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ABORDAJE DE TERAPIA OCUPACIONAL EN LA DISCAPACIDAD DE MIEMBROS SUPERIORES, DESTREZA MANUAL, HABILIDADES MOTORAS FINAS Y AUTOEFICACIA EN PACIENTES REUMÁTICOS CON DOLOR CRÓNICO

OCCUPATIONAL THERAPY APPROACH FOR RECOVERING UPPER LIMB DISABILITY, MANUAL DEXTERITY, FINE MOTOR SKILLS AND SELF-EFFICACY IN RHEUMATIC DISEASE PATIENTS WITH CHRONIC PAIN

TESIS DOCTORAL INTERNACIONAL/INTERNATIONAL PhD THESIS

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Dña María Encarnación Aguilar Ferrándiz, PROFESORA AYUDANTE DOCTOR DEL DEPARTAMENTO DE FISIOTERAPIA DE LA UNIVERSIDAD DE GRANADA

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Fdo. Dra. María Encarnación Aguilar Ferrándiz

En Granada, 23 de Mayo de 2016

Av. de la Ilustración, 60,

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El doctorando/a José Manuel Pérez Mármol y la directora de la tesis **"Abordaje de Terapia Ocupacional en la discapacidad de miembros superiores, destreza manual, habilidades motoras finas y autoeficacia en pacientes reumáticos con dolor crónico"**garantizamos, al firmar esta tesis doctoral, que el trabajo ha sido realizado por el doctorando bajo la dirección de la directora y tutora de la tesis y hasta donde nuestro conocimiento alcanza, en la realización del trabajo, se han respetado los derechos de otros autores a ser citados, cuando se han utilizado sus resultados o publicaciones.

Granada, a 23 de Mayo de 2016

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A mi familia y amigos

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RESUMEN

La artrosis de mano se describe como la alteración gradual del cartílago, unido a una degradación del hueso subcondral, de la estructura articular y periarticular. La autoeficacia es un constructo relacionado con diferentes componentes y aspectos de la salud. En la artrosis de mano, una percepción de autoeficacia mayor debería predecir niveles altos en el desempeño y en la funcionalidad de esta población. Sin embargo, aún no se conoce en profundidad el impacto que puede provocar la discapacidad de los miembros superiores, las destrezas y habilidades motoras finas de las manos en la autoeficacia general percibida en personas mayores institucionalizadas que padecen artrosis de mano. Por otra parte, existen pocos estudios que investiguen la efectividad de los tratamientos rehabilitadores centrados en la mejora de las habilidades motoras finas en pacientes con artrosis de mano. Determinadas actividades, previamente graduadas y modificadas por el terapeuta ocupacional, podrían alcanzar los objetivos deseados para la mejora de las habilidades motoras finas y la discapacidad general de los miembros superiores, evitando efectos adversos sobre las articulaciones y los tejidos subyacentes.

Los objetivos principales de esta tesis doctoral fueron: 1) evaluar la autoeficacia y su relación con el continuum funcionalidad-discapacidad de los miembros superiores en personas mayores institucionalizadas con artrosis de mano; 2) analizar la efectividad de un programa de rehabilitación sobre la discapacidad de los miembros superiores, la independencia de las actividades de la vida diaria, las habilidades motoras finas, la independencia funcional y la autoeficacia general en esta población.

En la presente tesis, para la consecución de los objetivos, se realizó un estudio observacional-trasversal y un ensayo clínico randomizado. Se incluyeron a 45 personas adultas institucionalizadas mayores de 65 años con artrosis de mano. En primer lugar, se evaluó la fuerza de la pinza, el rango de movimiento activo y pasivo de la mano, y la funcionalidad-discapacidad de los miembros superiores. Los participantes fueron clasificados como autoeficaces o no, teniendo en cuenta sus niveles de autoeficacia general. La influencia de los componentes del continuum funcionalidad-discapacidad de los miembros superiores fue analizado estadísticamente, utilizando un análisis bivariante y de regresión multivariante. En segundo lugar, los participantes fueron asignados de forma

aleatoria o bien a un grupo experimental que completó una intervención rehabilitadora dirigida hacia la mejora de las habilidades motoras finas (n=25) o a un grupo control que recibió un tratamiento habitual de terapia ocupacional. Ambas intervenciones se realizaron durante 8 semanas, tres veces por semana y con una duración de 45 minutos cada sesión. Las principales herramientas de medida utilizadas fueron la discapacidad de miembros superiores, el desempeño en las actividades de la vida diaria, la fuerza de la pinza, coordinación de los miembros superiores y destreza manual, rango de movimiento activo y pasivo de las articulaciones de las falanges implicadas en la pinza, independencia funcional y la autoeficacia general. Estas variables fueron evaluadas en tres momentos temporales distintos, mediante una evaluación basal, una evaluación posttratamiento y una evaluación de seguimiento, realizada dos meses después de la finalización de la intervención.

Los resultados sugieren que las personas mayores institucionalizadas con artrosis de mano con autoeficacia muestran puntuaciones significativamente más bajas de discapacidad y puntuaciones más altas en la fuerza de la pinza, destreza y rango de amplitud articular del pulgar, respecto a aquellos que no fueron clasificados como autoeficaces. Por otra parte, la autoeficacia apareció asociada a la fuerza de la pinza ($p \leq 0.038$), discapacidad de los miembros superiores ($p < 0.001$) y destreza ($p \leq 0.048$). Los análisis de regresión multivariante mostraron que la discapacidad de los miembros superiores y manos explicaban casi el 40% de la variabilidad de la autoeficacia. Por otra parte, la implantación de un tratamiento rehabilitador para las habilidades motoras finas de las manos evidenció mayores mejoras sobre la destreza manual ($p \leq 0.034$, $d \geq 0.48$) y el rango de movimiento del dedo índice ($p \leq 0.018$, $d \geq 0.58$) y pulgar ($p \leq 0.027$, $d \geq 0.39$), en comparación con el tratamiento habitual de terapia ocupacional. Además, los participantes del enfoque convencional de terapia ocupacional mostraron un significativo empeoramiento moderado-alto a través del tiempo para el rango de movimiento de algunas articulaciones de los dedos índice ($p \leq 0.037$, $d \geq 0.36$) y pulgar ($p \leq 0.017$, $d \geq 0.55$).

Las principales conclusiones fueron, en primer lugar, que las personas mayores institucionalizadas, clasificadas como personas que no se percibían autoeficaces, parecen tener una mayor discapacidad de los miembros superiores y una menor fuerza de la pinza, destreza manual y movimiento del pulgar, respecto a aquellos que se perciben como autoeficaces, sugiriéndose además una relación entre la discapacidad y la percepción que este tipo de pacientes tiene sobre su habilidad para ser eficaz. En segundo lugar, puede concluirse que una intervención rehabilitadora dirigida a la mejora de las habilidades motoras finas, utilizando una actividad terapéutica, puede mejorar la destreza manual y el rango de movimiento de los dedos. Sin embargo, aún permanece incierto su efecto sobre la percepción de discapacidad de los miembros superiores, el desempeño en las actividades de la vida diaria, la fuerza de la pinza, la independencia funcional general y la percepción de autoeficacia. El tratamiento de terapia ocupacional convencional mostró por su parte un cierto efecto de empeoramiento en el rango de movimiento. Por lo tanto, protocolos específicos de tratamiento de la mano como el presentado en esta tesis doctoral deberían incluirse en la rehabilitación de los miembros superiores en pacientes con artrosis de mano.

ABSTRACT

Hand Osteoarthritis is described by a gradual damage of articular cartilage linked to degradation of subchondral bone, joint borders, and periarticular structures. Self-efficacy is a construct probably associated with health behaviors and health status. Greater self-efficacy should predict higher levels of functional performance with Osteoarthritis. However, the impact of upper limb disability, dexterity and fine motor skill of older adults with hand Osteoarthritis on self-efficacy is not well known yet. Effectiveness´ studies of rehabilitation treatments for improving fine motor abilities in patients with hand Osteoarthritis are also scarce. Selected activities, previously modified and graded by the occupational therapist, could reach the desired aims for fine motor abilities on upper limb disability, with no negative effect on joints or tissues.

The main objectives of this thesis were: 1) to evaluate the self-efficacy and its relationship with upper limb function/disability in institutionalized elderly with hand Osteoarthritis; 2) to assess the effectiveness of a rehabilitation programme on upper limb disability, independence of activities of daily living, fine motor skills, functional independency, and general self-efficacy in this population.

A cross-sectional study and a randomized clinical trial were performed according to the main objectives previously expressed. Institutionalized adults (n = 45) over the age of 65 years with hand Osteoarthritis were evaluated, to determine pinch strength, active range of motion of the hand, and upper limb dexterity and disability. Firstly, they were classified as self-efficacious or not based on their general self-efficacy level. The influence of upper limb function-disability on self-efficacy was statistically analyzed by using bivariate and multivariate regression analyses. Secondly, participants were randomly assigned to an experimental group for completing a rehabilitation intervention focused on fine motor skills (n=25) or a control group that received conventional occupational therapy (n=23). Both interventions were performed 3 times a week, 45 minutes each session, during 8-weeks. Main outcome measures were upper limb disability, performance in activities of daily living, pinch strength, manual dexterity, active and passive range of fingers motion, functional independency, and general self-efficacy. These variables were assessed at baseline, post-treatment and after two months' follow-up.

The results highlighted that self-effective older adults seem to show significantly lower scores in disability and higher scores in pinch strength, dexterity and motion of thumb than those who were classified as non-self-effective. Self-efficacy was associated with pinch strength ($p \leq 0.038$), disability ($p < 0.001$) and dexterity ($p \leq 0.048$). Multiple regression analyses showed that upper limb and hand disability explained almost 40% of the variability of self-efficacy. On the other hand, the rehabilitation treatment of fine motor skills of the hand evidenced significant higher improvements on manual dexterity ($p \leq 0.034$, $d \geq 0.48$) and range of index ($p \leq 0.018$, $d \geq 0.58$) and thumb motion ($p \leq 0.027$, $d \geq 0.39$) in comparison to the conventional occupational therapy treatment. Moreover, the participants in the conventional approach showed a significant worsening over time moderate to large for range of motion in some joints at the index ($p \leq 0.037$, $d \geq 0.36$) and thumb ($p \leq 0.017$, $d \geq 0.55$) fingers.

The main conclusions were: firstly, institutionalized older adults classified as non-self-effective seem to have higher upper limb disability and less pinch strength, manual dexterity and thumb motion than those who are self-effective, suggesting a relationship between impairment and perceived ability. Secondly, a rehabilitation intervention by using a therapeutic activity for fine motor skills of the hand may improve manual dexterity and range of fingers motion, but its effects on upper limb disability, performance in activities of daily living, pinch strength, functionality, and self-efficacy remain uncertain. Conventional occupational treatment showed a certain worsening effect on range of motion. Thus specific treatments of the hand should be included for the upper limb rehabilitation of hand Osteoarthritis.

ABREVIATURAS

AM	Artrosis de mano
AVD	actividades de la vida diaria
CMC	carpometacarpiana
FR	factores de riesgo
MMSS	miembros superiores
PPA	principios de protección articular
SER	Sociedad Española de Reumatología
TMC	trapeciometacarpiana
TO	Terapia Ocupacional

ABREVIATIONS

ADLs	activities of daily living
ANOVA	analysis of variance
BI	Barthel index
CI	Confidential Interval
CMC	carpometacarpal
D	distal
DASH	Disability of the Arm, Shoulder and Hand
FIM	Functional Independence Measure
IP	interphalangeal
JPP	joint protection principles
MCP	metacarpophalangeal
OA	Osteoarthritis
OT	Occupational Therapy
P	proximal
PPT	Purdue Pegboard Test
PS	pinch strength
RCTs	randomised clinical trials
SD	coefficient Standard Deviation
TMC	trapeziometacarpal

INTRODUCCIÓN

INTRODUCTION

1. INTRODUCCIÓN

1.1 Artrosis: concepto, epidemiología, etiopatogenia y costes socioeconómicos.

La Sociedad Internacional de Investigación en Artrosis - OARSI define esta como una enfermedad global de las articulaciones, afectando no solo al cartílago, sino también a los tendones, músculos peri-articulares, capsula articular, ligamentos, y hueso subcondral (Henrotin & Berenbaum, 2010). Esta enfermedad incluye las articulaciones móviles, provocando estrés celular y degradación de la matriz extracelular, iniciados por micro y macro-alteraciones que activan respuestas de reparación maladaptativas a través de vías pro-inflamatorias autoinmunitarias (Osteoarthritis Research Society International, 2016).

Según el Colegio Americano de Reumatología, la artrosis se caracteriza por una erosión del cartílago articular, bien de forma primaria o secundaria a un trauma u otras condiciones, provocando que este se vuelva blando, deshilachado y que aparezca un estrechamiento del hueso subcondral y el crecimiento de osteofitos marginales (American College of Rheumatology, 2016). En España, la Sociedad Española de Reumatología (SER) define la artrosis como "una patología reumática que lesiona el cartílago articular" (Sociedad Española de Reumatología 2016, párrafo 1). Expresado en otros términos, se considera "una patología articular degenerativa caracterizada por alteración en la integridad del cartílago y el hueso subcondral" (Alonso Ruiz, 2010).

En el ámbito de la investigación, la artrosis se ha definido como una enfermedad común, crónica, que afecta al aparato musculoesquelético y se caracteriza por cambios completos en la estructura de las articulaciones (Kjeken et al., 2005; Walker-Bone, Javaid, Arden, & Cooper, 2000). Por tanto, se puede afirmar que pertenece a un grupo de condiciones asociadas a una alteración de la integridad del cartílago articular y cambios en las estructuras óseas subyacentes (Beasley, 2012). Otras definiciones se basan en cambios observados mediante el uso de rayos X, en la presencia de sintomatología articular, o en ambos. La definición para la artrosis más habitual combina la presencia de hallazgos radiográficos y la presencia de dolor articular casi a diario (Altman et al., 1986; EUMUSC, 2014). Sin embargo, pese al esfuerzo realizado a nivel internacional por definir la artrosis, actualmente se puede considerar "no como una única enfermedad, sino como un grupo heterogéneo de patologías con manifestaciones clínicas similares y cambios patológicos y radiológicos comunes" (Fernández-López, 2010). Esta enfermedad suele implicar las articulaciones de las manos, los pies, caderas y rodillas (Kjeken et al., 2005; Stamm et al., 2002), aunque también puede afectar a la columna cervical, lumbar y hombros (Sociedad Española de Reumatología 2016, párrafo 2).

