjectively recording present pain intensity experienced by an individual (Breivik et al., 2008). The Verbal Response Scale (VRS) is, however, less sensitive and less reliable in comparison to the VAS and NRS (Breivik et al., 2010; Brunelli et al., 2010). The VRS will therefore not be the assessment tool of choice when considering the proposed full scale research project, even though literature indicates that it is the preferred assessment tool amongst the elderly and that it presents with improved psychometric properties for research purposes, compared to the VAS and NRS (Hjermstad et al., 2011).

The NRS is an accepted unidimensional assessment tool for pain intensity (Hjermstad et al., 2011). The NRS is a 0 to 10-point scale with word anchors of "no pain" at one end of the scale, "moderate pain" in the middle of the scale, and "worst possible pain" at the end of the scale (Ware et al., 2006). In comparison with the VAS, it has been found that the NRS is more practical and participants find it easier to understand; it also additionally accommodates visual impairments and it does not rely on the dexterity of the participants (Breivik et al., 2008; Ware et al., 2006). This could be the reason why previous research projects indicated that elderly participants preferred the NRS to the VAS (Brunelli et al., 2010). Even though both the NRS and the VAS present with limitations when recording memory of pain experiences (Breivik et al.,

2008), the NRS can offer stability for remembering a painful event over a 2-week interval (Ware et al., 2006).

Even though NRS is a valid assessment tool, it is limited as the diversity of anchors used should still be empirically tested and standardised to determine the influence which the anchors may have on the response of participants, especially at the higher scores for pain (Hjermstad et al., 2011). The NRS reliability as a self-report tool and a tool for repeated measurements must still be established (Hjermstad et al., 2011; Brunelli et al., 2010).

In the likelihood of performing a full scale research project involving a more diverse sample population it has to be considered that education, gender and cultural influences are the variables which influence reliability and validity of various pain intensity scales and still have not been thoroughly explored in literature (Ware et al., 2006). The NRS has been indicated as a tool with adequate intrinsic properties, with cross-cultural validity and preference (Hjermstad et al., 2011; Brunelli et al., 2010).

5.2.3 Muscle strength assessment

In an attempt to prevent measurement errors, a standard procedure was used throughout all muscle strength assessments without changing the Jamar Dynamometer or the assessing Occupational Therapist (Roberts et al., 2011). The procedure was standardized in relation to positioning of participants, time of day and instructions used, as all these variables can alter the accuracy of assessments made (Roberts et al., 2011). Several amendments to procedure must be considered when considering conducting a full scale research project. The assessment forms should provide adequate space to allow the assessing Occupational Therapist to record any variables concerning procedure, where applicable.

The majority of previous research projects used the second handle position of the Jamar dynamometer as it has been found to be the most reliable position; with positions one and five being the most unreliable (Roberts et al., 2011). Recent research, however, indicated that only 60% of 214 volunteers could demonstrate maximum hand grip strength using the second hand position of

the Jamar dynamometer (Roberts et al., 2011). Hand size therefore does matter; it was also found that in women with fingernails longer than 1cm over the finger tip, using the second hand position also presented with significantly lower scores (Roberts et al., 2011).

In an attempt to prevent measurement errors, the set of instructions used during the strength assessment should be standardised and the assessor trained in these specifications prior to assessment opportunities(Roberts et al., 2011). The researcher's field notes included the set of instructions provided by the assessing Occupational Therapist. The instructions which were used were of a standardized nature; even with regard to the amount of verbal encouragement provided to participants before and while performing the strength assessment. In addition to the existing instructions, the following components could be added to facilitate maximum efforts by participants (Roberts et al., 2011).:

- As the participant starts to grasp the device the assessing Occupational Therapist should say: "Harder...harder...Relax".
- The assessing Occupational Therapist should encourage the participant to press as hard as possible up to the point where the indicating needle does not rise any higher.

Literature is not clear on whether the time of day influences the strength of the grasp performed and it is therefore advised to perform assessments during the same time of the day, where possible (Roberts et al., 2011).

The Jamar Dynamometer has been found to be a reliable assessment tool amongst elderly participants (Guerra & Amaral, 2009). However, it has a limitation in its reliability, as measurement errors are more common in participants with weaker grasps, as the device requires 3-4 pounds force to move the indicator needle; stronger readings have been found to be more reliable (Roberts et al., 2011).

5.2.4 The Michigan Hand Outcomes Questionnaire (MHQ):

Literature indicates that the MHQ has to be completely filled out to ensure accurate data (Gwynne-Jones et al., 2006). The questionnaire, however, provides a "not applicable" option for participants to select. The researcher monitored which questions were predominantly marked as "not applicable"; and used this information to decide which questions should be excluded from the final MHQ.

> The subjective nature of the MHQ became apparent, as even though no improvement was noted during the standardised muscle strength assessment of participants, 5 participants reported subjective perceptions of either improving or being more satisfied with their hand strength.

5.2.5 Compliance logbook, Feedback questionnaire and Researcher's field notes:

The three tools designed for recording subjective and qualitative data were helpful in supporting objective data measurement tools and assisted with the triangulation of data. This was an important component as it assisted with the process and interpretation of the pilot study in an attempt to set the parameters required for conducting a successful full scale research project.

The tools assisted in identifying variables, besides the intervention programs, which could have interfered with the symptoms experienced by participants. The tools can be amended to be used during a full scale research project in order to ensure in depth recording of variables, which could have an influence on participants. The compliance logbook should be more thorough with regard to keeping an accurate record of the use of participant's pain medication as a variable to pain as a symptom of osteoarthritis (Wilder et al., 2003).

Various research projects have studied the relation between pain experienced by individuals diagnosed with osteoarthritis and weather patterns (Wilder et al., 2003). Research indicated that no statistically significant correlation can be made between the described pain and weather patterns (Wilder et al., 2003). Research, however, acknowledges patterns where it is apparent that barometric pressure could have a minimal influence on the pain experienced by women diagnosed with osteoarthritis of the hands (Wilder et al., 2003). The

research also indicated that individuals residing in warmer and wetter climates are more likely to be sensitive to experiencing pain with weather changes (Wilder et al., 2003).

The compliance logbooks of the experimental group indicated good compliance to the exercise technique. It is recommended that a full scale study should not attempt to facilitate IP joint flexion of the thumb while performing the exercise, as the majority of the sample population struggled with this component. By using a general thumb abduction movement pattern with resistance, this could facilitate more independence of individuals performing their own exercises during sessions and therefore possibly decrease the amount of human resources required to perform exercise sessions. Using the general abduction pattern for all the participants in the experimental group will decrease the amount of variables as 2 techniques will not be utilized at the same time.

5.3 Procedure

5.3.1 Pre-pilot study

The pre-pilot study was only performed on 3 elderly ladies between 60 and 65 years of age who did not reside in a retirement home. The pre-pilot study assisted the researcher in accommodating for unanticipated variables. As the ladies who participated in the pre-pilot study did not fit the exact criteria of the target population, the researcher could not have anticipated all potential variables related to the pilot study.

5.3.2 Assessment

Having a baseline assessment; 4 week assessment opportunity and 8 week assessment opportunity provided an adequate number of assessment opportunities; more regular intervals would not be advised as the changes in the recorded variables are so minimal that more regular assessment opportunities would not have been sensitive enough to record any changes whatsoever. It could be recommended that the assessment opportunity be recorded at 4 weeks after the intervention sessions has stopped in order to monitor whether the changes observed (including repetition maximum) were

maintained; as previous literature indicates that strength obtained in exercises with the elderly is usually not maintained (Kisner & Colby, 2007).

Minimal variables occurred during the assessment procedures as the majority of participants were assessed on the same days, during the mornings, with the assessments being performed by the same assessing Occupational Therapist.

Additional efforts should be made to ensure blinding of the assessing Occupational Therapist from the research project; informing participants verbally prior to the assessment proved to be ineffective. It could assist if the assessing Occupational Therapist verbally reinforced the importance of the blinded study prior to engaging in the assessment opportunity with each individual.

The self-report abilities of the target population have been found to be inadequate based on the accuracy rates of the MHQ, which was predominantly used as a self-administered questionnaire. Poor self-report abilities have to be considered when planning a full scale research project; with specific regard to having accessible support available for individuals completing the MHQ and monitoring completion of questions. Adjusting the MHQ's font size to 14 could assist participants with visual impairments to be more independent in completing the questionnaire.

5.3.3 Intervention program

5.3.3.1 Abductor pollicis longus strengthening program

The researcher indicated that a participant would be deemed to have withdrawn from the research project at the fourth consecutive exercise opportunity missed. However, literature indicated that instead of having a proposed point of withdrawal, the researcher should continue treating a participant as part of the sample population and only decide the point of withdrawal in retrospect (Stineman et al., 2011; Warren-Findlow et al., 2003). During the pilot study the researcher attempted to include participants at their third consecutive missed appointment in the research project; however, on discussing withdrawal with them, they opted to withdraw instead of continuing with the research project.

Having flexible appointment options increased the human resources required for the exercise intervention program, but possibly assisted with retention of participants; especially participants with more active lifestyles. It is also recommended that the exercise program is only performed twice a week as this allowed for adequate strengthening of the muscle group; but also prevented any muscle exertion to be recorded by the elderly participants. The participants also indicated that they would not be able to participate in more regular intervention sessions.

Bearing group dynamics in mind, it seems advisable to use groups of 2-3 members for the prescribed target population of elderly Caucasian ladies, as the larger groups did not positively facilitate the compliance of participants with intervention sessions. Various data capturing tools indicated the inability of the target population to perform the exercises independently. If the target population were more independent in performing the prescribed exercises, larger groups would have been less resource intensive and more practical, however, due to the amount of personal support required by participants, larger groups are not advised (Stineman et al., 2011). The smaller group allowed the intervening Occupational Therapist to offer more guidance during the intervention session; ensuring using the correct method throughout the research project; more diligent record keeping was also facilitated by this process. The smaller groups also assisted in that only the intervening Occupational Therapist was required to facilitate the whole process; instead of having a research officer present as well. Considering that compliance to exercise programs is usually better amongst the following categories of participants: men, those with higher levels of education and younger age groups (Warren-Findlow et al., 2003); it could be expected that compliance would be poor in the prescribed target population. In addition to the previous reasons for continuing group based exercises sessions, it is further not recommended that the exercise program gets replaced with a home program, as the supervision of compliance is essential (Stineman et al., 2011).

The researcher, however, also has an ethical obligation to ensure patients can maintain an exercise program after the research project has been completed.

By promoting self-efficacy, the researcher can faciliate the process of adopting an exercise regime and maintaining it (Warren-Findlow et al., 2003).

The exercise strap assisted the researcher in facilitating a standard starting position and standard controlled action while adjusting the strap to suit each hand size. The thin elastic used to make the strap allowed the same exercise program to be adjusted to each individual's ability; which is a valuable quality of an intervention modality (Warren-Findlow et al., 2003).

Only a small percentage of participants could perform the exercise regime with a flexed IP joint of the thumb; making it a very small percentage of participants who were performing the exercise regime in a way that isolated the abductor pollicis longus muscle. The majority of the target population could only perform the exercise regime in a holistic, synergistic movement pattern of abduction. A full scale research project could consider not attempting flexion of the thumb's IP joint while performing the abduction movement pattern. Using a general abductor movement pattern could facilitate more independence in performing the exercises by participants, while allowing strengthening of the synergistic muscle group responsible for abduction and extension of the thumb.

Participation in exercise programs is decreased by participants within the following categories: advanced age; presence of more chronic illnesses; and individuals who perceive their own health as poor (Warren-Findlow et al., 2003). Excluding these individuals is not advised as they usually make up the percentage of high risk participants required for the sample population. The researcher should rather identify participants who specifically fall within these categories and provide additional support to them; as this could assist in their compliance with the exercise regime, as well as their retention within the research project. Other barriers for complying with an exercise program have been identified as follows: having a busy schedule; being employed; care giving and pre-established commitments (Warren-Findlow et al., 2003). These individuals who fall within these categories should also be identified by the researcher and receive additional support, as previously discussed.