En 2003, la artrosis fue la sexta causa de discapacidad a nivel mundial y se prevé que se convierta en la cuarta en 2020 (Silverwood et al., 2015; Woolf & Pfleger, 2003). La incidencia de la artrosis es difícil de calcular, debido a su desarrollo progresivo y gradual. Sin embargo, se ha estimado que uno de cada diez personas con 60 años o más presenta manifestaciones clínicas significativas de esta enfermedad. La incidencia de la artrosis incrementa de forma abrupta tanto para hombres como para mujeres después de los 50 años, con un pico máximo entre los 70 y 79 años (EUMUSC, 2014). Por otra parte, es difícil comparar los datos obtenidos sobre la prevalencia de esta enfermedad, ya que las investigaciones han incluido grupos etarios, criterios de inclusión y de diagnóstico diferentes (EUMUSC, 2014). En Estados Unidos, aproximadamente un 12% de las personas entre los 25 y 75 años presentan artrosis (Dennison & Cooper, 2003; Gomes, Jones, & Natour, 2010; Kjeken et al., 2005) y en Brasil afecta entre el 6-12% de la población adulta (Gomes et al., 2010). En España, es la patología osteoarticular más prevalente (Altman et al., 1986; González et al., 2011), afectando entre el 6 y el 20% de personas mayores de 20 años (González et al., 2011). Según el estudio EPISER, casi el 50% de la población con una edad superior a 50 años muestra signos radiológicos de artrosis de rodilla (Carmona, 2011; Carmona, Ballina, Gabriel, & Laffon, 2001). Por otra parte, casi el 25% de los adultos con más de 55 años han manifestado al menos un episodio anual de dolor en las rodillas, que probablemente esté reflejando una artrosis incipiente (Peat, McCarney, & Croft, 2001; Silverwood et al., 2015). El estudio de González et al. (2011) ha mostrado que el 8,8%, 2,2% y 11,2% de la población española padece artrosis de rodilla, de manos y en la columna vertebral, respectivamente (González et al., 2011). En nuestro contexto, la incidencia es baja en personas menores de 40 años, aunque aumenta progresivamente a partir de esta edad y empieza a ser bastante común entre los 51 y 60 años (Dennison & Cooper, 2003; Gomes et al., 2010; Moreira, & Carvalho, 2001). En población general se ha estimado que la prevalencia de la artrosis sintomática en personas mayores de 60 años es casi el doble en mujeres que en hombres (9,6% en hombres y el 18% en mujeres) (Bedson, Jordan, & Croft, 2005; Silverwood et al., 2015).

Atendiendo a la etiopatogenia, la Artrosis puede manifestarse como un inicio y evidencia de erosión del hueso subcondral tras el análisis radiográfico (Beasley, 2012; Roach & Tilley, 2007). Los cambios producidos en el cartílago articular y en el hueso subcondral provienen de la alteración de los condrocitos para mantener un equilibrio adecuado en la matriz extracelular. La causa de la destrucción del cartílago es aún desconocida, aunque se le ha relacionado con diversos factores de riesgo (FR). La importancia de la identificación de los FR de la artrosis reside en su capacidad para poder prevenir la aparición o detener la progresión de esta enfermedad (Fernández-López, 2010). Algunas clasificaciones indican que estos factores pueden dividirse en dos grandes grupos, los factores químicos-metabólicos y los mecánicos (Beasley, 2012). El primer grupo se caracteriza por una alteración en la proliferación y diferenciación de los condrocitos, además de cambios en la síntesis de los componentes de la matriz extracelular. En etapas tempranas de la enfermedad, estas alteraciones se manifiestan mediante la aparición de fibrilaciones, una reducción de la matriz, aglomeración celular y cambios en la cantidad, distribución y composición de las proteínas de la matriz extracelular. En etapas más avanzadas de la enfermedad, el proceso patológico se caracteriza por una debilitación de la articulación, la aparición de fibrilaciones, ulceraciones y una pérdida progresiva del cartílago articular, debido a la activación o inhibición de varias enzimas anabólicas y catabólicas que modulan la biosíntesis y degradación del cartílago (Beasley, 2012; Katz, Agrawal, & Velasquez, 2010). Por otra parte, los factores mecánicos que pueden aumentar exponencialmente el riesgo de padecer esta enfermedad suelen ser la sobrecarga anormal de la articulación por reiterados traumas, la realización de tareas pesadas, la inestabilidad articular y la obesidad (Beasley, 2012; Roach & Tilley, 2007). Dichos factores parecen ser los responsables de que los condrocitos produzcan enzimas degradativas y comience a desarrollarse el proceso de destrucción osteocartilaginoso. Es entonces cuando el cartílago articular empieza a dejar de absorber los impactos producidos por los movimientos (Beasley, 2012; Erggelet & Mandelbaum, 2008). Otros factores de riesgo que se contemplan en esta patología son la existencia de una distribución familiar y la edad avanzada. Aunque no se trata de una afección hereditaria porque no se ha descrito un patrón de herencia fijo, sí parece existir un componente de riesgo genético que, junto con otros factores, puede hacer que aparezca con mayor probabilidad en los sujetos que tienen una historia familiar previa (Fernández-López, 2010). La edad puede implicar un envejecimiento del cartílago, disminuyendo el contenido de agua y la cantidad de condrocitos. Esto provocará una merma en la capacidad de regeneración celular y en el mantenimiento del cartílago en unas condiciones óptimas (Beasley, 2012). En España, los FR identificados para la artrosis de rodilla han sido tener una edad superior a 50 años, vivir en un medio rural, tener estudios primarios o inferiores, realizar trabajos con un elevado esfuerzo físico, tener osteoporosis, pertenecer a una clase social baja, tener obesidad y presentar otras patologías comórbidas a la artrosis (Ayala & Fernández-López, 2007; Fernández-López, 2010; Fernández-López, Laffon, Blanco, Carmona, & EPISER Study Group, 2008).

Desde hace algo más de una década ha surgido un gran avance en el entendimiento de los cambios moleculares en la artrosis, el rol del sistema inmune y el tratamiento farmacológico, con el objetivo de controlar la inflamación y la erosión articular. Sin embargo, a pesar de estos avances médicos, la artrosis al igual que otras patologías reumatológicas sigue siendo aún una condición crónica (Beasley, 2012; Hafstrom et al., 2009; Klareskog, Catrina, & Paget, 2009; van Tuyl et al., 2009). Según el Colegio Americano de Reumatología, la artrosis está caracterizada por la alteración del cartílago, cambios en las articulaciones de los huesos, deterioro de los tendones y ligamentos, además de un determinado grado de inflamación del revestimiento de la articulación o sinovial (American College of Rheumatology, 2016). Los cambios patológicos más relevantes son el aumento de la densidad ósea (esclerosis), asimetría en el estrechamiento de la articulación, pérdida de cartílago y una formación nueva de hueso con un patrón irregular (osteofitos). Todas estas alteraciones pueden observarse mediante el uso de pruebas radiográficas (Burkholder, 2000). La enfermedad se manifiesta primero como un desequilibrio molecular (metabolismo anormal del tejido de las articulaciones), seguido de desequilibrio fisiológico y anatómico (caracterizado por degradación del cartílago, remodelación ósea, formación de osteofitos, inflamación de la articulación y pérdida de la función normal de la articulación), que termina culminando en patología (Osteoarthritis Research Society International, 2016). El condrocito es la célula específica del cartílago y el elemento necesario para el mantenimiento correcto de la homeostasis de la matriz extracelular. En la artrosis existe un número bajo de estas células si lo comparamos con el cartílago normal y existe una alteración del catabolismo producido por las proteasas (Monfort-Faure & Trujillo-Martín, 2010). La inflamación es otro factor importante del proceso patológico producido en esta enfermedad. Esta suele aparecer en la membrana sinovial de la articulación, provocando hipertrofia. A nivel histológico, esta inflamación puede producir una hiperplasia sinovial con un aumento del número de sinoviocitos y la generación de angiogénesis. Los mediadores de esta inflamación van a ser proteínas como las citoquinas, moléculas como los eicosanoides y radicales libres como el óxido nítrico (Monfort-Faure & Trujillo-Martín, 2010). Debido a esta inflamación, el hueso subcondral se irá convirtiendo esclerótico, denso y mostrará una menor calidad, debido a una progresiva mineralización de mala calidad y con un patrón desorganizado (Monfort-Faure & Trujillo-Martín, 2010).

Desde el punto de vista socioeconómico, los costes generados por los pacientes con artrosis son múltiples. Actualmente, el progresivo envejecimiento poblacional es uno de los problemas sociales de mayor impacto, donde casi el 80% de la población tiene una esperanza de vida superior a los 70 años. Esta progresión supone que probablemente la atención integral de las personas con artrosis aumente de forma exponencial los costes sociales y económicos en un futuro próximo (Kraus, 1997; Stamm et al., 2002). En España, la artrosis se considera la primera causa de invalidez permanente (Batlle-Gualda, 2010). Sin embargo, existen pocos estudios que aborden el impacto socioeconómico de esta enfermedad. La mayoría de los trabajos han dirigido su atención hacia el cálculo del consumo de recursos durante las visitas médicas y el uso de pruebas complementarias y tratamientos (Batlle-Gualda, 2010). El nuestro país, el estudio ArtRoCad, realizado en 2005 por la SER y la Sociedad Española de Medicina Rural y Generalista, evaluó el impacto socioeconómico y el consumo de recursos sanitarios de los pacientes con artrosis de cadera y rodilla. Los resultados mostraron que, en los últimos seis meses, una muestra de 1.071 pacientes con artrosis proveniente de todas las comunidades españolas había realizado 6.495 visitas a su médico de cabecera, con una media de una visita mensual por paciente y 1.069 visitas a algún especialista. El 85% tomaba medicación para aliviar los síntomas de la enfermedad, con un coste anual total de 254.770.168 € (Gualda, 2005). En un estudio sobre la comparativa económica entre diferentes modalidades de tratamiento farmacológico en estos pacientes, el uso de condroitín sulfato ha resultado ser el tratamiento menos costoso y con mejor tolerancia gastrointestinal respecto a los antiinflamatorios no esteroideos o AINES, prescritos clásicamente (Terrés, 2010). El estudio de Tudela, Marqués, Moreno, y Bucher (2004) concluyó que, de manera similar a las guías de práctica clínica vigentes, el paracetamol es preferido desde una perspectiva económica atendiendo a criterios de minimización de costes, eficacia y seguridad. En España, el coste anual atendiendo al tiempo consumido por los profesionales para este tipo de pacientes asciende a 1.031.158.497 €. Si se registra el coste de las pruebas utilizadas asciende a 330.531.070 € y el abordaje de la artrosis supone un coste total de 4.834.953.966 € (Gualda, 2005). En el caso de la gonartrosis, el mayor coste se debe a la incapacidad laboral transitoria que genera (Lorenzo & Díaz, 2010).

1.2 Artrosis de mano: concepto, prevalencia, manifestaciones clínicas y criterios diagnósticos.

Según la SER, la artrosis de mano (AM) es “una degeneración del cartílago de las articulaciones de las manos, benigna, aunque puede producir dolor, dificultad para mover los dedos y deformidad” (Sociedad Española de Reumatología 2016, párrafo 1). La AM también ha sido definida como una enfermedad crónica degenerativa para la que no existe actualmente cura y que constituye el tipo de artrosis más común, afectando habitualmente a las articulaciones carpometacarpianas (CMC) de la primera falange y a las articulaciones proximales y distales del resto de falanges (Altman et al., 1990; de Oliveira, Nunes, Aruin, & dos Santos, 2011; Egger et al., 1995; Stamm et al., 2002).

Según la Liga Europea contra las Patologías Reumáticas - European League Against Rheumatism - EULAR, la AM es una enfermedad altamente prevalente, que ocurre comúnmente, aunque no exclusivamente, cuando existe artrosis generalizada y puede generar un grado alto de discapacidad (Zhang et al., 2009). De forma general, la estimación de la prevalencia de las AM sintomáticas puede variar en un rango entre el 13% y 26% (Ye, Kalichman, Spittle, Dobson, & Bennell, 2011; Zhang et al., 2009). Esta enfermedad suele tener sus inicios entre los 40 y 50 años, aunque puede comenzar en edades más avanzadas (Gomes et al., 2010; Sociedad Española de Reumatología 2016, párrafo 1). Ocurre más frecuentemente en mujeres mayores de 50 años (Beasley, 2012; Dequeker, Aerssens, & Luyten, 2003; Kalichman & Hernández-Molina, 2010). La prevalencia de esta patología varía entre los diferentes estudios publicados. En Estados Unidos afecta al 75% de las mujeres comprendidas entre los 60 y 70 años (Dennison & Cooper, 2003; Kjeken et al., 2005; Valdes & Marik, 2010). A nivel europeo, en un estudio de prevalencia realizado en Holanda en 2005, basado en datos radiográficos, el 67% de las mujeres y el 54,8% de los hombres mostraron al menos una articulación de la mano afectada (Gomes et al., 2010). En Italia, en una investigación realizada con personas mayores de 65 años, se estimó una prevalencia de 14,9% (Carmona Ortells, 2010). En España, según el estudio EPISER, la AM tiene una prevalencia del 6,2% de la población. Si atendemos a la distribución etaria, hasta los 40 años no existen casos de artrosis, entre los 40-49 años existe un 1,1% de la población con esta patología, entre los 50-59 el 6,7%, entre los 60-69 el 15,3%, entre los 70-79 el 23,9%, y en personas mayores de 80 años supone el 17,3% de la población de nuestra nación (Fernández-López et al., 2008). Aunque la AM suele aparecer en ambos sexos, tiene un predominio mayor en el sexo femenino (Ye et al., 2011; Zhang et al., 2009). En España, las mujeres con edades comprendidas entre 40-49 años presentan una prevalencia de AM del 2%, en edades entre 50-59 del 10,6%, entre 60-69 del 24,4%, entre 70-79 del 29,9%, y mayores de 80 años del 23,4%. La media del porcentaje total de la frecuencia estimada de mujeres con artrosis en nuestro país es del 9,5% (Fernández-López et al., 2008).

Los FR relacionados con al AM han sido múltiples desde los inicios de su estudio, sin embargo, los que más se han informado en la literatura han sido la edad, el género femenino y la predisposición genética. También se ha sugerido la probable existencia de FR asociados a traumas continuados en la articulación, a actividades laborales prolongadas que implican la aplicación de fuerzas de prensión excesivas y el uso repetitivo de las manos (de Oliveira et al., 2011; Kalichman & Kobyliansky, 2009; Linares Ferrando, 2010). Por otra parte, multitud de investigaciones han abordado la localización articular de la AM. Las articulaciones que suelen afectarse con mayor frecuencia son las articulaciones CMC del pulgar (21%), las articulaciones trapeciometacarpianas (TMC) (35.8%), articulaciones metacarpofalángicas (8.2%), articulaciones interfalágicas proximales (18.2%) y articulaciones interfalángicas distales (del 35% al 47.3%) (Beasley, 2012; Berenbaum, 2008; Dahaghin et al., 2005; Fumagalli, Sarzi-Puttini, & Atzeni, 2004; Gomes et al., 2010; Kalichman & Hernández-Molina, 2010; Kloppenburg, 2007; Sociedad Española de Reumatología 2016, párrafo 2; Valdes & Marik, 2010; Wilder, Barrett, & Farina, 2006). El 50% de los pacientes que tienen alteración de las articulaciones interfalángicas distales, también tienen afectación en las proximales (Beasley, 2012; Kaufmann, Lögters, Verbruggen, Windolf, & Goitz, 2010). En este tipo de pacientes suele ser habitual observar deformidades. En las articulaciones interfalángicas distales pueden aparecer las denominadas como dedo en martillo y en las interfalángicas proximales suelen aparecer las desviaciones laterales, conocidas como en ojal o boutonniere (Beasley, 2012; Fumagalli et al., 2005).

Desde el punto de vista sintomatológico, las principales manifestaciones clínicas identificadas en la AM son dolor, rigidez, inflamación, tumefacción y deformidad en las articulaciones de los dedos (Bagis, Sahin, Yapici, Cimen, & Erdogan, 2003; de Oliveira et al., 2011; Kalichman & Kobyliansky, 2009; Thyberg, Hass, NordenskiÖld, Gerdle, & Skogh, 2005). El dolor y la pérdida de la funcionalidad de la mano puede provocar limitaciones en las actividades manuales realizadas de forma diaria, que repercuten negativamente en la calidad de vida general de estos pacientes (de Oliveira et al., 2011; Stamm et al., 2002). La sintomatología puede variar considerablemente respecto a la presencia, significatividad e impacto en la calidad de vida. En las etapas iniciales de la enfermedad, el paciente suele sentirse bien durante la mañana y el dolor es directamente proporcional a la sobrecarga articular. Sin embargo, en etapas más avanzadas, el dolor se torna constante y puede provocar alteraciones del sueño (Burkholder, 2000; Chaisson et al., 1997). El dolor, la discapacidad y una disminución de la calidad de vida influirán de forma notable en la rutina diaria del paciente (Estes, Bochenek, & Fasler, 2000). Las consecuencias funcionales negativas estarán relacionadas con el dolor, la reducción de la movilidad de la mano, la fuerza de la prensión y la limitación de las actividades cotidianas (Valdes & Marik, 2010), sobre todo las que implican los miembros superiores (MMSS) (de Oliveira et al., 2011). De igual forma, las articulaciones interfalángicas de la mano juegan un papel fundamental en el desempeño de las actividades de la vida diaria (AVD). Estas pueden verse alteradas debido a la inestabilidad articular, el dolor, la pérdida del rango de amplitud articular y la disminución de la fuerza muscular (Culver & Fleegler, 1987; Estes et al., 2000; Stern & Ho, 1987).

Aunque se han establecido ciertos criterios para la definición de la AM, el diagnóstico de esta patología presenta dificultades debido al número de articulaciones implicadas, el gran espectro de grados de alteración y la existencia de situaciones excepcionales (Zhang et al., 2009). El diagnóstico de la AM se realiza habitualmente mediante la combinación de los resultados hallados tras la evaluación clínica, un estudio radiográfico y la historia previa del paciente (Altman et al., 1990; Burkholder, 2000; Estes et al., 2000). Una historia detallada incluye información sobre las condiciones médicas del pasado, medicación, actividades vocacionales y laborales, la apariencia y progresión de los síntomas y las habilidades funcionales del paciente (Estes et al., 2000). La evaluación inicial incluye una valoración completa y bilateral de la fuerza y el rango de movimiento activo y pasivo de los MMSS. El examen de todas las articulaciones de la mano es importante para revisar las posibles lesiones focales en estas y su implicación en el uso de los MMSS en las articulaciones no afectadas. También debe registrarse la cantidad y localización del edema, e identificar y delimitar las deformidades existentes (Estes et al., 2000). La evaluación física de las manos debe implicar una valoración de la sensibilidad, las posibles subluxaciones y se debe diferenciar las irregularidades de las articulaciones y pérdida de cartílago producida por tendinitis, antes de utilizar pruebas de radioimagen (Altman et al., 1990; Estes et al., 2000; Swanson & de Groot, 1985). La severidad o estadio de la enfermedad se determinará en base al grado de estrechamiento del espacio de la articulación, la formación de osteofitos y la esclerosis ósea subcondral (Burkholder, 2000).

Según el Colegio Americano de Reumatología, los criterios diagnósticos para la AM son presentar dolor en la mano junto con, al menos, tres de los siguientes criterios (Alonso Ruiz, 2010; Altman et al., 1990):

- Engrosamiento de la estructura ósea de más de 2 de las 10 articulaciones siguientes: 2ª y 3ª interfalángicas proximales, 2ª y 3ª intefalángicas distales, y TMC de ambas manos.

- Engrosamiento de la estructura ósea de 2 o más articulaciones interfalángicas distales.

- Menos de 3 articulaciones metacarpofalángicas con tumefacción.

- Deformidad de, al menos, 1 de 10 las articulaciones seleccionadas a continuación: 2ª y 3ª interfalángicas proximales, 2ª y 3ª intefalángicas distales, y TMC de ambas manos.

La Liga Europea contra las Patologías Reumáticas - EULAR en 2009 analizó 184 proposiciones para establecer las características, criterios y recomendaciones de la AM a nivel europeo. Dicha institución, aporta una serie de recomendaciones que difiere del objetivo del Colegio Americano de Reumatología. La Liga Europea pretende, (1) servir de guía para asistir al personal clínico en el diagnóstico de la AM y no clasificarla para fines investigadores; (2) hacer énfasis en la posibilidad de que existan subtipos de AM y establecer los criterios necesarios para los diagnósticos diferenciales; (3) elaborar unas recomendaciones generalizables a toda la población con AM, ya que han utilizado una amplia evidencia científica para su creación; y (4) utilizar herramientas fiables como estudios Delphi y el criterio de expertos clínicos de diferentes nacionalidades para evitar el sesgo personal de dichas recomendaciones. De esta forma, esta organización pretende ayudar al clínico a discriminar que afirmaciones sobre la AM tienen un acuerdo previo general y que aspectos de esta enfermedad están más abiertos a la interpretación individual de cada profesional. Así pues, tras la realización de tres estudios Delphi anónimos, se consensuaron 10 características y criterios diagnósticos comunes para esta patología reumática (Zhang et al., 2009):

1. Los FR de la AM son ser mujer, tener una edad superior a 40 años, haber entrado en la menopausia, historia familiar previa, obesidad, la densidad ósea, tener una fuerza muscular mayor en el antebrazo, el grado de laxitud articular, historia previa de alteraciones en la mano y el uso habitual de esta por motivos laborales o de una actividad de ocio determinada.
2. Los síntomas típicos de la AM son dolor cuando se utilizan las manos, dolor matutino leve o rigidez, afectando a una o más articulaciones a la vez. La

sintomatología cursa de forma intermitente. Con dichas características, si la persona tiene más de 40 años se puede realizar con fiabilidad un diagnóstico de AM.

3. Los marcadores clínicos de la AM son la aparición de nódulos de Heberden y Bouchard y/o prolongaciones óseas con o sin deformidad (aparición de desviaciones laterales de las articulaciones interfalángicas, subluxación o adducción de la base del pulgar), afectando de forma característica a las articulaciones interfalángicas distales, interfalángicas proximales, base del pulgar y articulaciones metacarpofalángicas del índice y dedo medio.
4. El daño funcional en la AM puede ser tan severo como en la artritis reumatoide. La funcionalidad debería valorarse cuidadosamente y monitorizarse usando herramientas de evaluación validadas.
5. Los pacientes que presentan una AM poliarticular tienen más riesgo de padecer artrosis de rodilla, cadera y artrosis generalizada.
6. Los diferentes subtipos de AM reconocidos pueden tener diferentes FR, requiriendo por tanto una adaptación de la evaluación e intervención para cada caso particular. Estos subtipos incluyen la AM de las articulaciones interfalángicas (con o sin nódulos), alteración de la base del pulgar y AM erosiva. Cada uno de estos grupos pueden ser sintomáticos o asintomáticos.
7. La AM erosiva suele afectar a las articulaciones interfalángicas y en la radiografía se puede observar una erosión subcondral, que puede progresar a un desgaste marcado del hueso y del cartílago, inestabilidad articular y anquilosis ósea. Este tipo de AM suele tener un inicio abrupto, con dolor intenso, alteración de la funcionalidad, signos y síntomas inflamatorios (rigidez, hinchazón de tejidos blandos, eritema e incluso parestesia) y un peor pronóstico respecto a la AM no erosiva.
8. El diagnóstico diferencial para la AM es amplio.
9. La radiografía de ambas manos sobre un único campo de visión y en un plano postero-anterior debe utilizarse como valoración estándar de la AM. Las características clásicas observables en la radiografía son el estrechamiento del espacio articular, osteofitos, esclerosis, quistes y erosión del hueso subcondral. En raras ocasiones se usa otra modalidad de imagen para el diagnóstico de AM.

10. La realización de test sanguíneos no es necesario para el diagnóstico de la AM, pero pueden ser de utilidad para excluir la existencia de comorbilidad de otras patologías.

1.3 Conceptualización y evaluación del grado de funcionalidad del miembro superior y la percepción de autoeficacia en la artrosis de mano.

Según la Clasificación Internacional de Funcionamiento, de la Discapacidad y de la Salud, se entiende por funcionalidad o funcionamiento, el conjunto de las funciones corporales (funciones de los sistemas corporales y las estructuras del cuerpo), de actividades y de la participación. Los datos generados por el diagnóstico del paciente sumados al nivel de funcionalidad pueden proporcionar una visión más amplia y significativa del estado de salud de este (Organización Mundial de la Salud, 2001). La funcionalidad está relacionada directamente con las capacidades de la persona, que describen la aptitud de un individuo para realizar una tarea o una acción. Esta capacidad indicará el máximo nivel de funcionalidad que la persona tiene para conseguir dominio en un comportamiento en un momento determinado. El estudio de Kjeken et al. (2005) puso de manifiesto que la AM tiene consecuencias considerables sobre la funcionalidad, reflejadas en una limitación en el desempeño de las actividades y una restricción de la participación social. Estas alteraciones sobre la funcionalidad estaban relacionadas con la movilidad reducida de la mano, la disminución de la fuerza de prensión, el dolor ante movimientos resistidos y problemas en aspectos relacionados con la actividad y la participación (Kjeken et al., 2005). El dedo pulgar parece contribuir en un 60% en la funcionalidad general de la mano, estando habitualmente afectado en los pacientes con AM (Dickson & Morrison, 1979; Gomes et al., 2010; Kjeken et al., 2005).

La evaluación de la funcionalidad debe atender necesariamente al desempeño en todas las áreas de ocupación y en las AVD, tanto básicas como instrumentales (Estes et al., 2000). La ejecución o el desempeño adecuado en estas actividades debe valorarse y puntuarse mediante la observación directa del paciente, identificando que puede y que no puede hacer para completar cada una de estas AVD, además del grado de ayuda que necesita este para realizarlas. Las alteraciones a nivel funcional en la AM pueden manifestarse como problemas para estrujar una toalla, abrir una botella, una disminución del 60% de la fuerza de la prensión y una restricción general de los movimientos de la mano (Valdes & Marik, 2010). Estas personas también pueden encontrar dificultad o pueden verse completamente impedidas en el agarre, mantenimiento o manejo de objetos pesados o la manipulación de objetos pequeños (Culver & Fleegler, 1987; Estes et al., 2000; Stern & Ho, 1987). Por otra parte, suelen presentar problemas al realizar actividades de autocuidado como abotonarse, coger el cepillo de dientes, cortar comida con el cuchillo, untar mantequilla en una tostada; al desempeñar actividades de ocio como cortar el césped o jugar a las cartas; al ejecutar tareas del hogar como cocinar o limpiar; y para participar satisfactoriamente en tareas vocacionales como escribir a máquina (Estes et al., 2000). La incapacidad para completar las AVD, el miedo a la progresión de la enfermedad, la pérdida de movimiento o la necesidad de depender de otras personas pueden generar sentimientos depresivos y de ansiedad (Estes et al., 2000). Además, que esta enfermedad no sea reconocida por la sociedad como una patología común y grave, puede provocar que las personas con AM no tengan el apoyo emocional necesario para afrontar los cambios que sufren en sus estilos de vida, rutina, roles y motivación general (Estes et al., 2000).