5.3.3.2 Control group

The pilot study offered the opportunity to evaluate the choice in assistive devices issued to the participants. Even though the literature review indicated the jar opener as a suitable choice, considering osteoarthritis of the 1st CMC joint, it seemed less successful in the target population.

It needs to be remembered that the target population of the pilot study were elderly females residing in retirement homes, generally making use of a common dining room. The researcher investigated the target population's need for assistive devices prior to commencing the pilot study. Matrons and potential participants indicated that they kept jars of preserves in their rooms, which were taken to the common dining area when needed; the researcher's field notes indicated that potential participants indicated a need for a jar opener assistive device.

Even though the majority of participants mastered the technique to effectively use the jar opener; the control group's compliance logbook indicated that participants used the device on average only once a week; and only when opening the jars for the first time. A fair number of the participants reported poor memory as reasons for not using the jar opener more often.

The high attrition rate in the control group could be due to the intervention modality taking on more of a home program format than an on-site intervention modality; on-site programs increase adherence, compared to home programs (Stineman et al., 2011). It is advisable for a full scale research project to rather use an assistive device which would be more relevant to the target population, such as a tap turner to be kept in the participant's room. The exercise compliance logbooks indicated tap turning as one of the major activities causing pain for participants. The researcher could also attempt to increase contact with participants; even by facilitating compliance by means of telephone contact (Warren-Findlow et al., 2003).

5.3.4 Retention strategies

Retention strategies are interwoven into all phases of the research project. The researcher attempted a diverse set of strategies in an attempt to retain the

target population, who had a high likelihood of withdrawing from the research project.

The following retention strategies which were associated with the research design were noted by the researcher for discussion:

- Advertisement technique: using strategies not related to interpersonal themes facilitates a process of self-selection amongst the target population, in an attempt to enhance recruitment and retention rates (Stoy et al., 1995).

- A short waiting period between screening and intervention was implemented as literature indicated the effect which a short period has on improving retention rates of participants during this phase (Katula et al., 2007). The experimental group intervention and components of the control group intervention were run as on-site programs, increasing adherence compared to home programs (Stineman et al., 2011). The adherence rate for class based intervention sessions can be from 36-100%, where home based intervention programs' adherence rates are from 36-93% (Stineman et al., 2011).

- The chosen venue was consistent; accessible and within a safe environment, all of which have a positive effect on retention (Warren-Findlow et al., 2003). Having the venue on-site further aided in retention, as participants did not have to rely on their own transport arrangements to attend sessions (Katula et al., 2007).

- The choice of data collection methods were non invasive; chosen to be applicable to the target population and voluntary in nature. These strategies were implemented as the choice of data capturing methods can have an influence on the retention of participants (Warren-Findlow et al., 2003).

- The intervention program was easily adjustable to suit the various levels of participants (Warren-Findlow et al., 2003).

- The interpersonal relations between participants and the intervening Occupational Therapist were seen as an important retention strategy; one which was positively implemented and managed, as recorded in the feed back questionnaires of participants (Warren-Findlow et al., 2003).

- Although resource intensive programs are costly, they have to be prioritised against the retention of participants. The flexibility and convenience of appointment times could have aided in retention (Warren-Findlow et al., 2003).

- The reminder system of SMS and telephone contact has been proven to aid retention in previous research projects (Warren-Findlow et al., 2003).

- The pilot study made use of incentives to improve retention of participants; strategies such as feedback sessions at week 4 of the intervention and after completion of the research project, these included; scheduled reunions; personal gain from participating in the research project such as receiving an assistive device; being assessed by a trained Occupational Therapist; and having the opportunity to participate in cost-free intervention programs (Warren-Findlow et al., 2003). A full scale research project can employ these techniques to a greater extent; as these were not promoted during the pilot study.

The researcher could use collected background information to project which participants would be more likely to have poor compliance with exercise programs and who would be more likely to withdraw from the research project; as projected by literature (Warren-Findlow et al., 2003). By identifying these individuals prior to the research project, the researcher could put a system in place to monitor and facilitate compliance of individuals on this list. Individuals identified in literature as being probable to withdraw from a research project were as follows:

- Individuals with an impaired level of function are usually associated with high attrition rates (Warren-Findlow et al., 2003).

- Those with a poor or fair subjective perception of their own health usually have high attrition rates (Warren-Findlow et al., 2003).
- Low educational levels usually present with high attrition rates (Warren-Findlow et al., 2003).
- Individuals who live with someone have higher attrition rates compared to individuals living alone (Stineman et al., 2011).

Several factors can be noted when discussing the attrition rates of the pilot study. The attrition rate of the experimental group was higher during the screening phase of the research project; two participants dropped out of the experimental group due to their subjective opinions of their poor health.

The experimental group presented with similar attrition rates during the first 4 weeks of intervention compared to the last 4 weeks of intervention. This is in contrast to the control group where all participants intending to drop out from the research project did so during the 1st 4 weeks of intervention. The difference between the two patterns of dropping out could be related to the control group being a more home based intervention program compared to the experimental group, which was class based. The attrition rate for the experimental group was 46%, compared to 50% of the control group. These attrition rates are similar to previously performed intervention programs where the attrition rates for class based intervention sessions were between 0-74% and where home based intervention programs' were used, attrition rates ranged from 7-74% (Stineman et al., 2011). The pilot study's attrition rates being slightly in the higher ranges could be due to the high concentration of frailer participants residing in the involved retirement homes.

5.4 Data analysis

The pilot study did not lend itself to collecting statistically significant data, due to the small sample size used. The data collected during the screening procedure of a full scale research project will however be able to investigate various tendencies.

The relation between age and the following variables can be investigated: likelihood to withdraw from the research project; attendance rates; likelihood to either improve or deteriorate in symptoms experienced; and improvement in repetition maximum of participants.

The data collected from a full scale research project could be used to calculate whether there is any correlation between symptoms experienced and whether these improved or deteriorated between the baseline assessment opportunity; the 4 week assessment opportunity and the 8 week assessment opportunity e.g. the correlation between the pain assessment and the following variables could be assessed: Range of motion and strength assessments.

The various questions of the MHQ can be compared to detect any changes between the baseline assessment opportunity, the 4 week assessment opportunity and 8 week assessment opportunity. It will also be interesting to note whether the above mentioned differences can be correlated between various questions relating to symptoms and hand function, subjectively recorded by participants.

The researcher can also correlate the differences between subjective questions relating to symptoms experienced with the objective data capturing tools for muscle strength, range of motion and even pain; as well as the recorded difference in repetition maximum.

The compliance logbooks for the experimental group could be used to calculate whether any differences were recorded between the initial repetition maximum which was recorded and the repetition maximum recorded at the last intervention session. It would be interesting to note whether the differences in repetition maximum relates to attendance percentages, the percentage of maintaining IP joint flexion while performing the exercises, as well as the differences in symptoms experienced, as recorded by the selected data collection tools.

Chapter 6: Conclusion

This study supports the viability of a full scale research project with the title of: The influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st carpo-metacarpal joint. A full scale study would be a hypothesis testing study with a experimental pre-test/post-test research design. The study will curb the paucity of literature on the effects of strengthening exercises on the deabiliating effects of osteoarthritis of the 1st CMC joint amongst elderly females.

The pilot study evalaluated the methods and procedures required to conduct a full scale research project. It addressed components such as recruiting and sampling the relevant target population. The pilot study addressed assessment tools and procedures as well as the relevant intervention modalities for both the control and experimental group, Furthermore retention and compliance strategies were evaluated to assist in designing costum made parameters for a research protocol applicable for conducting a full scale research project.

Various recommendations could be drawn from this extensive pilot study and its various phases. The pre-screening procedure of potential retirement homes prior to participation in the research project proved to be crucial especially when dealing with a small target population; the similarity of the retirement homes also decreases internal variables which might interfere with data obtained from the research project. The pilot study identified the importance of a taylor made recruitment and retention plan when making use of a target population of elderly females. Due to the void in literature available on the recruitment and retention strategies for elderly Caucasian females within a South African context; literature referring to the American population had to be used as a framework during the pilot study. The recruitment and retention strategies proved to be relatively succesful for the target population of this pilot study; recruitment and retention strategies for other race groups will have to be established prior to conducting a full scale research project. Various components of the screening procedure were investigated; one of which recommends decreasing the inclusion age of the proposed full scale study to 60

years in an attempt to decrease the relatively high mean age of 76 years obtained during the pilot study. It can also be recommended that the screening phase should utilize the opportunity more effectively in obtaining background information from participants. Detailed background information is invaluable as it assists the researcher in categorizing participants in subgroups who might require additional support to decrease attrition rates and improve compliance to intervention modalities.

The data gathering instruments used were also evaluated during the pilot study. It is recommended that a full scale research project should add an active ROM goniometer assessment for thumb abduction as the Kapandji index for opposition prooved to be insufficient during the pilot study; it should also be further investigated to exchange the VAS with the NRS pain scale as the pilot study indicated the VAS to be an unsuitable assessment tool for the target population.

Other data gathering instruments such as the MHQ and compliance logbooks of participants prooved to be suitable instruments; it however required minor adjustments to ensure optimal use within the target population.

It was also found that the jar opener as an assistive device for the control group was not as suitable as expected. The pilot study recommends an alternative assistive device such as a tap turner which could be more benefisial in the daily living of the target population.

The pilotted intervention programs proposed several recommendation which only a few will be stated here. Persistantly making use of the progressively resistive strenghtening principles during the abductor pollicis longus strengthening program resulted in the definite strengthening of the noted muscle. It is however recommended that the movement pattern is adjusted to a general thumb abduction pattern in an attempt to accomodate the target population.

Literature recommends including forty participants per experimental and control group for similar research projects (Chevalier et al., 2000). Due to the high attrition rates recorded within the sample population it is recommended to

increase the sample size to 60 participants per group; 25% per group of who should represent diverse race groups (Katula et al., 2007). The proposed sample size is in line with a 95% confidence level; an 80% power; with an expected error margin of 5%.

The pilot study reported an average response rate of 14% while attempting recruitment of participants; it could therefore be expected that a full scale research project with a sample size of approximately 120 will have to include approximately 10 retirement homes. The retirement homes included in a full scale research project could potentially have an average total population of 170 residents of whom approximately 40% should potentially fall within the suitable target population. The pilot study was fortunate to have all the approached retirement homes agreeing to participate in the research project; but expecting a decline the researcher will on average have to contact 13 retirement homes in an attempt to access a suitable population. The estimated cost of recruiting approximately 13 retirement homes could be calculated at approximately R4329.

The cost for recruiting 90 elderly Caucasian ladies can be estimated at R17 659; with a higher expected recruitment cost expected per participant for the 30 participants from diverse race groups. The expected calculated cost for the experimental group's intervention period will be R190787 and the control group will be approximately R115296. The calculated costs for a full scale research project have to consider inflation rates.

It is recommended to perform one more pilot study prior and in preparation for a full scale research project addressing the following components:

- Focus groups on recruitment and retention of participants within other race groups.
- Translation and validation of all written material in the appropriate languages.
- Piloting the NRS as an alternative pain scale amongst an elderly population.

- Piloting the use of goniometer assessment of the abduction ROM of the thumb.

- Piloting the use of a tap turner as an alternative assistive device to be used within the control group.

Conducting a full scale research project with an experimental pretest/posttest research design within an elderly population will be viable but resource intensive. The pilot study detected that even though the muscle strength of the abductor pollicis longus muscle definitely improved amongst all the participants of the experimental group as indicated by the recorded repetition maximum; it did not result in any significant relief of symptoms or improvement in hand function; with the exception of a few participants who experienced improvement in one or two of the assessed variables. It could therefore be queried whether the abductor pollicis longus muscle has adequate biomechanical influence on the 1st CMC joint to counteract the diabilitating effect of osteoarthritis on this joint.

This pilot study was used to determine the parameters necessary to conduct a full scale research project. The pilot study however does not have any statistical significance and until a full scale research project is conducted the influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females would be undetermined

Bibliography

Boustedt, C., & Nordenskiöld, U. (2009). Effects of a hand-joint protection programme with an addition of splinting and exercise: one year follow-up. *Clinical Rheumatology*, 28 (7), 793-799.

Breivik, H., Borchgrevink, P.C., Allen, S.M., Rosseland, L.A., Romundstad, L., Breivik Hals, E.K., Kvarstein, G., Stubhaug, A. (2008). Assessment of Pain. *British Journal of Anaesthesia*, 101(1), 17-24.

Brunelli, C., Zecca, E., Martini, C., Campa, T., Fagnoni, E., Bagnasco, M., Lanata, L., Caraceni, A. (2010). Comparison of numerical and verbal rating scales to measure pain exacerbations in patients with chronic cancer pain. *Journal of Health and Quality of Life Outcomes*, 8, 42.

Chevalier, X., Mejjad, O., & Babini, S. (2000). Session 4: Methodology for the assessment of treatments in hand osteoarthritis. *Osteoarthritis and Cartilage*, S70-S72.

Colditz, J. C. (2000). The biomechanics of a thumb carpometacarpal immobilization splint: design and fitting. *Journal of Hand Therapy, 13* (3), 228-235.

Colditz, J. C. & Koekebakker, N. (2010). *A new splint design for the thumb CMC Joint*. White Paper. The Netherlands: Nea International.

Cooney, W. P., & Chao, E. Y. (1977). Biomechanical analysis of static forces in the thumb during hand function. *The Journal of bone and joint surgery,* 59-A.

Cooney, W. P., Lucca, M. J., Chao, E. Y., & Linsheid, R. L. (1981). The Kinesiology of the thumb trapeziometacarpal joint. *The Journal of Bone and Joint Surgery,* 63-A (9), 1371-1381.

Creswell, J. (Ed.). (2002). Research Design: Qualitative, Quantitative and mixed methods approaches Thousand Oaks, CA: Sage Publications Inc.

Dahaghin, S., Bierma-Zeistra, S. M., Ginai, A. Z., Pols, H. A., Hazes, J. M., & Koes, B. W. (2005). Prevalence and pattern of radiographic hand osteoarthritis and association with pain and disability (the Rotterdam study). *Ann Rheum Dis,* 64, 682-687.

Egan, M. Y., & Brousseau, L. (2007). Splinting for Osteoarthritis of the carpometacarpal joint: a review of the evidence. *The American Journal of Occupational Therapy,* 61, 70-78.

Gilliss, C. L., Lee, K. A., Gutierrez, Y., Taylor, D., Beyene, Y., Neuhaus, J. Murrell, N. (2001). Recruitment and Retention of Healthy Minority Women into

Community-Based Longitudinal Research. *Journal of Women's Health & Gender-Based Medicine*, 10(1), 77-85.

Gwynne-Jones, D. P., Penny, I. D., Sewell, S. A., & Hughes, T. H. (2006). Basal Thumb Metacarpal osteotomy for trapeziometacarpal osteoarthritis. *Journal of Orthopaedic Surgery,* 14, 58-63.

Guerra, R.S., Amaral, T.F. (2009). Comparison of hand dynamometers in elderly people. *The Journal of Nutrition, Health and Aging*. 13(10), 907-12.

Hernon, P., & Schwartz, C. (2009). Reliability and Validity. Library and Information Science Research, 31(2), 73-74.

Hjermstad, M.J., Fayers, P.M., Haugen, D.F., Caraceni, A., Hanks, G.W., Loge, J.H., Fainsinger, R., Aass, N., Kaasa, S. (2011). Studies comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for assessment of pain intensity in adults: a systematic literature review. *Journal of Pain and Symptom Management*, 41(6), 1073-1093.

Katula, J A; Kritchevsky, S B; Guralnik, J M; Glynn, N W; Pruitt, L; Wallace, K; Walkup, M P; Hsu, F; Studenski, S A; Gill, T M; Groessl, E J; Wallace, J M; Pahor, M. (2007). Lifestyle interventions and Independence for Elders Pilot Study: Recruitment and Baseline Characteristics. *The American Geriatrics Society , 55* (5), 674-683.

Kendall, F. P., McCreary, E. K., Provance, P. G., Rodgers, M., & Romani, W. A. (2005). *Muscles: Testing and function with porture and pain* (5th ed.). Lippincott Williams & Wilkins.

Kilanowski, J. (2011). Pilot studies: Helmsman on the ship of research design. Issue April 2011; 6(4).

Kisner, C., & Colby, L. A. (2007). *Therapeutic Exercise: Foundations and Techniques* (5 ed.). Philadelphia: F. A. Davis Company.

Kroll, T., Neri, M., & Miller, K. (2005). Using Mixed Methods in Disability and Rehabilitation Research. Rehabilitation Nursing, 30, 106-113.

Lefevre-Colau, M., Poiraudeau, S., Oberlin, C., Demaille, S., Fermanian, J., Rannou, F., et al. (2003). Reliability, validity, and responsiveness of the modified kapandji index for assessment of functional mobility of the rheumatoid hand. *Archives of Physical Medicine and Rehabilitation,* 84 (7), 1032-1038.

Liang, K; Zeger, S. L. (1986). Longitudinal Data Analysis for Discrete and Continuous Outcomes. *Biometrics, 42,* 121-130.

McHenry, J. C., Insel, K., Einstein, G. O., Vidrine, A. N., Koerner, K. M., & Morrow, D. G. (2012, August). Recruitment of Older Adults: Success May Be in the Details. *The Gerontologist* .

Meij, HS., Meyer, BJ., Van Papendorp, DH., Viljoen, M. (2004). *Human physiology* (3 ed.). Juta Publishers.

Mennen, U., & van Velze, C. (2008). *The Hand book: A practical approach to common hand problems* (3 ed.). Van Schaik Publishers.

Moore, C.G., Carter, R., Nietert, P.J. & Stewart, P.W. (2011). Recommendations for planning pilot studies in clinical and translational research. *Clinical and Translational Science*, 4(5), 332-337

Najima, H., Oberlin, C., Alnot, J. Y., & Cadot, B. (1997). Anatomical and biomechanical studies of the pathogenesis of trapeziometacarpal degenerative arthritis. *Journal of Hand Surgery (British & European Volume), 22* (2), 183-189

Norkin, C. C., & White, D. J. (2009). *Measurement of Joint Motion: A Guide to Goniometry* (4th ed.). Philadelphia: F. A. Davis Company.

Pagalidis, T., Kuczynski, K., & Lamb, F. R. (1981). Ligamentous stability of the base of the thumb. *The Hand,* 13 (1), 29-35.

Pai, S., Talwalkar, S., & Hayton, M. (2006). Presentation and management of arthritis affecting the trapeziometacarpal joint. *Acta Ortho Belg,* 72, 3-10.

Patrick, J. H., Pruchno, R. A., & Rose, M. S. (1998, June). Recruiting Research Participants: A Comparison of the Costs and Effectiveness of Five Recruitment Strategies. *The Gerontologist, 38*(3), 295-302.

Roberts, H.C., Denison, H.J., Martin, H.J., Patel, H.P., Syddall, H., Cooper, C., Syer, A.A. (2011). A review of the measurement of grip strength in clinical and epidemiological studies: towards a standardised approach. *Age and Aging*. 40, 423-429.

Rogers, M. W., & Wilder, F. V. (2007). The effects of strength training among persons with hand osteoarthritis: a two-year follow-up study. *Journal for Hand Therapy* , 20, 244-250.

Rogers, M. W., & Wilder, F. V. (2009). Exercise and Hand Osteoarthritis Symptomatology: A Controlled Crossover Trial. *Journal of Hand Therapy, 22*, 10-18.

Stineman, M. G., Strumph, N., Kurichi, J. E., Charles, J., Grisso, J. A., & Jayadevappa, R. (2011). Attempts to Reach the Oldest and Frailest: Recruitment, Adherence, and Retention of Urban Elderly Persons to a Falls Reduction Exercise Program. *Gerontologist*, 59-72.

Stoy, D B; Curtis, R C; Kimberly, R N; Dameworth, 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. *Journal of The National Medical Association , 87* (4), 280-287.

Swigart, C. R., Eaton, R. G., Glickel, S. Z., & Johnson, C. (1999, Jan). Splinting in the treatment of arthritis of the first carpometacarpal joint. *Journal of the American Society for Surgery of the Hand,* 24(1), 86-91.

Swigart, C. R. (2008). Arthritis of the base of the thumb. *Curr Rev Musculoskelet Med ,* 1, 142-146.

Unson, C. G., Ohannessian, C., Kenyon, l., Fenster, J., Reisine, S., & Prestwood, K. (2004). Strategies for Enrolling Diverse Older Women in an osteoporosis Trial. *Journal of aging and health ,* 16 (5), 669-687.

Valdes, K., & Marik, T. (2010). A Systematic Review of Conservative Interventions for osteoarthritis of the Hand. *Journal of Hand Therapy* , 334-351.

Van Heest, A. E., & Kallemeier, P. M. (2008). Thumb Carpal Metacarpal Athritis. *Journal of the American Academy of Orthopaedic Surgeons , 16*, 140-151.

Van Teijlingen, E. R., Hundley, V. (2001). The importance of pilot studies. *Social research update*, 35.

Vincent, D., & Pellegrini, J. M. (1991). Osteoarthritis of the trapeziometacarpal joint: The pathophysiology of articular cartilage degeneration. I. Anatomy and pathology of the aging joint. *The Journal of Hand Surgery,* 16 (6), 967-974.

Wajon, A., & Ada, L. (2005). No difference between two splint and exercize regimens for people with osteoarthritis of the thumb: A randomised controlled trial. *Australian Journal of Physiotherapy,* 51, 245-249.

Ware, L.J., Epps, C.D., Herr, K., Packard, A. (2006). Evaluation of the Revised Faces Pain Scale, Verbal Descriptor Scale, Numeric Rating Scale, and Iowa Pain Thermometer in Older Minority Adults. *Pain Management Nursing*, 7(3), 117-125.

Warren-Findlow, J., Prohaska, T. R., & Freedman, D. (2003). Challenges and Opportunities in Recruiting and Retaining Underrepresented Populations Into Health Promotion Research. *Gerontologist ,* 43, 37-46.

Weiss, S., Lastayo, P., Mills, A., & Bramlet, D. (2000). Prospective analysis of splinting the first carpometacarpal joint: an objective, subjective and radiographic assessment. *Journal of Hand Therapy*, 13, 218-26.

Wilder, F.V., Hall, B. J., Barrett, J. P. (2003). Osteoarthritis pain and weather. Rheumatology, 42(8), 955-958.

Ye, L., Kalichman, L., Spittle, A., Dobson, F., & Bennel, K. (2011). Effects of rehabilitative interventions on pain, function and physical impairments in people with hand osteoarthritis: a systematic review. *Arthritis Research and Therapy*, 13 (28).

Zhang, W., Doherty, M., Leeb, B. F., Alekseeva, L., Arden, N. K., Bijlsma, J. W., et al. (2007). EULAR evidence based recommendations for the management of hand osteoarthritis: Report of a Task Force of the EULAR Standing Committee for International Clinical Studies Including Therapeutics (ESCISIT). *Ann Rheum Dis ,* 66, 377-388.

Zhang, Y., Niu, J., Kelly-Hayes, M., Chaisson, C. E., Aliabadi, P., & Felson, D. T. (2002). Prevalence of Symptomatic Hand Osteoarthritis and Its Impact on Functional Status among the Elderly. *American Journal of Epidemiology ,* 152, 1021-1027.

Appendices

Appendix 1: Ethical clearance

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

19 June 2013

Mrs Marti Simpson
Department of Occupational Therapy
Westville Campus
University of KwaZulu-Natal

Dear Mrs Simpson

PROTOCOL: **he influence of an abductor pollicis longus strengthening program on the symptoms experiences by elderly females presenting with early stage osteoarthritic of the 1st carpo-metacarpal joint :REF:BF053/13**

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

The study was provisionally approved by a quorate meeting of BREC on 12 March 2013 pending appropriate responses to queries raised. Your responses dated 10 June 2013 to queries raised on 22 May 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 19 June 2013.