La evaluación de la discapacidad y nivel funcional de los MMSS puede abordarse desde dos perspectivas diferentes. O bien, analizando los problemas que encuentra el paciente en la realización de las actividades cotidianas debido a la alteración de los MMSS, o evaluando los diferentes componentes que contribuyen a que los MMSS funcionen de manera normal y permitan una adecuada independencia y autonomía del paciente.

Atendiendo a la primera perspectiva de evaluación, Schoneveld, Wittink y Takken (2009) revisaron la literatura existente sobre la validez de las herramientas de medida más utilizadas. Estos autores concluyeron que el DASH ha sido una de las herramientas más estudiadas y que ha mostrado tener una calidad psicométrica buena para la valoración de la discapacidad percibida en las actividades realizadas con los MMSS. Además, este estudio demostró que el DASH es adecuado para cualquier tipo de patología relacionada con los MMSS, analizando la alteración de estos como una unidad (Beaton et al., 2001; Gummesson, Atroshi, & Ekdahl, 2003; Hudak et al., 1996; MacDermid & Tottenham, 2004; McClure & Michener, 2003; Schoneveld et al., 2009; SooHoo, McDonald, Seiler, & McGillivary, 2002; Wong, Fung, Chu, & Chan, 2007). Uno de los problemas del DASH aparece cuando el paciente con AM presenta otras condiciones comórbidas que afectan a las articulaciones de los MMSS. En estos casos puede ser difícil aislar que grado de discapacidad se debe a la AM y cuál a estas condiciones. Sin embargo, de manera práctica, siempre que estas condiciones se mantengan estables durante la intervención y no aparezcan nuevas patologías que puedan modificar la funcionalidad de los MMSS, los cambios observados en las puntuaciones del DASH podrán ser atribuidas igualmente al efecto terapéutico de la intervención aplicada (Schoneveld et al., 2009). Por otra parte, aunque existen herramientas específicamente creadas para la valoración de la funcionalidad de la mano en pacientes con patologías de clínica similar a la AM, como es caso del "The Arthritis Hand Function Test", estos no están validados contextualmente a población española (Backman & Mackie, 1997) y por tanto no se consideran apropiados para su aplicación a nivel clínico o de investigación.

Desde la segunda perspectiva de evaluación, deberían tenerse en cuenta componentes motores como la coordinación y destreza de los MMSS. El Purdue Pegboard Test, el Nine Hole Peg Test, el Box and Blocks Test y el Grooved Pegboard Test son algunos ejemplos de herramientas de evaluación que están validadas para población adulta sana, con daño traumático en las manos o en procesos degenerativos (Buddenberg & Davis, 2000; Mathiowetz, Rogers, Dowe-Keval, Donahoe, & Rennells, 1986; Schmidt, Oliveira, Rocha, & Abreu-Villaca, 2000; Schoneveld et al., 2009; Shahar, Kizony, & Nota, 1998).

Las destrezas que implican directamente las manos, denominadas como componentes o habilidades manuales, son evaluadas en parte con las herramientas mencionadas anteriormente para los MMSS. Sin embargo, para realizar un análisis profundo de los aspectos musculoesqueléticos que posibilitan la funcionalidad de la mano, se debería valorar de forma aislada otro tipo de componentes como la fuerza muscular o el rango de amplitud articular de las articulaciones con mayor implicación en la realización de AVD. El grado de fuerza muscular se interpreta habitualmente como un reflejo más de la funcionalidad de la mano que tiene la persona que padece una patología reumatológica (Stamm et al., 2002; Stern, Ytterberg, Krug, Mullin, & Mahowald, 1996). Aunque una adecuada fuerza muscular puede disminuir el dolor y mejorar la estabilidad articular (Cordery & Rocchi, 1998; Estes et al., 2000; Swanson & de Groot, 1985), el dolor en sí mismo puede provocar que su valoración tenga una fiabilidad baja (Nordenskiöld & Grimby, 1997; Stamm et al., 2002). Por esta razón debe medirse en periodos donde no exista inflamación de las articulaciones implicadas en el movimiento resistido que ejercen las pruebas utilizadas para la valoración de la fuerza. El dinamómetro suele ser la herramienta usada en el contexto clínico para evaluar de forma objetiva la fuerza muscular en determinados movimientos íntimamente conectados con la función de la mano. Estos movimientos se traducen en las diferentes pinzas realizadas con los dedos índice y pulgar necesarias para asir todo tipo de objetos y herramientas (MacDermid, Kramer, Woodbury, McFarlane, & Roth, 1994; Mathiowetz et al., 1985; Mathiowetz, Weber, Volland, & Kashman, 1984). El rango de movimiento o de amplitud articular es otra variable que se considera un indicador directo de la funcionalidad de la mano. La preservación de la movilidad dentro del arco articular normal mantiene la salud del cartílago, la lubricación de la articulación, facilita la función muscular, hace que se distribuyan la carga sobre el área más amplia posible y evita las rigideces articulares (Cordery & Rocchi, 1998; Estes et al., 2000; Palmoski, Colyer, & Brandt, 1980; Swanson & de Groot, 1985; Tiger, 1986). El rango de amplitud articular debería evaluarse de manera activa y pasiva, utilizando los principios de goniometría para la medición de las diferentes articulaciones de las falanges de las manos, en especial el índice y pulgar (Carey, Laird, Murray, & Stevenson, 2010; Engstrand, Krevers, & Kvist, 2012).

Por otra parte, la capacidad funcional de la mano y del miembro superior también puede verse modificada en función de constructos psicológicos como la autoeficacia, por tanto, dicha perspectiva también constituye una entidad susceptible de evaluación y tratamiento en los pacientes con AM. La autoeficacia se define como las creencias que las personas tienen sobre su capacidad para alcanzar un determinado nivel de éxito en las actividades que realizan. Dicho de otra forma, la creencia de que uno puede realizar de forma exitosa un comportamiento requerido para producir un resultado determinado (Bandura, 1982; Sitzmann & Yeo, 2013). Cuanta mayor es la autoeficacia percibida, más activo y persistente es el esfuerzo de la persona por conseguir diferentes metas (Østerås et al., 2014). Por esta razón, se le ha identificado habitualmente como un dominio de autoregulación (Sitzmann & Yeo, 2013; Vancouver & Day, 2005). La teoría que sustenta la autoeficacia propone que niveles adecuados de este tipo de percepción puede potenciar el desempeño en la actividad, graduando el nivel de esfuerzo y persistencia que se tiene hacia los objetivos (Bandura, 1977, 2012; Bandura & Locke, 2003; Sitzmann & Yeo, 2013). La promoción de la autoeficacia dentro del ámbito rehabilitador puede alentar la adopción y el mantenimiento de comportamientos saludables por parte del paciente y la habilidad de abandonar comportamientos que no favorezcan la salud. Existe un campo previo amplio de investigación referente a la relación directa entre la autoeficacia y el desempeño, donde más del 93% de los estudios han hallado que existe asociación entre ambas variables (Sitzmann & Ely, 2011; Sitzmann & Yeo, 2013). La autoeficacia parece aumentar la funcionalidad en un 28%, ayuda al establecimiento de objetivos, puede producir feedback durante el tratamiento y es un modificador potencial de comportamientos en el contexto rehabilitador (Sitzmann & Yeo, 2013; Stajkovic & Luthans, 1998). La autoeficacia también ha demostrado influir de forma positiva sobre el alivio del dolor, permitiendo que los pacientes busquen ayuda para manejar la sintomatología de la AM, reduciendo la ansiedad y tensión física e interpretando las sensaciones desagradables de una forma más benigna. De hecho, los pacientes con niveles más altos de autoeficacia han manifestado tener una intensidad de dolor más baja, menos discapacidad física y una mejor respuesta a los programas de tratamientos del dolor, respecto a los pacientes con un nivel de autoeficacia bajo (Koestler, 2010). Por tanto, las creencias de autoeficacia pueden afectar a la habilidad del paciente con artrosis para ajustar y manejar exitosamente el dolor y la discapacidad producida por esta enfermedad (Allegrante & Marks, 2003).

Los profesionales que trabajan en la rehabilitación de la mano, especialmente el terapeuta ocupacional, debería identificar los niveles de autoeficacia del paciente con AM. El estudio de Hellström, Lindmark, Wahlberg, y Fugl-Meyer (2003) mostró que los pacientes que habían sufrido un ictus y que tenían un nivel de autoeficacia bajo tenían una mejora clínica inferior, comparado con aquellos pacientes que tenían una percepción de autoeficacia mayor. El estudio de Harrison (2004), utilizando una muestra de pacientes con artrosis de rodilla, concluyó que la autoeficacia puede influir sobre el desempeño y la funcionalidad, explicando parte de la varianza de la funcionalidad en mujeres con esta patología. Gaines, Talbot, y Metter (2002) en un estudio realizado con pacientes con artritis sugirió que tener un nivel alto de autoeficacia aumenta la probabilidad de que las personas mayores participen en actividades físicas, y a la inversa, la participación en actividades físicas y de rehabilitación puede aumentar los niveles de autoeficacia y funcionalidad (Gaines et al., 2002). Por tanto, la autoeficacia parece estar unida y tener influencia sobre la función física y la funcionalidad (Buchmann, 1997; Hellström et al., 2003; Sitzmann & Yeo, 2013; Stajkovic & Luthans, 1998). Existen diferentes escalas que valoran la percepción de autoeficacia general en diferentes poblaciones. Sin embargo, aunque existen herramientas validadas para personas con artrosis como la Arthritis Self-efficacy scale (ASES), Arthritis Self-Efficacy Scale-8 Item (ASES-8), Chronic Disease Self-Efficacy Scale (CDSES), estas no están validadas para población española. Cuestionarios validados al castellano como la escala de autoeficacia general de Suárez, García, y Moreno (2000), aunque no es específica para la AM, ofrece una alternativa para la evaluación de la percepción subjetiva de eficacia que tiene el paciente a la hora de realizar de forma global sus actividades cotidianas (Suárez et al., 2000).

Por tanto, se recomienda que los profesionales de la salud dediquen esfuerzos a la creación de estrategias que potencien la autoeficacia, amortiguando así el efecto producido por las barreras percibidas al realizar los ejercicios terapéuticos prescritos. De esta forma, la autoeficacia constituirá un factor protector, utilizando intervenciones ajustadas a las necesidades del paciente (Hanan & Sahar, 2011). En el estudio de Magklara, Burton, y Morrison (2014), los niveles de autoeficacia postoperatoria estuvieron asociados a la recuperación de las variables medidas, como conseguir una mayor distancia y velocidad de deambulación, la repetición y frecuencia con la que realizan los ejercicios y la mejora respecto a la discapacidad general (Magklara et al., 2014). Sin embargo, aunque se ha estudiado la relación de la autoeficacia con múltiples factores en diferentes contextos y procesos de la enfermedad, hasta donde conocemos, aún no existe evidencia científica acerca de la relación entre los MMSS y este constructo psicológico. El conocimiento de cómo influye la funcionalidad y la discapacidad de los MMSS sobre la percepción de autoeficacia en personas con AM podría aportar una información valiosa para los profesionales del área de rehabilitación. Por tanto, aunque existen estudios que han evaluado la funcionalidad del miembro superior y la efectividad de programas de intervención rehabilitadora sobre estos, parece aún necesario el análisis del impacto de las destrezas y discapacidad de los MMSS sobre los niveles de autoeficacia en personas mayores con AM.

1.4 Abordaje terapéutico de la artrosis de mano.

El abordaje terapéutico de la AM se puede dividir en dos enfoques de intervención habitualmente complementarios, el tratamiento médico farmacológico-quirúrgico y no farmacológico o rehabilitador. De acuerdo con el Liga Europea, el manejo óptimo de la AM debe incluir ambos abordajes (Zhang et al., 2005). La revisión sistemática realizada por Towheed (2005) exploró la efectividad de terapias farmacológicas y no farmacológicas en pacientes con AM. Estos autores identificaron 31 randomised clinical trials (RCTs), pero destacaron la necesidad de que se realizasen este tipo de estudios con pacientes con AM. La revisión sistemática de Mahendira y Towheed (2009), incluyeron un total de 44 RCTs para actualizar la búsqueda anterior. Estos autores concluyeron que los estudios previos tenían una baja calidad, no definían bien la población, no utilizaban herramientas de evaluación estandarizadas y en pocas ocasiones describían los métodos utilizados para la aleatorización, blindaje y ocultación de la asignación de los participantes. Debido a estas limitaciones inherentes a los estudios publicados hasta el momento a nivel metodológico, estos autores afirman que es difícil ofrecer recomendaciones prácticas fiables para la elección de un abordaje terapéutico u otro en pacientes con AM, delegando este juicio a los propios profesionales sanitarios, que deben seleccionar el tipo de intervención más adecuado en cada caso clínico. Sin embargo, los autores si informaron que al menos existe alguna evidencia sobre la eficacia de diferentes estrategias, como el uso de algunos fármacos como la trolamina salicilato, fiorinal o proloterapia y estrategias rehabilitadoras como la intervención de TO o el uso de ejercicios de yoga (Towheed, 2005; Mahendira & Towheed, 2009).