This approval is valid for one year from **19 June 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 March 2013:

Prof D Wassenaar	Chair
Prof V Rambiritch	Pharmacology
Prof R Bhimma	Paediatric & Child Health
Dr R Govender	Family Medicine
Dr U Govind	Private Pract. - Gen. Practitioner
Dr Z Khumalo	KZN Health (External) General Medicine
Dr NR Maharaj	Obstetrics & Gynaecology
Dr K Naidoo	Family Medicine
Dr S Paruk	Psychiatry
Prof DJ Pudifin	Medicine
Dr S Singh	Dentistry
Prof J Tsoka-Gwegweni	Public Health-Medicine
Dr A Sathar	External -Medicine

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

Appendix 2ai: Jan Richter Centre information letter to matron and board of directors

28 May 2013
Dear Sir/Madam

RE: Information letter to Jan Richter Centre management concerning conducting a research project at the facility

As a master's student in hand therapy at the University of KwaZulu-Natal I am conducting a study on the effect a strengthening program of the thumb has on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the base of the thumb.

This topic was chosen due to the high prevalence of developing osteoarthritis, a degenerative joint condition, at the base of the thumb. The condition is generally associated with the elderly and with women.

The muscle intended to be strengthened during the program is seen as an important stabilizer of the effected joint.

I am hoping to contribute valuable insight into the advantages of the therapeutic modality of strengthening when considering osteoarthritis of the base of the thumb.

The strengthening program will take place in conjunction with a control group where participants will receive an assistive device as treatment modality for the noted condition.

The group of participants participating in the strengthening program and the group receiving the assistive device will be from separate retirement villages in order to prevent contamination of treatment modalities.

I hereby seek permission to conduct this study at your facility. Conducting the study at your retirement village will entail the following:

- Recruiting potential participants 6 weeks prior to commencing the research project:
  - Distributing information pamphlets concerning the study at the resident's post boxes requesting voluntary participation in the case of experiencing specific symptoms.
  - Referrals from the matron in the case of her knowing residents who present with such symptoms and who might benefit from the study.
  - Having an information session at a venue on the premises recruiting voluntary participants and clarifying any questions concerning the study.
  - Conducting individual initial and final screening opportunities at a venue on the premises.

- The research project will be 8 weeks long and entails the following:
    - Assessment and treatment sessions will take place on an appointment basis.
    - Conducting individual baseline assessments and follow up assessments at a venue on the premises.
    - Refreshments will be offered at all treatment sessions.
    - In the case of conducting the strengthening program at your retirement village:
        - A venue on your premises would be required. The venue should be big enough to host group sessions consisting of 12 members. The group will gather on Monday and Thursday afternoons.
    - In the case of conducting the group concerning assistive devices at your retirement village:
        - A venue on your premises would be required. The venue should be big enough to host group sessions consisting of 12 members. Only 2 session will be held; spread 4 weeks apart.

The research study's assessment components and therapeutic modalities have minimal risks to participants. The only risk noted in literature refers to muscle strain injuries. Taking this into consideration it is important to note that the researcher is taking precautionary measures by means of not selecting risk candidates by making use of a detailed inclusion and exclusion criteria. The assessments and therapeutic modalities will be performed by a trained occupational therapist that would have had prior training in precautionary measures pertaining to the study.

Participation in this study will be voluntary and participants will be free to withdraw from the study at any point in time. The participants' anonymity will also be ensured by making use of a coding system when dealing with data. All information from the study will be handled confidentially.

After writing the thesis for the research a feedback session will be held with participants. An opportunity will then also be offered to partake in the therapeutic modality they did not partake in during the course of the study.

Ethical clearance will be sought from the Faculty of Health Sciences Research Ethics Committee prior to commencement of the study.

I would sincerely appreciate your co-operation in this regard. Please indicate whether you are willing to allow your residents to participate in this research study by signing the attached informed consent form.

Thank you for your co-operation, we await you early response. Please contact me with any queries concerning the research project.

Marti Simpson
(Researcher)
Telephone (work): 033 395 4218
Cell Number: 074 990 2536

E-mail: simpson.marti@gmail.com

Verucia Chetty
(Supervisor)
Telephone (work): 031 260 7974
Cell Number: 074 890 5279
Fax number: 031 260 7818
E-mail: chettyve@ukzn.ac.za

Appendix 2aii: Jan Richter Centre consent form

UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

Informed consent: Management of Jan Richter Centre

The management of Jan Richter Centre hereby grants voluntary permission that the residents of the named facility may be invited to participate in the following research study titled *"The influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st carpo-metacarpal joint."* as more fully discussed in the accompanied information letter hereto.

The consent is granted on the condition that the information letter in fully understood. It is understood that participation of residents will entail the data gathering procedures (as more fully described in the information letter) which includes the initial screening; final screening, baseline assessment; assessments at week 4 and 8; logbook to be filled out during intervention group sessions.

The consent granted may be withdrawn at any stage without penalty. Each signatory of this consent will receive a copy of the agreement and acknowledge receipt thereof.

Chairperson of the board of Jan Richter Centre

THEODORUS J. NEL
Full name

Signature

Signed at Pietermaritzburg on this 7th day of June 2013

Matron of Jan Richter Centre

Mona Jansen van Rensburg
Full name

Signature

Signed at Pietermaritzburg on this 10 day of June 2013

Appendix 2bi: Sunnyside Park Home information letter to matron and board of directors

28 May 2013
Dear Sir/Madam

RE: Information letter to Sunnyside Park Home management concerning conducting a research project at the facility

As a master's student in hand therapy at the University of KwaZulu-Natal I am conducting a study on the effect a strengthening program of the thumb has on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the base of the thumb.

This topic was chosen due to the high prevalence of developing osteoarthritis, a degenerative joint condition, at the base of the thumb. The condition is generally associated with the elderly and with women.

The muscle intended to be strengthened during the program is seen as an important stabilizer of the effected joint.

I am hoping to contribute valuable insight into the advantages of the therapeutic modality of strengthening when considering osteoarthritis of the base of the thumb.

The strengthening program will take place in conjunction with a control group where participants will receive an assistive device as treatment modality for the noted condition.

The group of participants participating in the strengthening program and the group receiving the assistive device will be from separate retirement villages in order to prevent contamination of treatment modalities.

I hereby seek permission to conduct this study at your facility. Conducting the study at your retirement village will entail the following:

- Recruiting potential participants 6 weeks prior to commencing the research project:
  - Distributing information pamphlets concerning the study at the resident's post boxes requesting voluntary participation in the case of experiencing specific symptoms.
  - Referrals from the matron in the case of her knowing residents who present with such symptoms and who might benefit from the study.
  - Having an information session at a venue on the premises recruiting voluntary participants and clarifying any questions concerning the study.

        - Conducting individual initial and final screening opportunities at a venue on the premises.

- The research project will be 8 weeks long and entails the following:
    - Assessment and treatment sessions will take place on an appointment basis.
    - Conducting individual baseline assessments and follow up assessments at a venue on the premises.
    - Refreshments will be offered at all treatment sessions.
    - In the case of conducting the strengthening program at your retirement village:
        - A venue on your premises would be required. The venue should be big enough to host group sessions consisting of 12 members. The group will gather on Monday and Thursday afternoons.
    - In the case of conducting the group concerning assistive devices at your retirement village:
        - A venue on your premises would be required. The venue should be big enough to host group sessions consisting of 12 members. Only 2 session will be held; spread 4 weeks apart.

The research study's assessment components and therapeutic modalities have minimal risks to participants. The only risk noted in literature refers to muscle strain injuries. Taking this into consideration it is important to note that the researcher is taking precautionary measures by means of not selecting risk candidates by making use of a detailed inclusion and exclusion criteria. The assessments and therapeutic modalities will be performed by a trained occupational therapist that would have had prior training in precautionary measures pertaining to the study.

Participation in this study will be voluntary and participants will be free to withdraw from the study at any point in time. The participants' anonymity will also be ensured by making use of a coding system when dealing with data. All information from the study will be handled confidentially.

After writing the thesis for the research a feedback session will be held with participants. An opportunity will then also be offered to partake in the therapeutic modality they did not partake in during the course of the study.

Ethical clearance will be sought from the Faculty of Health Sciences Research Ethics Committee prior to commencement of the study.

I would sincerely appreciate your co-operation in this regard. Please indicate whether you are willing to allow your residents to participate in this research study by signing the attached informed consent form.

Thank you for your co-operation, we await you early response. Please contact me with any queries concerning the research project.

Marti Simpson
(Researcher)
Telephone (work): 033 395 4218
Cell Number: 074 990 2536

E-mail: simpson.marti@gmail.com

Verucia Chetty
(Supervisor)
Telephone (work): 031 260 7974
Cell Number: 074 890 5279
Fax number: 031 260 7818
E-mail: chettyve@ukzn.ac.za

Appendix 2bii: Sunnyside Park Home consent form

UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

Informed consent: Management of Sunnyside Park Home

The management of Sunnyside Park Home hereby grants voluntary permission that the residents of the named facility may be invited to participate in the following research study titled *"The influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st carpo-metacarpal joint."* as more fully discussed in the accompanied information letter hereto.

The consent is granted on the condition that the information letter in fully understood. It is understood that participation of residents will entail the data gathering procedures (as more fully described in the information letter) which includes the initial screening; final screening, baseline assessment; assessments at week 4 and 8; logbook to be filled out during intervention group sessions.

The consent granted may be withdrawn at any stage without penalty. Each signatory of this consent will receive a copy of the agreement and acknowledge receipt thereof.

Chairperson of the board of Sunnyside Park Home

Kate Pearce (SSP Manager) _____
Full name Signature

Signed at PMBurg on this 10 day of June 20 13

Matron of Sunnyside Park Home

Mrs. L. BIRKETT _____
Full name Signature

Signed at PMB on this 10 day of JUNE 20 13

Appendix 2ci: Riverside Park Home information letter to matron

3 July 2013
Dear Sir/Madam

RE: Information letter to Riverside Park Home management concerning conducting a research project at the facility

As a master's student in hand therapy at the University of KwaZulu-Natal I am conducting a study on the effect a strengthening program of the thumb has on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the base of the thumb.

This topic was chosen due to the high prevalence of developing osteoarthritis, a degenerative joint condition, at the base of the thumb. The condition is generally associated with the elderly and with women.

The muscle intended to be strengthened during the program is seen as an important stabilizer of the effected joint.

I am hoping to contribute valuable insight into the advantages of the therapeutic modality of strengthening when considering osteoarthritis of the base of the thumb.

The strengthening program will take place in conjunction with a control group where participants will receive an assistive device as treatment modality for the noted condition.

The group of participants participating in the strengthening program and the group receiving the assistive device will be from separate retirement villages in order to prevent contamination of treatment modalities.

I hereby seek permission to conduct this study at your facility. Conducting the study at your retirement village will entail the following:

- Recruiting potential participants 2 weeks prior to commencing the research project:
  - Distributing information pamphlets concerning the study requesting voluntary participation in the case of experiencing specific symptoms.
  - Referrals from the matron in the case of her knowing residents who present with such symptoms and who might benefit from the study.
  - Having an information session at a venue on the premises recruiting voluntary participants and clarifying any questions concerning the study.
  - Conducting individual initial and final screening opportunities at a venue on the premises.

- The research project will be 8 weeks long and entails the following:

- Assessment and treatment sessions will take place on an appointment basis.
- Conducting individual baseline assessments and follow up assessments at a venue on the premises.
- Refreshments will be offered at all treatment sessions.
- In the case of conducting the strengthening program at your retirement village:
    - A venue on your premises would be required. The venue should be big enough to host group sessions consisting of 12 members. The group will gather on Monday and Thursday afternoons.
- In the case of conducting the group concerning assistive devices at your retirement village:
    - A venue on your premises would be required. The venue should be big enough to host group sessions consisting of 12 members. Only 2 session will be held; spread 4 weeks apart.