Los principios terapéuticos subyacentes a la intervención médica farmacológica incluyen el alivio sintomático cuando existe dolor e inflamación, el mantenimiento o mejora funcional, el control general del impacto de la discapacidad física y evitar la posible toxicidad de la medicación (Estes et al., 2000). Por otra parte, los programas de manejo de este tipo de pacientes pueden ir también dirigidos al reposo de las articulaciones, evitar el sobreuso de las articulaciones afectadas y la derivación al personal sanitario rehabilitador (Culver & Fleegler, 1987; Estes et al., 2000; Stern & Ho, 1987; Tiger, 1986). En el tratamiento farmacológico suelen utilizarse diferentes estrategias. Los tratamientos de forma local suelen ser la primera opción cuando el paciente no presenta dolores severos ni existe afectación de un gran número de articulaciones. El paracetamol y los antiinflamatorios no esteroideos o AINES se han utilizado para el alivio del dolor, prefiriéndose el primero cuando el tratamiento es a largo plazo y los AINES cuando se pretende una mayor disminución del dolor y de la inflamación. Por otra parte, también se pueden utilizar los fármacos de acción sintomática lenta como la diacereína, el condrotín sulfato, el sulfato de glucosamina y el ácido hialurónico. (Linares Ferrando, 2010; Walker-Bone et al., 2000). La SER por su parte facilita las siguientes pautas de comportamiento ante la enfermedad para el propio paciente: "para el dolor provocado por la artrosis leve o moderada, va a ser suficiente con la toma de analgésicos simples que su médico le aconsejará. Durante los brotes inflamatorios deberá utilizar antiinflamatorios, mientras duren. Si no mejora con estos tratamientos, consulte con su especialista en Reumatología, porque en ocasiones es necesaria la inyección de corticoides y anestésicos en la articulación, para aliviar el dolor y la inflamación. Si el brote inflamatorio es leve puede ser suficiente combinar analgésicos simples con cremas o geles de antiinflamatorios. En la actualidad existe un grupo de fármacos denominados modificadores lentos de los síntomas de la artrosis o condroprotectores. Entre estos fármacos se incluyen el ácido hialurónico, el sulfato de glucosamina, la diacereina y el condroitin sulfato. Con este último fármaco hay evidencias clínicas de eficacia y seguridad en la artrosis de los dedos". El tratamiento médico-quirúrgico será prescrito para aquellos pacientes con sintomatología y una alteración funcional grave, que no hayan mostrado mejoría con el tratamiento farmacológico. Las intervenciones quirúrgicas más habituales en la AM son la artrodesis de la articulación TMC, cirugía sobre las partes blandas y artroplasias con resección parcial o total del trapecio. Estas intervenciones pueden lesionar el nervio y arteria radial, provocar neurinomas, cicatrices dolorosas con posibilidad de que se hipertrofien, infecciones y distrofia simpática refleja (Linares Ferrando, 2010).

Los abordajes terapéuticos no farmacológicos para pacientes con AM suelen incluir intervenciones como el uso de ortesis o férulas, protección de las articulaciones, la utilización de parafina caliente, acciones educativas e instrucción al paciente, o programas de ejercicios terapéuticos (Valdes & Marik, 2010). Diferentes profesionales del ámbito rehabilitador pueden verse involucrados en el proceso de recuperación funcional de estos pacientes, como el fisioterapeuta o el terapeuta ocupacional (Walker-Bone et al., 2000; Ye et al., 2011). De forma general, las intervenciones terapéuticas para estos pacientes suelen contener diferentes principios como el control del edema, la maximización del rango de movimiento, la potenciación de la fuerza, la movilidad de los articulaciones afectadas y no afectadas y la utilización de los principios de protección articular (PPA) (Estes et al., 2000). Antes de diseñar y elegir alguno de estos enfoques o principios o la combinación de varios de ellos, se deberían tener en cuenta la multitud de aspectos íntimamente relacionados con la AM.

En primer lugar, el sistema musculo esquelético funciona como una unidad compuesta por diferentes componentes que trabajan de forma eficaz. Por esta razón, un profundo entendimiento de los mecanismos inflamatorios y el aumento de la destrucción tisular también deben constituir la base del diseño de tratamiento no farmacológico de los pacientes con AM. En algunos casos esta enfermedad puede ser asintomática, excepto la aparición de problemas como llevar anillos, debido al engrosamiento óseo de las falanges por la formación exagerada de osteofitos, mientras que en otras personas puede acompañarse de periodos inflamatorios agudos (Burkholder, 2000). Un rango de movimiento reducido prolongado en el tiempo puede incrementar la AM, por esta razón, el mantenimiento de este dentro de la normalidad debe ser primordial para un control óptimo del dolor y de la función (Stamm et al., 2002). Controlar la sobrecarga y fuerzas ejercidas sobre la articulación, la mejora física general y el aumento de la fuerza muscular son posibles caminos para estabilizar el hueso y cartílago. Por otra parte, programas de intervención dirigidos a mejorar la funcionalidad de la mano en las AVD constituye otro aspecto esencial en el tratamiento de la AM (Cordery & Rocchi, 1998; Stamm et al., 2002).

En segundo lugar, los pacientes con AM pueden experimentar una disminución de la fuerza muscular, del rango de amplitud articular, un aumento de la fatiga y un decrecimiento de la resistencia, como resultado del dolor y la inflamación (Beasley, 2012; Semble, Loeser, & Wise, 1990). Sin embargo, según la revisión realizada por Beasley (2012), aún existe una evidencia moderada que apoye el uso de ejercicios con las manos en pacientes con artrosis para mejorar la fuerza de la prensión, la funcionalidad, rango de movimiento y reducción del dolor (Beasley, 2012; Valdes & Marik, 2010). Los programas de ejercicios terapéuticos deberían tener en cuenta tanto el proceso de la enfermedad, como el grado de inflamación, estabilidad de las articulaciones y la atrofia muscular (Beasley, 2012). La función muscular puede verse mejorada mediante ejercicios de fortalecimiento (Beasley, 2012; Stenström & Minor, 2003). Las actividades de bajo impacto como nadar o montar en bicicleta son mejores respecto a las de alto impacto, porque estas pueden contribuir a las exacerbaciones y al aumento de la frecuencia de aparición de los brotes inflamatorios (Beasley, 2012). La movilidad articular irrigará al cartílago articular avascular con fluido sinovial, aportando los nutrientes necesarios para la matriz de la articulación (Beasley, 2012).

Diferentes enfoques o aproximaciones rehabilitadoras y compensatorias han demostrado mejoría en diferentes habilidades, destrezas y componentes funcionales después de su utilización en pacientes con AM. Las diferentes estrategias utilizadas habitualmente en el ámbito clínico para este tipo de pacientes han sido:

- **Prescripción de ortesis o férulas**. Este tipo de estrategia suele utilizarse para disminuir el dolor, la deformidad, la inflamación, el estrés mecánico sobre las articulaciones, mejorar la estabilidad articular, promover la alineación adecuada de las articulaciones y potenciar la funcionalidad (Beasley, 2012). En un estudio donde se organizaron sesiones individuales sobre equipamiento adaptado, consejos estructurados, la prescripción de una férula de tela semiestable y una férula de cuero sin estabilizar para la mejora del primer CMC, se demostró que estas intervenciones parecen reducir la necesidad de cirugía en esta articulación (Berggren, Joost-Davidsson, Lindstrand, Nylander, & Povlsen, 2001; Valdes & Marik, 2010). En otro trabajo donde se utilizaron ortesis rígidas de reposo (nocturnas) hechas a medida, utilizando material de neopreno sobre la articulación CMC, el uso de este tipo de ortesis redujo el dolor y aumentó la funcionalidad de la mano (Rannou et al., 2009; Valdes & Marik, 2010). En otro estudio donde se utilizó ortesis hechas a medida para mejorar el dolor y la funcionalidad de la mano en dolor crónico de muñeca, estas aumentaron la funcionalidad de la mano, el desempeño en las AVD y la prensión, además de disminuir el dolor y la rigidez (Thiele, Nimmo, Rowell, Quinn,

& Jones, 2009; Valdes & Marik, 2010). Los participantes del estudio de Weiss, LaStayo, Mills, y Bramlet (2000, 2004), utilizaron la ortesis cada vez que el paciente presentaba sintomatología en el pulgar, tanto de día como de noche. El uso de la ortesis con esta periodicidad ayudó a estabilizar la articulación CMC, disminuyó el dolor y mejoró el desempeño en las AVD (Valdes & Marik, 2010; Weiss et al., 2000, 2004). En el estudio de Buurke, Grady, De Vries, y Baten, (1999), se evaluó la preferencia del paciente ante tres tipos de ortesis, la primera hecha de material elástico flexible, la segunda de material elástico, pero con material semi-rígido para la primera falange, y la tercera de material semi-rígido. Después de aplicar los tres tipos de ortesis a todos los participantes, el 80% refirió la necesidad de usar una órtesis de forma permanente y el 20% eligió la ortesis semi-rígida (Valdes & Marik, 2010; Buurke et al., 1999). El estudio de Gomes et al. (2010) evaluó la efectividad de las ortesis funcionales sobre la articulación TMC en personas con AM. Estos autores concluyeron que el uso de ortesis durante la realización de las AVD tiene capacidad para reducir el dolor, pero no mejora la funcionalidad, la fuerza de prensión, de la pinza o las destrezas (Gomes et al., 2010).

- **Principios de protección articular (PPA)**. Este abordaje debería iniciarse de forma temprana para disminuir el estrés articular y los posibles daños traumáticos (Beasley, 2012). De forma general, los PPA son el respeto del dolor, el equilibrio entre los periodos de descanso y de actividad (pautas para conseguir un nivel de actividad adecuado), el ejercicio en un rango de amplitud libre de dolor, evitar posiciones que favorezcan la deformidad, reducir el esfuerzo, y las fuerzas ejercidas sobre la articulación que puedan ser perjudiciales. Se deben usar las palancas naturales de movimiento, mediante el uso de grupos articulares y musculares generales, que tengan mayor fuerza y que permitan recaer las fuerzas sobre las articulaciones más proximales (Beasley, 2012; Cordery, 1965; Cordery & Rocchi, 1998). Dicho de otra forma, los PPA son las directrices que guían los movimientos durante realización de las AVD, con el objetivo de reducir la sobrecarga en el cartílago articular y hueso subcondral. Estos principios incluyen:

- Reducir la excesiva carga sobre una articulación, usando mecanismos corporales adecuados y materiales, herramientas u objetos de poco peso (Cordery & Rocchi, 1998; Estes et al., 2000).
- Evitar dolor durante la actividad, aumentando el fortalecimiento muscular, utilizando ortesis estabilizadoras y ayudas técnicas, además de una modificación de la secuencia de pasos de las AVD (Cordery & Rocchi, 1998; Estes et al., 2000).
- Buscar equilibrio entre los periodos de actividad y descanso para evitar el agotamiento y fatiga muscular y el sobreuso de determinadas articulaciones, que ayuden a aliviar la sintomatología inflamatoria y evite que los brotes sean más continuos en el tiempo, provocando así una progresión más lenta de la enfermedad (Cordery & Rocchi, 1998; Estes et al., 2000). El paciente debe comprender que tiene derecho al descanso pautado y que la rigidez puede prevenirse utilizando las articulaciones de una forma adecuada. Este debe conocer que son factores que pueden contribuir a la inflamación y al dolor (Estes et al., 2000; Schreuer, Palmon, & Nahir, 1994).
- Evitar el posicionamiento estático de las articulaciones durante periodos mayores de 15-20 minutos, disminuyéndose de esta forma la rigidez (Cordery & Rocchi, 1998; Estes et al., 2000).

– **Equipamiento y técnicas adaptativas.** Suelen recomendarse para reducir la cantidad de esfuerzo o sobrecarga realizada con las articulaciones que se ven más expuestas durante el desempeño de ciertas AVD. Este tipo de ayudas también promueven la alineación articular, la utilización de las palancas corporales, como el uso global de los MMSS, y la incorporación de los PPA (Beasley, 2012; Hammond & Freeman, 2004). Cuando se realiza una prensión o una pinza manual para coger un objeto, la fuerza ejercida se trasmite a las articulaciones, produciendo una posible inestabilidad articular si esta no se distribuye de forma equitativa (Beasley, 2012). A medida que aumentamos el grosor del mango de una herramienta, se reduce la fuerza realizada con las articulaciones más distales o de menor tamaño. A modo de ejemplo, en las manos sin patología, el mango más confortable es el que tiene una longitud del 19,7% del tamaño total de la mano y una empuñadura cilíndrica de 33 milímetros de diámetro (Beasley, 2012; Kong & Lowe, 2005; Sancho-Bru, Giurintano, Perez-Gonzalez, & Vergara, 2003). Por otra parte, para disminuir la fuerza de tiro-empuje sobre una herramienta, el mango cilíndrico debería ser paralelo a la dirección del movimiento (Beasley, 2012; Seo, Armstrong, & Young, 2010).

- **Modalidades de terapia física**. Este tipo de intervención tiene como objetivos la disminución de la inflamación, dolor y rigidez articular. El frío causa vasoconstricción, reduciendo los mediadores químicos asociados a la inflamación. Este puede tener un efecto analgésico sobre la irritación y disminuye la velocidad de conducción nerviosa, enlenteciendo la transmisión de información de las vías sensoriales y motoras (Beasley, 2012; Welch et al., 2002). El frio aplicado durante un periodo de 10 a 15 minutos ayudará a reducir el dolor y el edema, aunque habrá que tener en cuenta la influencia que este puede tener sobre la rigidez (Estes et al., 2000). El calor puede transmitirse mediante mecanismos de conducción, convección y conversión. Este aumenta el flujo sanguíneo a través de la vasodilatación, la permeabilidad capilar, la velocidad de contracción de las fibras musculares, la conducción nerviosa, la ratio de metabolismo celular y la extensibilidad de las fibras de colágeno, disminuyendo el dolor, aunque puede provocar un aumento de la inflamación y del edema en periodos inflamatorios (Beasley, 2012; Estes et al., 2000; Welch et al., 2002). Algunos estudios han abordado la efectividad de la aplicación de los principios de la termoterapia (Brosseau et al., 2003b; Valdes & Marik, 2010; Welch et al., 2002). Por otra parte, el uso de ultrasonidos puede aumentar la mejora de la inflamación mediante la activación de mediadores que actúan sobre esta. Además, puede facilitar la permeabilidad celular y la movilización de histamina (Beasley, 2012; Brosseau et al. 2003a). La decisión de aplicar o no un medio físico debe razonarse clínicamente. Deberá valorarse si el tiempo dedicado a este tipo de intervención debe ocuparse en otro tipo de enfoques como adquirir la habilidad de colocarse correctamente la ortesis, la realización de un programa de ejercicios en casa o cerciorarse de que los objetivos terapéuticos se ciñan realmente a las necesidades funcionales del paciente (Estes et al., 2000).

- **Acciones educativas**. La educación dirigida al paciente es crucial en el logro de resultados positivos durante la rehabilitación de pacientes reumatológicos (Estes et al., 2000). El conocimiento del proceso de la enfermedad y el pronóstico por parte del paciente, puede disminuir la sintomatología de ansiedad, producida ante la incertidumbre del estado de salud futuro, y aumentar la adherencia al tratamiento (Culver & Fleegler, 1987; Estes et al., 2000; Swanson & de Groot, 1985; Tiger, 1986). La educación debería dirigirse hacia la adecuada alineación de las articulaciones y el uso de equipamiento adaptado (Beasley, 2012; Cordery, 1965; Cordery & Rocchi, 1998). La SER ha elaborado el siguiente manual con consejos prácticos para que el paciente con AM pueda utilizarlos en su vida diaria: "(1) utilice aparatos eléctricos para exprimir, pelar o batir alimentos, así como para abrir latas; (2) utilice lavaplatos y secadora, si es posible; (3) no aguante mucho peso con las manos y utilice un carrito; (4) use utensilios de cocina ligeros, hechos de plástico o aluminio, y con mangos gruesos; (5) póngale asas a los vasos o tazas, o bien cójalas con las dos manos; (6) no desenroscar, utilizar abridores; (7) sujete los platos por debajo con las palmas de las manos y no por los lados para evitar efectuar la pinza con el índice y el pulgar; (8) para abrir puertas evite el uso de pomos, mejor manillas o palanca; (9) en la ropa es preferible el uso de velcro con el fin de evitar abotonar y desabotonar; (10) no sujete bolsas con la mano, distribuya el peso en antebrazo y hombro; (11) no sujetar libros con la mano, utilice un atril; (12) para escribir utilice lapiceros o bolígrafos gruesos; (13) no utilizar grifo de rosca, sino de monomando" (Sociedad Española de Reumatología, 2016).

- **Programas de ejercicios terapéuticos**. Estudios previos han mostrado que los ejercicios terapéuticos pueden producir beneficios en pacientes con artrosis, sin los efectos negativos que produce la sobrecarga articular en el cartílago y la aceleración de la formación de osteofitos (Coppard, Gale, & Jensen, 1998; Lockard, 2000). Entre las terapéuticas actuales, los ejercicios se han desarrollado en diferentes contextos como el domicilio de los pacientes con AM. El estudio de Roger y Wilder

(2009) evaluó si existían diferencias entre un programa a domicilio diario basado en ejercicios de la mano y la aplicación de una crema neutra de manos sin fármaco en personas con AM. Los resultados mostraron que la realización de los ejercicios a domicilio mejoró de forma moderada la fuerza de la mano respecto al otro grupo (Rogers & Wilder, 2009). Otras investigaciones han evaluado la efectividad del entrenamiento general e implicando todas las partes del cuerpo. Rogers y Wilder (2007) valoró el efecto del entrenamiento del cuerpo completo y ejercicios de agarre/prensión sobre la fuerza de la mano, dolor y funcionalidad. Los resultados mostraron un fortalecimiento de la musculatura general, una disminución del dolor y un aumento de la fuerza de prensión estática y dinámica (Beasley, 2012; Rogers & Wilder, 2007). En el trabajo de Garfinkel, Schumacher, Husain, Levy, y Reshetar (1994), un programa de técnicas de relajación y yoga fue comparado con un programa de tratamiento farmacológico. Después de las sesiones de yoga, disminuyó el dolor y hubo un aumentó la fuerza de prensión (Garfinkel et al., 1994; Valdes & Marik, 2010). Sin embargo, otros estudios han focalizado su atención en la efectividad de intervenciones centradas en componentes de la funcionalidad del miembro superior de forma aislada como la fuerza o el rango de movimiento. En el estudio de Lefler y Armstrong (2004), el grupo experimental realizó un entrenamiento diario mediante ejercicios para aumentar la fuerza y al grupo control se le animó a continuar realizando las actividades normales de su vida diaria. La fuerza de la prensión y el rango de movimiento aumentaron después de la ejecución de estos ejercicios (Lefler & Armstrong, 2004; Valdes & Marik, 2010). Sin embargo, algunos estudios han mostrado que el uso de la fuerza de la pinza de forma resistida puede provocar que los pacientes abandonen este tipo de protocolos de ejercicios, debido al aumento de la sintomatología de la mano (Beasley, 2012; Rogers & Wilder, 2009; Valdes & Marik, 2010). A su vez, los programas de ejercicios que trabajan los rangos de movimiento han demostrado ser más efectivos que los enfocados a mejorar de forma aislada la fuerza de la pinza (Beasley, 2012; Stamm et al., 2002).

- **Combinación de varias estrategias de intervención**. En la literatura podemos encontrar evidencia de la efectividad de la combinación de diferentes estrategias del abordaje rehabilitador. En el estudio de Boustedt, Nordenskiöld, Nilsson (2009) se realizó una comparación entre la combinación de ortesis diurnas y nocturnas, más la aplicación de compresas calientes, sesiones educativas de protección articular y ejercicios a domicilio, respecto a varias sesiones educativo-comportamentales. El dolor y la rigidez se redujeron en mayor medida tras la combinación de las primeras técnicas respecto a las sesiones educativas (Boustedt et al., 2009; Valdes & Marik, 2010). En el estudio de Stamm et al. (2002), el grupo experimental fue incluido en un programa de ejercicios de mano a domicilio y de educación para la protección articular. El grupo control solo recibió información general sobre la AM. La combinación de los PPA más el programa de ejercicios a domicilio, aumento la fuerza de prensión y la funcionalidad general de la mano (Stamm et al., 2002).

La revisión reciente de Valdes y Marik (2010) pretende servir de guía terapéutica para la toma de decisiones clínicas cuando los objetivos de tratamiento son el alivio del dolor, prevención de la deformidad de las articulaciones y un aumento de la funcionalidad de la mano en personas con AM. Esta realizó una búsqueda de los estudios comprendidos entre 1986 y 2009 y concluyó que las técnicas con mayor apoyo en la literatura científica fueron el uso de ortesis, ejercicios manuales, aplicación de calor y educación sobre protección articular, combinada con la prescripción de ayudas técnicas, adaptativas o equipamiento adaptado y la potenciación de la fuerza de prensión (Valdes & Marik, 2010). Ocho de los nueve estudios recopilados encontraron que los ejercicios realizados provocaron un aumento de la fuerza de prensión en un rango del 1,94-25% respecto a la situación basal. Existe una evidencia moderada de que los ejercicios de la mano aumentan la fuerza de prensión, la funcionalidad, el rango de amplitud articular y la reducción del dolor. Asimismo, la evidencia es moderada para la efectividad de la educación sobre protección articular y prescripción de equipamiento adaptativo para el aumento de la funcionalidad de la mano y reducción del dolor. Por último, existe una alta evidencia sobre la efectividad del uso de ortesis en la articulación CMC para disminuir el dolor en las manos y la mejora de la función de estas (Valdes & Marik, 2010). Otras revisiones han evaluado la literatura previa sobre la efectividad de intervenciones específicas como la terapia de spa (Françon & Forestier, 2009).

1.5 Principios terapéuticos y evidencia científica de Terapia Ocupacional para el tratamiento de la artrosis de mano.

Los principios generales de intervención de Terapia Ocupacional (TO) están centrados en el aumento de las habilidades y destrezas para conseguir un correcto desempeño en las actividades ocupacionales y AVD, además de maximizar la independencia y autonomía del paciente (Clark et al., 1997; Stamm et al., 2002). La ocupación y las actividades con sentido y con propósito son parte de la raíz histórica de la TO, atribuyéndoles propiedades para mejorar la salud y prevenir la discapacidad (Lin, Wu, Tickle-Degnen, & Coster, 1997; Stamm et al. 2000). En la AM, la intervención del terapeuta ocupacional puede incluir la protección articular, el entrenamiento de las AVD y la realización de ejercicios funcionales. El objetivo principal es mantener y mejorar la funcionalidad de las articulaciones de las manos afectadas (Clark et al., 1997; Stamm et al., 2002). Estudios previos han señalado que la intervención sobre aspectos motivacionales (volitivos) y componentes psicológicos puede revertir positivamente sobre la funcionalidad física (Cordery & Rocchi, 1998; Estes et al., 2000). Por esta razón, la rehabilitación de TO debe ser holística, teniendo en cuenta aspectos como la significatividad de las tareas durante el tratamiento y valorando la percepción subjetiva del paciente durante el desempeño de las AVD.

Para que el proceso de rehabilitación sea significativo para el paciente y adquiera sentido, la intervención debería basarse en la inclusión de los principios terapéuticos de la AM en la realización de actividades ocupacionales cotidianas y conocidas por este. Estas actividades deben ser analizadas, graduadas y modificadas previamente por el terapeuta, utilizando la herramienta básica de este profesional, el "análisis de la actividad", para que de esta forma puedan identificarse las denominadas "implicaciones terapéuticas" subyacentes a cada actividad. Las actividades seleccionadas y adaptadas a las necesidades de cada paciente y su patología involucrarán a este a largo plazo, recibiendo un feedback continuo en su desempeño (Estes et al., 2000). De igual forma, el trabajo de la funcionalidad en las diferentes actividades puede tener una mayor relevancia clínica para el tratamiento de la AM que el aumento aislado de las destrezas y funciones, como por ejemplo la potenciación de la fuerza muscular. En esta línea, algunos trabajos diseñaron programas para el fortalecimiento muscular sin obtener un gran aumento de la fuerza muscular (Lefler & Armstrong, 2004; Østerås et al., 2014; Rogers & Wilder, 2009) y, sin embargo, un estudio que utilizó ejercicios de flexibilidad como intervención, obtuvo un aumento significativo en la fuerza de prensión, ya que este estaba orientado a un propósito funcional (Østerås et al., 2014; Stamm et al., 2002).

Para la utilización de actividades como herramienta de intervención rehabilitadora en los pacientes con AM debe tenerse en cuenta multitud de factores propios de la enfermedad. En primer lugar, en relación al control de la fuerza muscular, para que una persona manipule eficientemente un objeto se requiere de un control preciso de la fuerza de prensión. Durante la manipulación de los objetos, las fuerzas realizadas para la prensión deben ajustarse para no ser excesivas, como para romper o deformar el objeto, o demasiado pequeñas, provocando la caída de este (de Oliveira et al., 2011; Gorniak, Zatsiorsky, & Latash, 2010; Johansson, 2002). Estas fuerzas se modifican en base a las propiedades físicas de los objetos como el peso, la textura o la forma, el tipo de prensión o pinza y la velocidad del movimiento que exija el manejo del objeto (de Oliveira et al., 2011; Johansson, 2002; Johansson & Westling, 1987). La eficiencia del sistema nervioso central para controlar las fuerzas ejercidas durante la prensión se puede observar a través de los cambios que aparecen cuando una persona realiza una tarea compleja, donde estas fuerzas deben ir modificándose. Cuando existe un error de ajuste entre la fuerza ejercida por la persona y la necesaria para coger el objeto, los individuos sanos solo necesitan un ensayo para calibrar correctamente la fuerza necesaria. Sin embargo, las personas con AM parecen tener alterado varios componentes implicados en la adaptabilidad necesaria para la manipulación de los objetos (de Oliveira et al., 2011; Hermsdörfer, Elias, Cole, Quaney, & Nowak, 2008; Johansson, 2002; Johansson & Westling, 1987; Quaney, Nudo, & Cole, 2005). De Oliveira et al. (2011) evaluó el control de la fuerza de prensión en pacientes con AM durante la tarea de levantar un objeto. Los resultados mostraron que los participantes con AM eran capaces de ejecutar el movimiento correctamente, atendiendo a parámetros temporales y de magnitud de la fuerza de prensión, pero demostraron una latencia y fuerza desproporcionada respecto a los participantes sanos. Estos resultados indicaron que los pacientes con AM parecen presentar limitaciones y cierta alteración en la prensión de objetos (de Oliveira et al., 2011). Por tanto, se debería prestar especial atención a la calibración y calidad de los movimientos, más que a la mera potenciación de la fuerza muscular de la prensión. Para ello, quizás no sea suficiente la realización de ejercicios que impliquen una resistencia al movimiento, sino la incorporación de movimientos resistidos de forma dinámica, incluidos en diferentes ángulos espaciales. De esta forma, la información sensorial superficial y profunda (propioceptiva y kinestésica), sumada a la aferencia visual, podrían aumentar la información de los propios movimientos recibida por el sistema nervioso central. Esta información ha podido verse mermada por el desuso de la musculatura de la mano, secundaria a la kinesiofobia provocada por el dolor producido en los diferentes brotes inflamatorios. El aumento de dicha información, adquirida a nivel cerebral, podría estimular a su vez la calidad de la ejecución de los movimientos en los parámetros temporal y espacial. Esta mejora también podría aumentar la percepción de eficacia que el paciente tiene sobre su propio desempeño y sobre la funcionalidad de sus manos. Por estas razones, de Oliveira et al. (2011) concluyeron que los resultados de su estudio sugerían la necesidad de diseñar protocolos de rehabilitación dirigidos a normalizar el control de la fuerza de la prensión en personas con AM, para así conseguir una mejor manipulación de los objetos y herramientas cotidianos.