The research study's assessment components and therapeutic modalities have minimal risks to participants. The only risk noted in literature refers to muscle strain injuries. Taking this into consideration it is important to note that the researcher is taking precautionary measures by means of not selecting risk candidates by making use of a detailed inclusion and exclusion criteria. The assessments and therapeutic modalities will be performed by a trained occupational therapist that would have had prior training in precautionary measures pertaining to the study.

Participation in this study will be voluntary and participants will be free to withdraw from the study at any point in time. The participants' anonymity will also be ensured by making use of a coding system when dealing with data. All information from the study will be handled confidentially.

After writing the thesis for the research a feedback session will be held with participants. An opportunity will then also be offered to partake in the therapeutic modality they did not partake in during the course of the study.

Ethical clearance has been granted from the Faculty of Health Sciences Research Ethics Committee prior to commencement of the study.

I would sincerely appreciate your co-operation in this regard. Please indicate whether you are willing to allow your residents to participate in this research study by signing the attached informed consent form.

Thank you for your co-operation, we await you early response. Please contact me with any queries concerning the research project.

Marti Simpson
(Researcher)
Telephone (work): 033 395 4218
Cell Number: 074 990 2536

E-mail: simpson.marti@gmail.com

Verucia Chetty
(Supervisor)
Telephone (work): 031 260 7974
Cell Number: 074 890 5279
Fax number: 031 260 7818
E-mail: chettyve@ukzn.ac.za

Appendix 2cii: Riverside Park Home consent form

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

Informed consent: Management of Riverside Park Home

The management of Riverside Park Home hereby grants voluntary permission that the residents of the named facility may be invited to participate in the following research study titled *"The influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st carpo-metacarpal joint."* as more fully discussed in the accompanied information letter hereto.

The consent is granted on the condition that the information letter is fully understood. It is understood that participation of residents will entail the data gathering procedures (as more fully described in the information letter) which includes the initial screening; final screening, baseline assessment; assessments at week 4 and 8; logbook to be filled out during intervention group sessions.

The consent granted may be withdrawn at any stage without penalty. Each signatory of this consent will receive a copy of the agreement and acknowledge receipt thereof.

Management of Riverside Park Home

TRACY JANE BRUMER	R Brumer	MANAGER
Full name	Signature	Capacity

Signed at PIETERMARITZBURG on this 5th day of JULY 2013

Full name	Signature	Capacity

Signed at _____ on this _____ day of _____ 20____

P. A. D. C. A.
RIVERSIDE PARK HOME
450 BULWER STREET
PIETERMARITZBURG - 3201

Appendix 3a: Information letter to participants (Experimental group)

28 May 2013

Dear Sir/Madam

RE: Information letter for potential participants participating in the strengthening program.

As a masters student in hand therapy at the University of KwaZulu-Natal I am conducting a study to determine whether strengthening exercises for the thumb can have an influence on pain, stiffness and poor grasps experienced by individuals with early stage osteoarthritis, a degenerative joint condition, of the base of the thumb.

The muscle intended to be strengthened during the program is seen as an important stabilizer of the affected joint.

The results achieved by the strengthening program will be compared to individuals from a different retirement center who received an alternative form of therapy for the same condition. The comparison may assist in determining the advantages the two forms of therapy has to offer for people suffering from osteoarthritis of the base of the thumb.

At the end of the study participants will be informed on the results of the two different forms of therapy. They will also be offered the opportunity to receive the form of therapy which was offered at the other retirement center.

Participation in this study is completely voluntarily; and when you choose to participate in this study you will be free to withdraw at any given time.

In an attempt to accommodate the residents the following measures has been taken:

- All the treatment sessions will take place at a venue located on the premises of the retirement center.
- All assessment and treatment sessions will be based on appointment basis. Participants will be informed of these dates in writing prior to the study; they can also be telephonically contacted to remind them of their sessions taking place.
- Treatment sessions will take place in group format; with refreshments being made available at these sessions.
- Transport can be arranged if required.

If you choose to participate in this study you'll be asked to participate in the following activities:

- Initial screening questionnaire to be filled out by yourself 3 weeks prior to starting treatment sessions. The questionnaire will take approximately 10 minutes to complete. If the results of the questionnaire indicates that you are a suitable candidate for the research a final screening opportunity will be arranged; where an occupational therapist will assess you; this assessment will take approximately 10 minutes to perform. The final screening assessment will then indicate whether you are a suitable candidate for the study.
- The research project will be 8 weeks long and assessment and treatment sessions will take place on an appointment basis.
- Assessment sessions will take place during week 1; 5 and 8 of the study. Each assessment session will be conducted by a trained occupational therapist and will take approximately 25 minutes to complete.
- Participating in the strengthening group:
    - You will be asked to attend 2 treatment sessions a week; for a duration of 8 weeks.
    - Sessions will take place in a group setup of 12 people per group.
    - Each treatment session will take 40 minutes in total.
- Treatment sessions and assessments may cause muscle strain; this is why all assessments and treatments will be performed by a trained occupational therapist that will monitor you closely for any pain, discomfort or muscle fatigue. Sessions will be stopped immediately when any of these symptoms are present; your future sessions will then be adjusted accordingly.

After the research study the information gathered will be used to publish an article. The published article will not contain any of your personal details or your name. All information obtained will be presented in a group format which will not translate back to you as an individual.

I wish to remind you that the study is voluntary and you are free to withdraw from it at any given time, however your participation will be greatly appreciated.

Thank you for your co-operation, please contact me with any queries concerning the research project.

Marti Simpson
(Researcher)
Telephone (work): 033 395 4218
Cell Number: 074 990 2536

E-mail: simpson.marti@gmail.com

Verucia Chetty
(Supervisor)
Telephone (work): 031 260 7974
Cell Number: 074 890 5279
Fax number: 031 260 7818
E-mail: chettyve@ukzn.ac.za

Appendix 3b: Information letter to participants (Control group)

28 May 2013

Dear Sir/Madam

RE: Information letter for potential participants receiving an assistive device.

As a masters student in hand therapy at the University of KwaZulu-Natal I am conducting a study to determine whether strengthening exercises for the thumb can have an influence on pain, stiffness and poor grasps experienced by individuals with early stage osteoarthritis, a degenerative joint condition, of the base of the thumb.

The strengthening program will be presented at a different retirement center. But in order to see whether the strengthening program benefits individuals with the above mentioned symptoms the results needs to be compared with an alternative and accepted alternative form of therapy.

The decided alternative form of therapy will be issuing an assistive device which helps to open jars. This form of intervention was decided on as many individuals suffering from the mentioned condition reports aggravation of symptoms when opening jars on a daily basis

At the end of the study participants will be informed on the results of the two different forms of therapy. They will also be offered the opportunity to receive the form of therapy which was offered at the other retirement center.

Participation in this study is completely voluntarily; and when you choose to participate in this study you will be free to withdraw at any given time.

In an attempt to accommodate the residents the following measures has been taken:

- All the treatment sessions will take place at a venue located on the premises of the retirement center.
- All assessment and treatment sessions will be based on appointment basis. Participants will be informed of these dates in writing prior to the study; they can also be telephonically contacted to remind them of their sessions taking place.
- Treatment sessions will take place in group format; with refreshments being made available at these sessions.
- Transport can be arranged if required.

If you choose to participate in this study you'll be asked to participate in the following activities:

- Initial screening questionnaire to be filled out by yourself 3 weeks prior to starting treatment sessions. The questionnaire will take approximately 10 minutes to complete. If the results of the questionnaire indicates that you are a suitable candidate for the research a final screening opportunity will be arranged; where an occupational therapist will assess you; this assessment will take approximately 10 minutes to perform. The final screening assessment will then indicate whether you are a suitable candidate for the study.
- The research project will be 8 weeks long and assessment and treatment sessions will take place on an appointment basis.
- Assessment sessions will take place during week 1; 5 and 8 of the study. Each assessment session will be conducted by a trained occupational therapist and will take approximately 25 minutes to complete.
    - Participating in the group receiving the assistive device to open a jar will ask of you to attend only 2 group sessions which will be held at week 1 and 4. Each session will take 20 minutes.
    - You will be given an assistive device which will assist you in opening jars at home. You will also receive practical demonstrations and an information booklet to take home.

After the research study the information gathered will be used to publish an article. The published article will not contain any of your personal details or your name. All information obtained will be presented in a group format which will not translate back to you as an individual.

I wish to remind you that the study is voluntary and you are free to withdraw from it at any given time, however your participation will be greatly appreciated.

Thank you for your co-operation, please contact me with any queries concerning the research project.

Marti Simpson
(Researcher)
Telephone (work): 033 395 4218
Cell Number: 074 990 2536

E-mail: simpson.marti@gmail.com

Verucia Chetty
(Supervisor)
Telephone (work): 031 260 7974
Cell Number: 074 890 5279
Fax number: 031 260 7818
E-mail: chettyve@ukzn.ac.za

Appendix 4a: Informed consent for participants (Experimental group)

Informed consent: Potential participant participating in the strengthening program.

I hereby grant voluntary permission to participate in the following research study titled (as more fully discussed in the accompanied information letter hereto):

> *"The influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st carpo-metacarpal joint."*.

I grant my consent, to participate in the study, on the condition that I fully understand and agree to the specifications of the accompanied information letter.

I understand that my participation in the research study will entail the data gathering procedures (as more fully described in the information letter) which includes the initial screening; final screening, baseline assessment; assessments at week 4 and 8; logbook to be filled out during intervention group sessions.

I understand that I can withdraw from the research at any stage without penalty.

A copy of the signed agreement will be given to you as well as acknowledgement of receipt thereof.

Potential participant

_____ _____

Full name Signature

Signed at _____ on this _____ day of _____ 20____

Appendix 4b: Informed consent for participants (Control group)

Informed consent: Potential participant receiving an assistive device.

I hereby grant voluntary permission to participate in the following research study titled (as more fully discussed in the accompanied information letter hereto):

> *"The influence of an abductor pollicis longus strengthening program on the symptoms experienced by elderly females presenting with early stage osteoarthritis of the 1st carpo-metacarpal joint."*.

I grant my consent, to participate in the study, on the condition that I fully understand and agree to the specifications of the accompanied information letter.

I understand that my participation in the research study will entail the data gathering procedures (as more fully described in the information letter) which includes the initial screening; final screening, baseline assessment; assessments at week 4 and 8; logbook to be filled out during intervention group sessions.

I understand that I can withdraw from the research at any stage without penalty.

A copy of the signed agreement will be given to you as well as acknowledgement of receipt thereof.

Potential participant

_____ _____

Full name Signature

Signed at _____ on this _____ day of _____ 20____

Appendix 5: Initial screening form

INITIAL SCREENING TOOL

Official use:
Date:_____ Participant number:_____
Retirement village: Progress to final screening phase:
□ Jan Richter □Sunnyside □ Riverside □ Yes □No

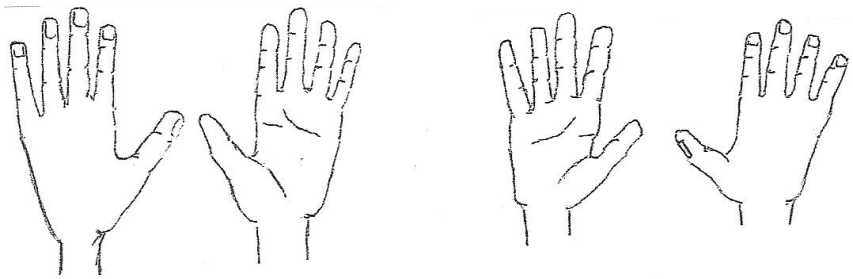
Instructions to questionnaire:
Please answer **all** questions by making a cross (x) in the appropriate block **OR** by referring to the specific instructions provided with certain questions.

1. **Background Information of the Potential Participant:**
   Please fill out the following background information.

1.1 Name, Surname			
1.2 Contact number	Home nr:	Cell nr:	
1.3 Physical address			
1.4 Date of birth	(dd/mm/year) _____/_____/_____		
1.5 Age			
1.6 Race			
1.7 Home language			
1.8 Gender (indicate with a cross)		Male	Female
1.8 Are you currently residing in the frail care unit? (indicate with a cross)		Yes	No
1.9. Are you diagnosed with any of the following psychological conditions: (indicate with a cross)	Alzheimer's	Dementia	No
1.10. Are you a Diabetic?		Yes	No
1.11Are you currently participating in any other research projects considering intervention for your hands?		Yes	No

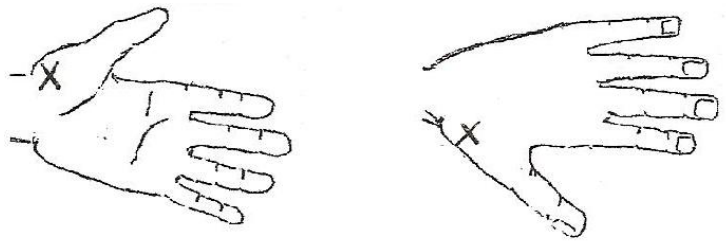
2. Information Concerning Potential Hand Conditions:

2.1 Use the following pictures and mark the areas with crosses where you have experienced any hand pain during the past week:



Right hand **Left hand**

2.2 <u>Please note that this question must only be answered in the case of experiencing pain at the base of the thumb (as indicated on the following picture).</u>



The following pain scale is marked from 0 to 10; where 0 indicates no pain experienced at all; and 10 indicates the worse pain ever experienced.

Please use this scale to mark with a cross the amount of pain you have experienced during the past week when considering pain at the base of the thumb.

<u>If you experience pain in both your left and right thumb basis'</u> please make 2 crosses ; but please write a "L" for left and a "R" for right next to the cross to indicate which thumb is being indicated.

0 ⟷ 10

2.3 Have you received any therapy for any hand conditions during the past 6 months? □Yes □No

If “yes” please specify which hand (left or right) and what therapy you have received”:

_____
_____
_____
_____

2.4 Have you received any injections to your hand during the past 6 weeks?

□Left hand □Right hand □None

2.5 Have you undergone any previous surgery to your hand? □Yes □No

If “yes” please indicate the following (in the case of multiple surgeries; attempt to describe all of them where possible):

- The date of the surgery:
- Was the left or right hand involved
- Which area of your hand was the surgery performed to
- If possible, please describe the type of surgery received

_____
_____
_____
_____
_____

2.6 Are you planning to have any hand surgery in the nearby future? □Yes □No

If “yes” please specify:

- The date the surgery will take place
- Will the left or right hand be involved
- To which area of the hand the surgery will take place

_____
_____
_____
_____

Thank you for your participation

Appendix 6: Final screening form

FINAL SCREENING TOOL

Official use:
Date:_____ Participant number:_____
Retirement village : Progress to baseline assessment:
□ Jan Richter □Sunnyside□ Riverside □ Yes □No

Instructions to questionnaire:
The screening tool must be filled out by the designated Occupational Therapist

1. Radiographic diagnosis available:

□ No ☐ Yes

□ Osteoarthritis 1st CMC joint:

- Gr. I
- Gr.II
- Gr.III
- Gr.IV

□ Any other diagnoses, please specify:_____

2. Symptoms, observations and test used	**Positive**	**Negative**
1.Grind test		
Pain		
Crepitus		
2. Crank test		
Pain		
Laxity of the 1st CMC joint		
3. Inflammation of the 1st CMC joint		
Decreased pain with distraction of joint		
Localised swelling		
Palpating 1st CMC joint: Tenderness Inflammation		
Palmar compression of the 1st CMC joint indicates inflammation		
4. Deformity		
Squaring off of the base of 1st MC		
Adduction-flexion deformity of the 1st MC		

5. Tick the conditions relevant and known to the participant:

- Rhumatiod disease
- Chondrocalcinosis
- Psoriatic arthritis
- Hemochromatosis
- Arthritis

- All active diseases of the hand
  - Tendinitis
  - Post-fracture pain
  - Scarring
  - Neurological diseases

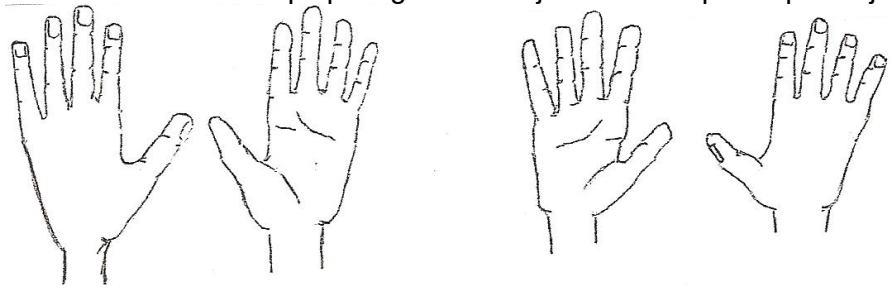
- Using the following medication
  - NSAIDS
  - Analgesics
  - Specify other medication used:_____
_____
_____

- History of major hand trauma.
  - Yes
  - No
  - If "yes" specify date of injury; type of injury and the intervention received_____
_____
_____
_____
_____

- Conditions
  - De quervain's tendonitis
  - Carpal tunnel syndrome
  - Scapholunate instability
  - Trigger thumb
  - Other conditions; please specify:_____
_____
_____

6. Pain experienced:

Using the pictures of the right and left hand indicate the areas where pain is experienced. Make use of the following symbols when marking areas of pain:
R= At rest
O=With thumb opposition
W= With radial and ulnar wrist deviation
P= With 2-point pinch
T= Tenderness when palpating: 1st CMC joint and scaphotrapezial joint



Right hand **Left hand**

Thank you for your participation

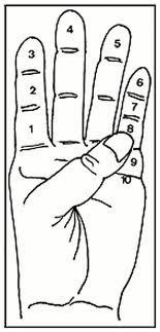
Appendix 7: Assessment form

ASSESSMENT

Official use:
Date of assessment:_____ Participant number:_____
Retirement village: Occupational Therapist:_____
□ J. Richter □S.Side □R.Side Hand:_____

Instructions to assessment:
The assessment tool must be filled out by the designated Occupational Therapist

1. **Active range of motion of the thumb opposition** (making use of attached diagram scoring)**:**



Score achieved:_____

2. **Voluntary isometric grip strength:**

Trial 1:_____ Trial 2:_____ Trial 3:_____

Highest score:_____Mean score:_____

Reluctance due to pain:_____Elaborate:_____

4. **Voluntary isometric two-point:**

Trial 1:_____ Trial 2:_____ Trial 3:_____

Highest score:_____Mean score:_____

Reluctance due to pain:_____Elaborate:_____

5. **Voluntary isometric tripod:**

Trial 1:_____ Trial 2:_____ Trial 3:_____

Highest score:_____Mean score:_____

Reluctance due to pain:_____Elaborate:_____

6. Voluntary isometric keygrip:

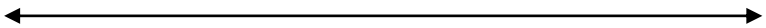
Trial 1:_____ Trial 2:_____ Trial 3:_____

Highest score:_____Mean score:_____

Reluctance due to pain:_____Elaborate:_____

7. Visual analogue scale (10cm line); assessing pain during strength assessment :

(O resembles no pain and 10 resembles the most pain ever experienced)



0 10

Appendix 8: The Michigan Hand Outcomes Questionnaire (MHQ)

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)/wrist(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/wrist.

	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/wrist.

	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

2

II. The following questions refer to the ability of your hand(s) 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*** (including both housework and school 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)/wrist(s)?	1	2	3	4	5
2. How often did you have to shorten your work day because of problems with your hand(s)/ wrist(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)/ wrist(s)?	1	2	3	4	5
4. How often did you accomplish less in your work because of problems with your hand(s)/ wrist(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)/ wrist(s)?	1	2	3	4	5

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

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

1. How often did you have pain in your ***right*** hand(s)/wrist(s)?
   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(s)/wrist(s).
   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(s)/wrist(s) interfere with your sleep?	1	2	3	4	5
4. How often did the pain in your ***right*** hand(s)/wrist(s) 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(s)/wrist(s) make you unhappy?	1	2	3	4	5

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

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

If you answered **never** to **question IV-B1** above, please skip the following questions and go to the next page.

2. Please describe the pain you had in your ***left*** hand(s)/wrist(s).
   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 ***left*** hand(s)/wrist(s) interfere with your sleep?	1	2	3	4	5
4. How often did the pain in your ***left*** hand(s)/wrist(s) interfere with your daily activities (such as eating or bathing)?	1	2	3	4	5
5. How often did the pain in your ***left*** hand(s)/wrist(s) make you unhappy?	1	2	3	4	5

V. 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

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/wrist **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 ***right*** hand	1	2	3	4	5
2. Motion of the fingers in your ***right*** hand	1	2	3	4	5
3. Motion of your ***right*** wrist	1	2	3	4	5
4. Strength of your ***right*** hand	1	2	3	4	5
5. Pain level of your ***right*** hand	1	2	3	4	5
6. Sensation (feeling) of your ***right*** hand	1	2	3	4	5

B. The following questions refer to your satisfaction with your ***left*** hand/wrist **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 of your ***left*** hand	1	2	3	4	5
6. Sensation (feeling) of your ***left*** hand	1	2	3	4	5

Appendix 9a: Compliance logbook - Experimental group

Week:Session:_____

Day of OR day after previous session (Tick the applicable box):

	N/A	0		Discomfort	3		Improved movement	6
	Localised CMC pain	1		Improved comfort	4		Increased pain elsewhere Specify:	7
	Localised CMC swelling	2		No change	5		Other:	8

Date:

Time:

Participant name(nr):

Signature:_____

Rescheduled for:

	Original appointment	1		Rescheduled to:	2		Could not reschedule	3

Reason for not attending:

	N/A	0		Forgot	3		Other:	6
	Prior appointment	1		Rest	4			
	Hospitalized	2		Sick	5			

Pain (Verbal analogue scale:0-10)(0:no pain; 10: severe pain):

- during the week with activity:_____
- before session at rest:_____
- during the session:_____
- 2-3min post session:_____

Adequate rest before session:

	N/A	0		1-2 days	1		3-4 days	2		More than 4 days	3

□1:IPJ Flexed □2:Not flexed	Set 1	Rest	Set 2	Rest	Set 3	Rest sets: □1:<2min □2:2-3min □3:>3min
Nr. of elastics						Load: □1:The same □2:Less □3:More
Pain (nr rep)						Fatigue: □1:No □2:Yes;7-10 □3:Yes;1-6
Fatigue (nr rep)						
Discont. (X/P/F)	□1		□2		□3	□4: No

Feedback:

Follow up appointment:

Appendix 9b: Compliance logbook - Control group

COMPLIANCE LOGBOOK: Control group

Participants name:

Participant number:

Date	Time	Signature	Reasons for not attending the session; specify; follow up appointment	Demonstrates correct method in using device	Reports use of device at home: Daily; Weekly or None	Complaints concerning the device; specify
					Not applicable for 1st session	

Date:

Visual analogue scale (10cm line):

(O resembles no pain and 10 resembles the most pain ever experienced)

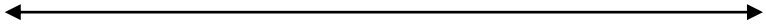
Localised 1st CMC joint pain at rest:

0 10

Localised 1st CMC joint pain with activities during the week:

0 10

Localised 1st CMC joint pain while using the assistive device:



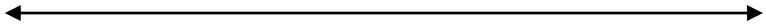
0 10

Date:

Visual analogue scale (10cm line):

(O resembles no pain and 10 resembles the most pain ever experienced)

Localised 1st CMC joint pain at rest:

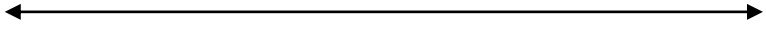


0 10

Localised 1st CMC joint pain with activities during the week:

0 10

Localised 1st CMC joint pain while using the assistive device:



0 10

Appendix 10a: Cost sheet – Total cost of research project

The cost to perform the pilot study was calculated by means of a cost sheet. The following costs are excluded from the cost sheet: research officer to assist with data collection (the researcher didn't provide sufficient record keeping of time sheets pertaining to data capturing to assist in calculating the cost factor for a data capturer); the costs for a data statistician were not included due to UKZN providing this service to its students as well as any cost to finalize a dissertation were excluded.