En segundo lugar, la dosificación, intensidad y la capacidad de repetición requiere también de una serie de adaptaciones o peculiaridades en la AM. Stamm et al. (2002) afirmaron que los ejercicios resistidos del programa de intervención que implantaron en su estudio produjo un aumento de la fuerza, pero también podría haber causado cierto daño en el cartílago articular de las articulaciones de la mano, siendo más susceptibles de este daño las personas con menor fuerza muscular. Es decir, la utilización de una prensión con una fuerza exagerada y de forma repetitiva se ha relacionado con el aumento del riesgo de desarrollar sintomatología de AM, mientras un fortalecimiento apropiado de la mano puede ayudar a prevenir y tratar esta patología (Stamm et al., 2002). Además, estos autores sugirieron que, pese a que la mayor parte de los participantes informaron un beneficio subjetivo cuando estaban recibiendo el programa de ejercicios a domicilio, algunas personas no se sintieron cómodas con el programa terapéutico estandarizado que recibieron y varios participantes solicitaron procedimientos más específicos, dirigidos a mejorar los problemas provocados por la AM en el desempeño de sus AVD. En este estudio se sugirió que los ejercicios deberían incluirse dentro de actividades que tuvieran un fin en sí mismas, reemplazando así los programas tradicionales de ejercicios por tratamientos que impliquen actividades que sean significativas para el paciente (Bernard, 1992; Lin et al., 1997; Stamm et al., 2002). En estas actividades se deben incluir movimientos activos y con una resistencia ligera (Coppard et al., 1998; Stamm et al., 2002). Aunque la movilidad de las articulaciones dentro de un plan de ejercicios se conoce que ayuda a lubricar y aumentar la difusión de nutrientes al cartílago articular, existe la necesidad de un mayor número de resultados científicos que estudien los beneficios y efectividad de intervenciones que incluyan ejercicios dirigidos a la funcionalidad y destrezas realizadas con los MMSS y las manos (Beasley, 2012).

Por tanto, una intervención de TO con un enfoque intermedio debería aunar las ventajas de un programa de ejercicios estandarizado clásico, con el que puede monitorizarse fácilmente al paciente y que requiere menos tiempo, y utilizar una actividad analizada y adaptada a las necesidades terapéuticas de la población con AM, para provocar así cambios a nivel musculoesquelético, psicológico y funcional. Los programas de rehabilitación deberían ser multidimensionales, potenciando la funcionalidad de la mano, mejorando el desempeño ocupacional, aumentando la percepción de autoeficacia y aportando estrategias para el afrontamiento de la enfermedad. A los pacientes se les debería animar a involucrarse en actividades que aumenten la funcionalidad global de la mano (Kjeken et al., 2005). El terapeuta deberá observar y monitorizar todas las articulaciones y tejidos de los MMSS mientras el paciente realiza la actividad, para asegurarse que los movimientos se están llevando a cabo adecuadamente, sin compensaciones y sin riesgo de daño articular. En estos casos, la observación debe seguir los PPA, evitando posturas o movimientos que impliquen dolor o una sobrecarga de la musculatura con una función de soporte o apoyo articular (Lockard, 2000). Cuando el terapeuta monitorice las articulaciones debe preguntar por la presencia de dolor y crepitaciones. Los movimientos realizados durante los ejercicios deben analizarse biomecánicamente para determinar los efectos negativos potenciales de la actividad sobre las articulaciones, sobre todo cuando el paciente no presenta sintomatología. Se debe tener en cuenta las cargas compresivas o las fuerzas de reacción que aparecen sobre la superficie de las articulaciones tras la fuerza producida por las contracciones musculares durante la ejecución de los movimientos o la estabilización de las articulaciones (Lockard, 2000). Las actividades que se seleccionen para la intervención deberían minimizar estas fuerzas de compresión. Se debería tener en cuenta que el dolor en diferentes partes de los MMSS puede provocar una reducción de la fuerza de prensión y de la pinza, debido al desuso. Se debería considerar que, aunque el paciente necesita cierta fuerza para mantener la funcionalidad, no se puede provocar estrés o sobrecarga en las estructuras implicadas en los movimientos de prensión o de pinza. La sobrecarga mediante ejercicios de pinza podría incluso agravar la sintomatología localizada en las articulaciones del pulgar. La fuerza de compresión en la articulación basal del pulgar cuando se realiza una pinza lateral puede llegar a ser doce veces superior a la producida en la pinza dígito-digital (Cooney, Lucca, Chao, & Linscheid, 1981; Lockard, 2000). Los ejercicios para la rehabilitación de las manos tendrían además que implicar cambios en la dirección de los movimientos para asegurar que estos no sobrecargan las articulaciones ni favorecen la aparición de deformidades (Beasley, 2012; Dunlop et al., 2005).

Investigaciones previas han estudiado la efectividad de intervenciones realizadas por terapeutas ocupacionales en la AM. Un estudio de TO comparó tres estrategias terapéuticas como, (1) la provisión de información y demostración del uso apropiado de las manos; (2) instrucciones o guía por escrito de ejercicios de manos para realizarlas en casa; y (3) prescripción de ayudas técnicas para las AVD. La instrucción sobre la protección articular unido al programa de ejercicios a domicilio aumentó la funcionalidad general de la mano (Moratz, Muncie, & Walsh, 1985; Valdes & Marik, 2010; Walker-Bone et al., 2000). Dziedzic et al. (2011) publicaron un protocolo de intervención de TO, que dos años más tarde publicaron en versión extendida, aportando los resultados obtenidos tras la ejecución de este (Dziedzic et al. 2011; Dziedzic et al., 2013). En estos estudios concluyeron que los terapeutas ocupacionales pueden ser profesionales que apoyen el automanejo de las personas mayores con AM y que la utilización de los PPA pueden ser un abordaje efectivo a medio plazo (Dziedzic et al., 2011; Dziedzic et al., 2013). El estudio de Adams et al. (2012) diseñó y publicó un protocolo de intervención para pacientes con Artritis Reumatoide, incluyendo la figura del TO como parte de la intervención rehabilitadora de estos pacientes. En este protocolo se utilizó PPA, consejos sobre ejercicios generales, el uso de ortesis funcionales y de ayudas técnicas, en comparación con un programa de ejercicios de fortalecimiento y estiramiento muscular. Estos autores sugirieron que la aplicación de este protocolo podría aportar mayor evidencia sobre el apoyo o rechazo del uso de programas de ejercicios optimizados para el tratamiento de la Artritis Reumatoide (Adams et al., 2012). Posteriormente, Williams et al. (2015), publicaron los resultados obtenidos tras la implantación del protocolo mencionado anteriormente, sugiriendo que añadir programas de ejercicios para la muñeca y manos en la Artritis Reumatoide es clínicamente efectiva y que existe un buen equilibrio coste-efectividad cuando se compara respecto a la sola provisión de los cuidados habituales (Williams et al., 2015).

Ya que no existen intervenciones que modifiquen la enfermedad y los tratamientos farmacológicos de la AM están limitados al alivio sintomático, la efectividad de los tratamientos no farmacológicos debería estudiarse en mayor profundidad. Aunque los ejercicios se han recomendado como núcleo central del tratamiento de personas con AM, la mayor parte de estudios se han realizado con personas con artrosis de rodilla y cadera. Además, el número de estudios que evalúan la efectividad de programas de ejercicios en personas con AM es limitado y muestran una efectividad moderada (Østerås et al., 2014). Aunque el terapeuta ocupacional provee un medio para educar y dar apoyo social al paciente con AM, existen pocos estudios que evalúen la intervención específica de este profesional. A pesar de la ausencia de estudios controlados randomizados sobre intervenciones mediante el uso de la actividad de manera terapéutica, existe una amplitud de evidencia histórica y anecdótica sobre la efectividad de estos tratamientos en la práctica clínica. Asimismo, las indicaciones precisas para la derivación al terapeuta ocupacional en AM permanecen aún sin explorar. Por tanto, existe la necesidad de valorar la efectividad de protocolos de intervención de TO en los pacientes con AM (Walker-Bone et al., 2000). Por otra parte, tampoco se han desarrollado estudios que evalúen la efectividad de un programa de rehabilitación para la mejora de las habilidades y destrezas de MMSS mediante el uso de una actividad manipulativa de laborterapia en este tipo de pacientes reumáticos con dolor crónico.

1.6 Justificación de la tesis.

Los pacientes con AM constituyen una población en riesgo continuo de pérdida de la funcionalidad, autonomía, independencia, motivación y la percepción de autoeficacia debido a las manifestaciones clínicas asociadas. Los síntomas y características de los pacientes con AM han sido ampliamente estudiados, sin embargo, hasta donde conocemos, no existe evidencia sobre cómo influyen estos síntomas, en especial, los relacionados con la funcionalidad y discapacidad de los MMSS y manos sobre la percepción de autoeficacia general.

Las intervenciones terapéuticas realizadas para la mejora de los componentes alterados en pacientes con AM como la fuerza, el rango de movimiento, la coordinación o las destrezas motoras se han centrado en la mejora aislada de estos, utilizando ejercicios que implican movimientos artificiales, repetitivos y exclusivos del ámbito clínico. Sin embargo, se ha demostrado un déficit de adherencia a este tipo de intervenciones, probablemente porque los pacientes no se sienten motivados por las tareas diseñadas para el tratamiento de esta patología. Utilizar una AVD analizada, graduada y diseñada previamente por el terapeuta con el fin de adaptarla a las necesidades de mejora del paciente con AM, puede tener un potencial motivador y de adherencia del paciente al proceso de rehabilitación. Determinadas actividades cotidianas pueden modificarse con el objetivo de que estas adquieran un potencial terapéutico, ya que implican ciertos componentes físicos que permiten mejorar alteraciones y sintomatología encontrada en los pacientes con AM. No se han encontrado estudios publicados que aborden la aplicación estandarizada de un programa rehabilitador basado en la utilización de una actividad cotidiana como tratamiento en pacientes con AM, ni de su combinación con los principios terapéuticos clásicos de protección articular, potenciación muscular y articular y el mantenimiento de la percepción adecuada de desempeño y motivación.

De esta forma, la hipótesis general de esta tesis doctoral es que factores o componentes físicos de funcionalidad y discapacidad de los MMSS y de las manos del paciente con AM pueden estar relacionados y pueden ser FR de la percepción de autoeficacia general. Además, un protocolo de TO especifico mediante el desarrollo de una actividad manipulativa con un objetivo funcional preestablecido, podría tener un efecto beneficioso de forma inmediata y a corto plazo sobre la funcionalidad de los miembros superiores y percepción subjetiva de autoeficacia en personas mayores institucionalizadas que padecen AM.

De forma específica, la hipótesis de partida para el primer estudio de la tesis doctoral fue que la discapacidad de los miembros superiores, la fuerza de las pinzas realizadas con las manos, la coordinación y destreza de los miembros superiores y el rango de amplitud articular activa de los dedos de la mano son características que influyen sobre la autoeficacia general percibida en personas mayores institucionalizadas con AM.

La hipótesis de partida para el segundo estudio fue que la implementación de un protocolo de intervención de Terapia Ocupacional para personas mayores institucionalizadas con AM, consistente en una actividad manipulativa de laborterapia durante un periodo de dos meses, mejorará individualmente la independencia y funcionalidad general para las actividades básicas e instrumentales de la vida diaria de estos pacientes así como la funcionalidad del miembro superior, las destrezas propias de la mano y la percepción subjetiva de autoeficacia.

1. INTRODUCTION

1.1 Osteoarthritis: definition, epidemiology, pathogenesis and socioeconomic cost.

The Osteoarthritis Research Society International (OARSI) defines osteoarthritis (OA) as a global disease of the joints affecting not only the cartilage, but also the tendons, periarticular muscles, the joint capsule, ligaments and subchondral bone (Henrotin & Berenbaum, 2010). It is a disorder involving movable joints, characterized by cell stress and extracellular matrix degradation initiated by micro- and macro-injury that activates maladaptive repair responses including pro-inflammatory pathways of innate immunity (Osteoarthritis Research Society International, 2016).

According to the American College of Rheumatology, OA is characterised by erosion of articular cartilage, either primary or secondary to trauma or other conditions, which becomes soft, frayed, and thinned with eburnation of subchondral bone and outgrowths of marginal osteophytes (American College of Rheumatology, 2016). In Spain, the *Sociedad Española de Reumatología* (SER) defines OA as a rheumatic pathology that damages the articular cartilage (*Sociedad Española de Reumatología* 2016, paragraph 1). In other words, OA is a degenerative articular pathology characterised by changes in the integrity of the cartilage and the subchondral bone (Alonso Ruiz, 2010).

In the field of research, OA has been defined as a common, chronic musculoskeletal disorder characterised by complete changes in joint structure (Kjeken et al., 2005; Walker-Bone, Javaid, Arden, & Cooper, 2000). OA, therefore, can be said to belong to a group of conditions associated with a defective integrity of the articular cartilage and changes in the underlying bone structure (Beasley, 2012). Other definitions are based on changes observed in x-ray images, on the presence of joint-related symptoms, or on both. The most common definition of OA combines the presence of radiographic findings and the almost daily occurrence of joint pain (Altman et al., 1986; EUMUSC, 2014). However, despite international efforts to define OA, it is currently considered to be not a single disease, but rather a heterogeneous group of diseases with similar clinical manifestations and shared pathological and radiological changes (Fernández-López, 2010). The disease usually affects the joints of the hands, feet, hips and knees (Kjeken et al., 2005; Stamm et al., 2002), although it can also involve the cervical and lumbar spine and the shoulders (*Sociedad Española de Reumatología* 2016, paragraph 1).

In 2003, OA was the sixth leading cause of disability worldwide, and by 2020 is expected to occupy the fourth place in this ranking (Silverwood et al., 2015; Woolf & Pfleger, 2003). As OA develops progressively over many years, incidence of the condition is hard to calculate. However, it has been estimated that 1 in 10 individuals over the age of 60 present significant clinical manifestations of this disease. Incidence of OA increases dramatically in both men and women over the age of 50, reaching a peak between the ages of 70 and 79 (EUMUSC, 2014). Any comparison of data on the prevalence of this disease, however, is hampered by differences in age groups, inclusion criteria and diagnostic criteria among epidemiology studies (EUMUSC, 2014). In the United States, approximately 12% of individuals between the ages of 25 and 75 present OA (Dennison & Cooper, 2003; Gomes, Jones, & Natour, 2010; Kjeken et al., 2005), while in Brazil, the disease is estimated to affect between 6% and 12% of the adult population (Gomes et al., 2010). In Spain, OA is the most prevalent osteoarticular pathology (Altman et al., 1986; González et al., 2011), affecting between 6% and 20% of individuals over the age of 20 (González et al., 2011). According to the EPISER study, nearly 50% of the over-50 age group show radiological signs of knee OA (Carmona, 2011; Carmona, Ballina, Gabriel, & Laffon, 2001), and nearly 25% of adults over the age of 55 years have presented at least 1 episode of knee pain over a 1-year period, probably indicative of incipient OA (Peat, McCarney, & Croft, 2001; Silverwood et al., 2015). The study published by González et al. (2011) showed that 8.8%, 2.2% and 11.2% of the Spanish population suffers from arthritis of the knee, the hands and the spinal column, respectively (González et al., 2011). In our context, incidence is low among the under-40 age group, although the number of cases gradually increases after this age, and the disease becomes quite prevalent in individuals aged between 51 and 60 (Dennison & Cooper, 2003; Gomes et al., 2010; Moreira, & Carvalho, 2001). In the general population, estimates suggest that symptomatic OA affects nearly twice as many women as men in the over-60 age group (9.6% of men, and 18% of women) (Bedson, Jordan, & Croft, 2005; Silverwood et al., 2015).