The costs to perform the pilot study were as follows:

Description	**Units**	**Price per unit**	**Total for subsection**	**Total for section**
Total cost for pilot study				**R54315.41**
Pre-screening phase				**R999.50**
Telephonic contact with the matron of each of the prospective retirement villages: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 15 min 15 min 15 min	Cell C Peak Call per minute: Cell C to telkom land line: R1.70	 R 25.50 R25.50 R25.50	R76.50
Research officer attended meetings with matrons (including travelling time): Jan Richter Centre Sunnyside Park Home Riverside Park Home	 1h 1h 1h	Remuneration per hour for research officer to attend meeting: R 200 per hour	 R200 R200 R200	R600
Travelling to attend meetings with matrons: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	R98
Files containing: Research protocol and addendums; information letter and informed consent form. Jan Richter Centre Sunnyside Park Home Riverside Park Home	 60 60 60	Printing costs at R1 a page File cost average R15.	 R75 R75 R75	R225
Informed consent for retirement villages				**R711**
Telephonic contact with the matron of each of the prospective retirement villages: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 10 min 10 min 10 min	Cell C Peak Call per minute: Cell C to telkom land line: R1.70	 R 17 R 17 R 17	R51
Research officer attended meetings with matrons		Remuneration per hour for		

(including travelling time): Jan Richter Centre Sunnyside Park Home Riverside Park Home	45min 45min 45min	research officer to attend meeting R200 per hour	R150 R150 R150	R550
Travelling to attend meetings with matrons: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Copies of informed consent and ethical clearance: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 4 4 4	Printing costs at R1 a page	 R4 R4 R4	 R12
Recruitment phase				**R5886.56**
A1 size posters: 1x A1 size colour poster: R7 5x A4 black ink print: R5 2x A4 colour ink print: R5 4x A4 colour sheets: R2 20g Prestick: R4 Jan Richter Centre Sunnyside Park Home Riverside Park Home	 2 2 2	Cost of R23 per A1 poster to fabricate	 R46 R46 R46	 R138
A4 size posters: 1xA4 black ink print: R1 1xA4 colour sheet: R0.50 5g prestick: R1 Jan Richter Centre Sunnyside Park Home Riverside Park Home	 6 10 4	Cost of R2.50 per A4 poster to fabricate	 R15 R25 R10	 R50
A5 size pamphlets: 1xA5 black ink print:R0.50 Jan Richter Centre Sunnyside Park Home Riverside Park Home	 37 84 43	Cost of R0.50 per pamphlet	 R18.50 R42 R21.50	 R82
Travelling to distribute pamphlets and erect posters: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Matron and receptionist referral system: 1xA4 black ink print:R1 1xA4 plastic sleeve:R0.50 Jan Richter Centre	 1 1	Cost of R1.50 per contact list	 R1.50 R1.50	 R4.50

Sunnyside Park Home Riverside Park Home Information letters: 3xA4 black ink print: R3 Jan Richter Centre Sunnyside Park Home Riverside Park Home Telephonic contact with residents on the contact list: Jan Richter Centre: 0 Participants Sunnyside Park Home: 3 Participants Riverside Park Home: 3 Participants	1 20 20 20 0 min 15min 15min	 Cost of R3 per information letter Cell C Peak Call per minute: Cell C to other mobiles : R2.25	R1.50 R60 R60 R60 R0 R33.75 R33.75	 R180 R67.50
Information desk and information meetings: All the existing recruitment resources were used during these sessions.				R0
Travelling to host information desks and information meetings: Jan Richter Centre: 2 information desk sessions and 3 information meetings Sunnyside Park Home: 2 information desk sessions and 3 information meetings Riverside Park Home: 1 information desk session and 1 information meeting	 60km 30km 26km	UKZN Travel allowance per kilometre: R3.16	 R189.60 R94.80 R82.16	 R366.56
Research officer attended spent the following time during the recruitment procedure (including travelling time): Erecting posters and distributing pamphlets: 1 hour 30 minutes 1x Information desk: 1hour 30 min 1x Information meeting: 2 hours 30 min Jan Richter Centre: 1x Posters and pamphlet	 1hr30min 3hrs 5hrs	Remuneration per hour for research officer: R200 per hour 9hrs30min	 R1900	 R4900

session 2x Information desk sessions 3x Information meetings Sunnyside Park Home: 1x Posters and pamphlet session 2x Information desk sessions 3x Information meetings Riverside Park Home: 1x Posters and pamphlet session 1x Information desk session 1x Information meeting	 1hr30min 3hrs 5hrs 1hr30min 1hr30min 2hrs30min	 9hrs30min 5hrs30min	 R1900 R1100	
Informed consent				**R100**
The informed consent ran simultaneously with the information meetings; travelling and costs for staff are therefore calculated for at the information meeting section				
Informed consent forms: 2xA4 black ink print:R2 Jan Richter Centre Sunnyside Park Home Riverside Park Home	Potential Participants 12 15 3	Cost R2 per single informed consent form	 R24 R30 R6	 R60
Pens	20	R2	R40	R40
Initial screening				**R870**
Initial screening forms: 3xA4 black ink print:R3 Jan Richter Centre Sunnyside Park Home Riverside Park Home	Potential Participants 12 15 3	Cost R3 per single initial screening form	 R36 R45 R9	 R90
The screening phase ran simultaneously with the information meetings; travelling and costs for staff are therefore calculated for in the information meeting section; however if the phase ran independently the following will be used to calculate with				
Travelling to initial screening opportunities: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Research officer performing the initial screening process: 5 min per potential participant and including travelling time: Jan Richter Centre: 12 Participants Sunnyside Park Home:15 Participants Riverside Park Home:3 Participants	 1hr 30min 1hr 45min 45min	Remuneration per hour for research officer : R200 per hour	 R300 R330 R150	 R780
Final screening				**R1458**

Initial screening forms: 2xA4 black ink print:R2 Jan Richter Centre Sunnyside Park Home Riverside Park Home	Potential Participants 12 15 3	Cost R2 per single initial screening form	 R24 R30 R6	 R60
The final screening phase ran simultaneously with the information meetings; travelling and costs for staff are therefore calculated for in the information meeting section; however if the phase ran independently the following will be used to calculate with				
Travelling to final screening opportunities: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Research officer performing the final screening process: 10 min per potential participant and including travelling time: Jan Richter Centre: 12 Participants Sunnyside Park Home:15 Participants Riverside Park Home:3 Participants	 2hr 30min 3hrs 1h	Remuneration per hour for research officer: R200 per hour	 R500 R600 R200	 R1300
Baseline assessment opportunity				**R4084.05**
Assessment forms: 9xA4 black ink copies: R0.50 per sheet Jan Richter Centre Sunnyside Park Home Riverside Park Home	Total participants 10 12 3	Cost R4.50 per single assessment batery	 R45 R54 R13.5	 R112.50
Travelling to baseline assessment opportunities: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Research officer performing facilitating the baseline assessment opportunity: 10 min per participant and including travelling time: Jan Richter Centre: 10 Participants Sunnyside Park Home:12 Participants Riverside Park Home:3 Participants	 2hrs10min 2hrs30min 1hr	Remuneration per hour for research officer: R200 per hour	 R433 R500 R200	 R1133

Assessing Occupational Therapist performing facilitating the baseline assessment opportunity: 10 min per participant and including travelling time: Jan Richter Centre: 10 Participants Sunnyside Park Home:12 Participants Riverside Park Home:3 Participants	 2hrs10min 2hrs30min 1hr	Remuneration per hour for assessing Occupational Therapist: R320 per hour	 R693 R800 R320	 R1813
Travelling to baseline assessment opportunities for assessing Occupational Therapist: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Refreshments: Catering for 25 participants Platters (10-12 people sharing a platter): Coffee and tea	 2 25	 R320 per platter R5 per individual	 R640 R125	 R765
Reminders to participants: Appointment cards: 1xA5 appointment card black ink copy: R0.20 Jan Richter Centre Sunnyside Park Home Riverside Park Home Sms's to participants: Jan Richter Centre Sunnyside Park Home Riverside Park Home Telephone call average of 3min per call: Jan Richter Centre: 3 Participants Sunnyside Park Home: 3 Participants Riverside Park Home:1 Participants	 10 12 3 10 12 3 9min 9min 3min	 Cost per appointment card is R0.20 Cost per Cell C sms is R0.50 Cell C Peak Call per minute: Cell C to other mobiles : R2.25	 R2 R2.4 R0.40 R5 R6 R1.50 R20.25 R20.25 R6.75	 R4.80 R12.50 R47.25

4 week assessment opportunity				**R3891.05**
Assessment forms: 9xA4 black ink copies: R0.50 per sheet Jan Richter Centre Sunnyside Park Home Riverside Park Home	Total participants 10 10 3	Cost R4.50 per single assessment batery	 R45 R45 R13.5	 R103.50
Travelling to baseline assessment opportunities: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Research officer performing facilitating assessment opportunity: 10 min per participant and including travelling time: Jan Richter Centre: 10 Participants Sunnyside Park Home:10 Participants Riverside Park Home:3 Participants	 2hrs10min 2hrs10min 1hr	Remuneration per hour for research officer: R200 per hour	 R433 R433 R200	 R1066
Assessing Occupational Therapist performing facilitating the baseline assessment opportunity: 10 min per participant and including travelling time: Jan Richter Centre: 10 Participants Sunnyside Park Home:12 Participants Riverside Park Home:3 Participants	 2hrs10min 2hrs10min 1hr	Remuneration per hour for assessing Occupational Therapist: R320 per hour	 R693 R693 R320	 R1706
Travelling to baseline assessment opportunities for assessing Occupational Therapist: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Refreshments: Catering for 23 participants Platters (10-12 people sharing a platter):	 2	 R320 per platter	 R640	 R755

Coffee and tea	23	R5 per individual	R115	
Reminders to participants: Appointment cards: 1xA5 appointment card black ink copy: R0.20 Jan Richter Centre Sunnyside Park Home Riverside Park Home Sms's to participants: Jan Richter Centre Sunnyside Park Home Riverside Park Home Telephone call average of 3min per call: Jan Richter Centre: 3 Participants Sunnyside Park Home: 3 Participants Riverside Park Home:1 Participants	 10 12 3 10 12 3 9min 9min 3min	 Cost per appointment card is R0.20 Cost per Cell C sms is R0.50 Cell C Peak Call per minute: Cell C to other mobiles : R2.25	 R2 R2.4 R0.40 R5 R6 R1.50 R20.25 R20.25 R6.75	 R4.80 R12.50 R47.25
8 week assessment opportunity				**R2120.25**
Assessment forms: 9xA4 black ink copies: R0.50 per sheet Jan Richter Centre Sunnyside Park Home Riverside Park Home	Total participants 5 6 2	Cost R4.50 per single assessment batery	 R22.5 R27 R9	 R58.5
Travelling to baseline assessment opportunities: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Research officer performing facilitating the assessment opportunity: 10 min per participant and including travelling time: Jan Richter Centre: 5 Participants Sunnyside Park Home:6 Participants Riverside Park Home:2 Participants	 1hr20min 1hr30min 50min	Remuneration per hour for research officer: R200 per hour	 R267 R300 R167	 R734

Assessing Occupational Therapist performing facilitating the baseline assessment opportunity: 10 min per participant and including travelling time: Jan Richter Centre: 5 Participants Sunnyside Park Home:6 Participants Riverside Park Home:2 Participants	 1hr20min 1hr30min 50min	Remuneration per hour for assessing Occupational Therapist: R320 per hour	 R427 R480 R267	 R1174
Travelling to baseline assessment opportunities for assessing Occupational Therapist: Jan Richter Centre Sunnyside Park Home Riverside Park Home	 12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	 R38 R19 R41	 R98
Refreshments: Catering for 13 participants Platters (10-12 people sharing a platter): Coffee and tea	 1 13	 R320 per platter R5 per individual	 R320 R65	 R385
Reminders to participants: Appointment cards: 1xA5 appointment card black ink copy: R0.20 Jan Richter Centre Sunnyside Park Home Riverside Park Home Sms's to participants: Jan Richter Centre Sunnyside Park Home Riverside Park Home Telephone call average of 3min per call: Jan Richter Centre: 3 Participants Sunnyside Park Home: 3 Participants Riverside Park Home:1 Participants	 5 6 2 5 6 2 9min 9min 3min	 Cost per appointment card is R0.20 Cost per Cell C sms is R0.50 Cell C Peak Call per minute: Cell C to other mobiles : R2.25	 R1 R1.20 R0.40 R2.5 R3 R1 R20.25 R20.25 R6.75	 R2.60 R6.50 R47.25

Control group intervention program Two intervention sessions. One after baseline assessment and one just after the 4 week assessment opportunity.				**R3866**
Reminders to participants: Appointment cards: 1xA5 appointment card black ink copy: R0.20 Intervention session 1 Intervention session 2 Sms's to participants: Intervention session 1 Intervention session 2 Telephone call average of 3min per call: Intervention session 1 Intervention session2	 10 10 10 10 30min 30min	 Cost per appointment card is R0.20 Cost per Cell C sms is R0.50 Cell C Peak Call per minute: Cell C to other mobiles : R2.25	 R2 R2 R5 R5 R67.50 R67.50	 R4 R10 R135
Control logbooks: 2xA4 black ink copy: R0.40	10	R0.40	R4	R4
Assistive devices: Jar openers	10	R183 (Hitech Therapy)	R1830	R1830
Intervention Occupational Therapist (including travelling time): Intervention session 1 Intervention session2	 2hrs 1hr20min	Remuneration per hour for intervention Occupational Therapist: R320 per hour	 R640 R427	 R1067
Travelling for intervention Occupational Therapist: Jan Richter Centre Intervention session 1 Intervention session2	 12km 12km	UKZN Travel allowance per kilometre: R3.16	 R38 R38	 R76
Refreshments: Catering for 10 participants Intervention session 1 Platters (10-12 people sharing a platter): Coffee and tea Intervention session 2 Platters (10-12 people sharing a	 1 10 1	 R320 per platter R5 per individual	 R320 R50 R320	 R370 R370

platter): Coffee and tea	 10	R320 per platter R5 per individual	 R50	
Experimental group intervention program Two group intervention sessions were held per week. Four individual intervention sessions had to be conducted during the course of the intervention program.				**R24671.80**
Group intervention sessions				**R23420.28**
Reminders to participants: Appointment cards: 1xA5 appointment card black ink copy: R0.20 Week 1-4: 8 Intervention sessions x 12 Participants Week 5-8: 8 Intervention sessions x 9 Participants Sms's to participants: Week 1-4: 8 Intervention sessions x 12 Participants Week 5-8: 8 Intervention sessions x 9 Participants Telephone call average of 3min per call: Week 1-4: 8 Intervention sessions x average 4 phone calls Week 5-8: 8 Intervention sessions x average 2 phone calls	 96 72 96 72 96min 48min	 Cost per appointment card is R0.20 Cost per Cell C sms is R0.50 Cell C Peak Call per minute: Cell C to other mobiles : R2.25	 R19.20 R14.40 R48 R36 R216 R108	 R33.60 R84 R324
Control logbooks: 1xA5 black ink copy: R0.20 Week 1-4: 8 Intervention sessions x 12 Participants Week 5-8: 8 Intervention sessions x 9 Participants	 96 72	 R0.20	 R33.60	 R33.60

Exercise devices:	15	Average R5 per unit	R75	R75
Intervention Occupational Therapist: Week 1-4: 8 Intervention sessions x 12 Participants Week 5-8: 8 Intervention sessions x 9 Participants Travel time for 16 intervention sessions (16x 30min)	 24 hrs 18hrs 8hrs	Remuneration per hour for intervention Occupational Therapist: R320 per hour	 R7680 R5760 R2560	 R16000
Travelling to intervention sessions for intervention Occupational Therapist: (Sunnyside Park Home and Riverside Park Home = 18km per session) Sessions twice a week for 8 weeks	 288km	UKZN Travel allowance per kilometre: R3.16	 R910.08	 R910.08
Refreshments: Week 1-4: 8 Intervention sessions x 12 Participants Platters (10-12 people sharing a platter) Coffee and tea Week 5-8: 8 Intervention sessions x 9 Participants Platters (10-12 people sharing a platter) Coffee and tea	 8 96 8 72	 R320 per platter R5 per individual R320 per platter R5 per individual	 R2560 R480 R2560 R360	 R3040 R2920
Individual intervention sessions: 4 sessions				**R1251.52**
Intervention Occupational Therapist: Intervention sessions: 4 sessionsx 20 minutes Travel time for 4 intervention	 1hr 20min 2hrs	Remuneration per hour for intervention Occupational Therapist: R320 per hour	 R384 R640	 R1024

sessions (4x 30min)				
Travelling to intervention sessions for intervention Occupational Therapist: (Sunnyside Park Home and Riverside Park Home = 18km per session) 4 x 18km	72km	UKZN Travel allowance per kilometre: R3.16	R227.52	R227.52
Feedback sessions				**R5657.20**
Reminders to participants: Telephone calls: 30 Participants (average 5min per call) 3 Matrons (average 10 min per call)	2hrs30min 30min	Cell C Peak Call per minute: Cell C to other mobiles : R2.25	R337.50 R67.50	R405
Researcher travelling to feedback sessions: Jan Richter Centre Sunnyside Park Home Riverside Park Home	12km 6km 13km	UKZN Travel allowance per kilometre: R3.16	R38 R19 R41	R98
Feedback hand outs for participants and matrons. 6xA4 black ink copy: R2.40	33	Cost R2.40 per handout	R79.20	R79.20
Research officer performing feedback sessions to participants and matrons: 2 hours per feedback session Jan Richter Centre: 10 Participants Sunnyside Park Home:12 Participants Riverside Park Home:3 Participants	2hrs 2hrs 2hrs	Remuneration per hour for research officer: R200 per hour	R400 R400 R400	R1200
Assistive devices for experimental group participants: Jar openers	15	R183 (Hitech Therapy)	R2745	R2745
Refreshments: Catering for 34 participants Platters (10-12 people sharing a platter): Coffee and tea	3 34	R320 per platter R5 per individual	R960 R170	R1130

Appendix 10b: Cost sheet – Cost of each phase of the research project

Phase of research project	**Calculated cost**	**Costs absorbed by Researcher acting as Research Officer (RO) and Intervention Occupational Therapist (OT)**	**Actual costs**
Pre-screening phase	R999.50	RO: R 600	R399.50
Informed consent for retirement villages	R711	RO: R550	R161
Recruitment procedure:	R5886.56	RO: R4900	R986.56
Informed consent of participants	R100		R100
Initial screening	R870	RO: 780	R90
Final screening	R1458	RO and OT: R1300	R158
Baseline assessment	R4084.05	RO: R1133	R2951.05
Four week assessment	R3891.05	RO: R1066	R2825.05
Eight week assessment	R2120.25	RO: R734	R1386.25
Control group intervention	R3866	OT: R1067	R2799
Experimental group intervention	R24671.8	OT:R16640	R8031.80
Feedback sessions	R5657.20	RO:R1200	R4457.20
Total:	**R54315.41**	**R29970**	**R24345.41**

Appendix 10c: Cost sheet – Cost per participant

The following table will reflect how much each phase of the research project cost per participant:

Phase of research project	**Calculated cost**	**Number of participants involved**	**Average cost per participant**
Pre-screening phase	R999.50	3 Retirement villages	R333.17 per retirement village
Informed consent for retirement villages	R711	3 Retirement villages	R237 per retirement village
Recruitment procedure: Posters Pamphlets Referral/contact list Information desk Information meeting	R5886.56 R1137 R131 R252 R1866.56 R2500	30 9 13 6 11 35	R196.22 p.p R126.33 p.p R10.08 p.p R42 p.p R169.69 p.p R71.43 p.p
Informed consent of participants	R100	30	R3.33 p.p
Initial screening	R870	30	R29 p.p
Final screening	R1458	28	R52.07 p.p
Baseline assessment	R4084.05	25	R163.36 p.p
Four week assessment	R3891.05	23	R169.18 p.p
Eight week assessment	R2120.25	13	R163.10
Control group intervention	R3866	10	R386.60 p.p
Experimental group intervention Week 1-4	R24671.8	15	R1644.79 p.p over 8 weeks R1118.19 p.p over

Week 5-8	R13418.30 R11253.50	12 9	first 4 weeks R1250.39 p.p over last 4 weeks
Feedback sessions	R5657.20	30	R188.57 p.p
Total:	**R53931.41**	**30**	**R1797.81 p.p (Total)** **R1921.60 (Control group)** **R3179.79 (Experimental group)**

Appendix 11: Feedback questionnaire

The questionnaire is designed to assist the researcher to critically evaluate the past 8 weeks. Your answers will assist to make the necessary adjustments ensuring a more successful full scale study in the future.

Your participation is greatly appreciated.

Participant nr: ___

1. How many minutes (approximately) does it take for you:
   - To perform the MHQ questionnaire:_____
   - To get from your residence to the venue:_____
   - To participate in the exercise session:_____

2. In your opinion; what effect did the past 8 weeks' exercise have on your affected thumb:
   _____
   _____

3. Did you perform any other exercises for your thumb during the past 8 weeks:___
   - If yes; what other exercises did you perform:_____
   - Where did you hear about the other exercises:_____

4. Did your pain medication change during the past 8 weeks:_____
   - If yes; in what way:_____

5. Did you start using any assistive devices during the past 8 weeks:_____
   - If yes; what type of assistive device did you start using and where did you hear about it:

     _____
     _____
     _____

6. During the past 8 weeks; what was the main factors which either improved or increased the symptoms you experienced in the involved thumb:

   _____
   _____
   _____

7. What was the main activities that increased your pain levels during the past 8 weeks and how regulartly did you participate in them:

Activity	How regular

8. Is there anything new you attempted during the past 8 weeks to assist you with the symptoms you experienced in your affected thumb:_____
   - If yes; what did you attempt:_____
     _____

9. Did you have any contact with any of the ladies who participated in the study at the other retirement homes:

   _____

10. When the study was initially advertised what methods reached you (please tick the applicable options):

- Posters
- Pamphlets
- Announcements
- Information desk at dining hall
- Being approached by the researcher at the dining hall
- Referred by the matron
- Word of mouth

11. Why did you decide to become involved with the study:

_____
_____
_____

12. Which method of advertising did you feel was most effective:

_____

13. Do you feel the study should have been advertised for longer than 2 weeks before commencing the study; reason:

_____
_____
_____

14. What was the reasons preventing you from withdrawing from the study:

_____
_____
_____

15. Did you understand the following components and do you have any suggestions on improving the following:

- The instructions the therapist gave when performing the exercises:

_____
_____

- The instructions on the MHQ questionnaire:

_____
_____

16. What helped you to remember to attend the sessions (any suggestions on making this component more effective):
_____
_____
_____

17. How many sessions will you be able to attend a week: _____

18. What days of the week and what time of the day is ideal for you to attend exercise sessions:
_____
_____
_____

19. What was the main reasons for you not being able to attend sessions:
_____
_____

20. Was the venue appropriate; what would have been more suitable:
_____
_____

21. Do you think you can perform the exercises by yourself (using the correct technique, making the necessary adjustments) or do you require someone to guide you through the exercises:
_____
_____
_____

<u>Refreshments:</u>

22. Did you prefer having refreshments at the sessions or not; please indicate a reason:
_____
_____
_____

23. What type of refreshments did you prefer (please tick):

- Savoury
- Sweet
- Smaller snacks (biscuits, nuts, biltong)
- Juice

24. Did the refreshments meet your dietary requirements; if no please specify:

_____
_____

25. Any other comments or suggestions relevant to the study?:

_____
_____
_____

Thank you for participating in this survey.