In terms of pathogenesis, OA can be presented as radiographic findings of erosion of the subchondral bone (Beasley, 2012; Roach & Tilley, 2007). Changes in articular cartilage and subchondral bone result from the chondrocytes failing to maintain a necessary balance of the extracellular matrix. The cause of cartilage destruction is not fully understood, although it has been related to several risk factors (RF). It is important to identify RFs for OA, as these can predict the onset or detain the progression of this disease (Fernández-López, 2010). According to some classification systems, these factors can be divided into 2 major groups: chemical-metabolic factors and mechanical factors (Beasley, 2012). The first group is characterised by changes in the proliferation and differentiation of chondrocytes, together with changes in the synthesis of the components of the extracellular matrix. In early stages of the disease, these changes are evidenced by the appearance of fibrillations, matrix depletion, cell clusters, and changes in the quantity, distribution and composition of the proteins of the extracellular matrix. In the more advanced stages, the pathological process is characterised by a weakening of the joints, the appearance of fibrillations, ulcers, and progressive loss of joint cartilage due to the activation or inhibition of various anabolic and catabolic enzymes that modulate cartilage biosynthesis and degradation (Beasley, 2012; Katz, Agrawal, & Velasquez, 2010). Mechanical factors that can exponentially increase the risk of developing OA, meanwhile, usually include abnormal loading of the joint due to repeated trauma, heavy labour, joint instability, and obesity (Beasley, 2012; Roach & Tilley, 2007). These factors appear to activate the chondrocytes to produce degradative enzymes (Beasley, 2012; Erggelet & Mandelbaum, 2008), and the process of destruction of the osteocartilaginous structures commences. It is at this point that the joint cartilage starts to lose its capacity to absorb the shocks produced by movement. Other risk factors associated with this pathology are advanced age and familial predisposition. Although OA is not a hereditary disease, insofar as no established pattern of inheritance has been described, there does seem to be a genetic risk component and this, together with other factors, can increase the likelihood of individuals with a family history of OA developing the disease (Fernández-López, 2010). Age can affect cartilage insofar as ageing cartilage contains less water and fewer chondrocytes. This diminishes the capacity of the cells to restore and maintain the cartilage in optimal conditions (Beasley, 2012). In Spain, RFs associated with knee OA are: over 50 years of age, residence in a rural area, primary education or less, occupation that requires considerable physical effort, osteoporosis, lower social class, obesity, and presence of other comorbid pathologies (Ayala & Fernández-López, 2007; Fernández-López, 2010; Fernández-López, Laffon, Blanco, Carmona, & EPISER Study Group, 2008).

During the last decade, much progress has been made in understanding the molecular changes involved in OA and the role of the immune system, and new pharmacological therapies have been developed to control inflammation and joint erosion. Despite these advances, however, OA, like other rheumatological pathologies, remains a chronic condition (Beasley, 2012; Hafstrom et al., 2009; Klareskog, Catrina, & Paget, 2009; van Tuyl et al., 2009). According to the American College of Rheumatology, OA is characterised by changes in articular cartilage, changes in the structure of bone joints, deterioration of tendons and ligaments, coupled with a certain degree of inflammation of the joint lining or synovium (American College of Rheumatology, 2016). The most relevant pathological changes are increased bone density (sclerosis), asymmetric narrowing of the joint spaces, loss of cartilage, and the formation of new, irregular shaped bone spurs (osteophytes). All these changes can be observed on radiographic images (Burkholder, 2000). OA manifests first as a molecular derangement (abnormal joint tissue metabolism) followed by anatomic, and/or physiologic derangements (characterized by cartilage degradation, bone remodelling, osteophyte formation, joint inflammation and loss of normal joint function) that can culminate in illness (Osteoarthritis Research Society International, 2016). Chondrocytes are the cells found in cartilage, and are essential to maintain the homoeostasis of the extracellular matrix. Osteoarthritic cartilage contains fewer chondrocytes than healthy cartilage, and changes occur in the expression of catabolic proteases (Monfort-Faure & Trujillo-Martín, 2010). Inflammation is another important factor in the pathological progression of this disease, and usually involves hypertrophy of the synovial membrane of the affected joint. Histologically, this inflammatory process can cause synovial hyperplasia, with increased expression of synoviocytes and even angiogenesis. The inflammation is mediated by proteins, such as cytokines, molecules, such as eicosanoids, and free radicals, such as nitric oxide (Monfort-Faure & Trujillo-Martín, 2010). This inflammation causes the subchondral bone to become sclerotic, dense, and to lose quality due to poor, disorganised mineralisation (Monfort-Faure & Trujillo-Martín, 2010).

From the socioeconomic perspective, OA carries a heavy burden. The progressive ageing of the world's population, with a life expectancy of over 70 years in 80% of the population, is one of today's most pressing social problems. In socioeconomic terms, this points to an exponential increase in the need for comprehensive care of OA patients in the future (Kraus, 1997; Stamm et al., 2002). In Spain, OA is considered the leading cause of permanent disability (Batlle-Gualda, 2010). However, few studies have addressed the socioeconomic impact of this disease. Most authors have focussed on the consumption of resources arising from medical consultations and the need for complementary tests and treatment (Batlle-Gualda, 2010). In Spain, the ArtRoCad study conducted in 2005 by the SER and the *Sociedad Española de Medicina Rural y Generalista* evaluated the socioeconomic impact and use of healthcare resources in the context of patients with hip and knee OA. The study found that, in the preceding 6 months, a sample of 1,071 OA patients from all over Spain had made a total of 6,495 visits to their primary care physician, with a mean number of one visit per month per patient, and 1,069 visits to the specialist. Most (85%) received treatment to alleviate the symptoms of the disease at a total annual cost of €254,770,168 (Gualda, 2005). A study comparing the cost of the different pharmacological treatments used in these patients found chondroitin sulphate to be the most economical, with better gastrointestinal tolerability than the nonsteroidal anti-inflammatory drugs (NSAID) traditionally used in OA (Terrés, 2010). The study published by Tudela, Marqués, Moreno, and Bucher (2004) concluded that, in line with current clinical practice guidelines, paracetamol is the treatment of choice from an economic perceptive, based on cost-minimisation, efficacy and safety criteria. In Spain, the annual cost of consultations by OA patients is €1,031,158,497, with the cost of tests totalling €330,531,070, and the total cost of treating OA estimated at €4,834,953,966 (Gualda, 2005). The economic impact of gonarthrosis (knee OA), meanwhile, is particularly high due to the number of days taken off work associated with this disease (Lorenzo & Díaz, 2010).

1.2 Hand OA: definition, prevalence, clinical manifestations and diagnostic criteria.

According to the SER, hand OA is a benign disease involving degeneration of the cartilage of the joints of the hand that can cause pain, difficulty in moving the fingers, and deformity (*Sociedad Española de Reumatología* 2016, paragraph 1). Hand OA has been defined as a chronic, degenerative disease for which there is currently no cure. It is the most common type of OA, and usually affects the carpometacarpal (CMC) joint of the thumb and the proximal and distal interphalangeal joints (Altman et al., 1990; de Oliveira, Nunes, Aruin, & dos Santos, 2011; Egger et al., 1995; Stamm et al., 2002).

According to the European League Against Rheumatism, hand OA is a highly prevalent condition that commonly, though not exclusively, occurs in the context of generalised OA, and can result in considerable disability (Zhang et al., 2009). Overall prevalence of symptomatic hand OA is generally estimated at between 13% and 26% (Ye, Kalichman, Spittle, Dobson, & Bennell, 2011; Zhang et al., 2009). Onset usually occurs between the ages of 40 and 50, although it can also start later in life (Gomes et al., 2010; *Sociedad Española de Reumatología* 2016, paragraph 1). It is more common among women over the age of 50 (Beasley, 2012; Dequeker, Aerssens, & Luyten, 2003; Kalichman & Hernández-Molina, 2010). The prevalence of hand OA varies across studies. In the USA, it affects 75% of women aged between 60 and 70 (Dennison & Cooper, 2003; Kjeken et al., 2005; Valdes & Marik, 2010). In Europe, meanwhile, a prevalence study carried out in Holland in 2005, based on radiological records, estimated that 67% of women and 54.8% of men presented OA in at least 1 hand joint (Gomes et al., 2010). In Italy, a study in individuals over the age of 65 estimated the prevalence of OA to be 14.9% (Carmona Ortells, 2010). In Spain, according to the EPISER study, hand OA has a prevalence of 6.2%. In terms of age, no cases of OA are reported in the under-40 age group, while prevalence in the population 40 to 49 years old is 1.1%; in the 50-59 age group it is 6.7%; in the 60-69 age group it is 15.3%; and in the 70-79 age group it is 23.9%. Prevalence among individual over the age of 80 is 17.3% (Fernández-López et al., 2008). Although hand OA presents in both men and women, it is more common in the latter (Ye et al., 2011; Zhang et al., 2009). In Spain, prevalence of hand OA among women 40 to 49 years old is 2%; in the 50-59 age group it is 10.6%; in the 60-69 age group it is 24.4%; in the 70-79 age group it is 29.9%; and in women over 80, prevalence is 23.4%. The mean overall percentage of women presenting OA in Spain is 9.5% (Fernández-López et al., 2008).

Many different RFs have been associated with hand OA since the disease was first studied. However, the most common RFs reported in the literature are age, female sex, and genetic predisposition. Other suggested RFs include occupations factors, repeated joint trauma, long-term manual labour involving excessive gripping movements and repeated use of the hands (de Oliveira et al., 2011; Kalichman & Kobyliansky, 2009; Linares Ferrando, 2010). Many studies have investigated the joints most commonly involved in hand OA. The most common sites are the CMC of the thumb (21%), the trapeziometacarpal (TMC) joints (35.8%), the metacarpophalangeal (MCP) joints (8.2%), the proximal interphalangeal joints (18.2%) and the distal interphalangeal joints (between 35% and 47.3%) (Beasley, 2012; Berenbaum, 2008; Dahaghin et al., 2005; Fumagalli, Sarzi-Puttini, & Atzeni, 2004; Gomes et al., 2010; Kalichman & Hernández-Molina, 2010; Kloppenburg, 2007; *Sociedad Española de Reumatología* 2016, paragraph 2; Valdes & Marik, 2010; Wilder, Barrett, & Farina, 2006). In half (50%) of all patients with involvement of the distal interphalangeal joints, the disease also affects the proximal interphalangeals (Beasley, 2012; Kaufmann, Lögters, Verbruggen, Windolf, & Goitz, 2010). This type of patient typically presents some kind of deformity. The distal interphalangeal joints can present the deformity known as mallet finger, and lateral deviation or boutonnière deformities can be found in the proximal interphalangeals (Beasley, 2012; Fumagalli et al., 2005).

With regard to symptoms, the primary clinical manifestations of hand OA are pain, stiffness, inflammation, numbness and deformity of the finger joints (Bagis, Sahin, Yapici, Cimen, & Erdogan, 2003; de Oliveira et al., 2011; Kalichman & Kobyliansky, 2009; Thyberg, Hass, NordenskiÖld, Gerdle, & Skogh, 2005). Pain and loss of hand function can limit the number and scope of manual activities performed on a daily basis and undermine the quality of life of OA hand patients (de Oliveira et al., 2011; Stamm et al., 2002). Symptoms can vary considerably with respect to the presence, importance and impact of hand OA on the patient's life. In the early stages of the disease, patients usually feel well during the morning, with pain being directly proportional to joint overload. However, in later stages the pain becomes constant, and can disturb the patient's sleep patterns

(Burkholder, 2000; Chaisson et al., 1997). Pain, disability and loss of quality of life have a considerable impact on the patient's daily routine (Estes, Bochenek, & Fasler, 2000). Negative functional consequences of hand OA are directly related to pain, loss of hand mobility and grip strength, and limitations in daily activities (Valdes & Marik, 2010), above all those that involve use of the upper limbs (de Oliveira et al., 2011). Similarly, the interphalangeal joints of the hand are essential for the activities of daily living (ADL). These activities can be hampered by joint instability, pain, loss of range of motion and muscle strength (Culver & Fleegler, 1987; Estes et al., 2000; Stern & Ho, 1987).

Although certain criteria have been developed to define hand OA, diagnosis is difficult due to the number of joints and the broad spectrum of changes involved, together with the existence of special situations (Zhang et al., 2009). Hand OA is usually diagnosed on the basis of the results of a clinical evaluation, x-ray findings, and the patient's clinical history (Altman et al., 1990; Burkholder, 2000; Estes et al., 2000). A detailed clinical history includes information relating to previous medical conditions, the patient's medication, their occupation and leisure pursuits, the onset and progression of symptoms, and the patient's functional capacity (Estes et al., 2000). The initial examination includes a comprehensive, bilateral evaluation of strength and range of movement, both active and passive, of the upper limbs. It is important to examine all the joints of the hand to check for the presence of local lesions and how these affect the use of unaffected upper limb joints. The extent and location of swelling should also be noted, and the presence and extent of deformities should be identified and described (Estes et al., 2000). The physical examination of the hands involves evaluating sensitivity and the presence of subluxations, and differentiating joint irregularities and cartilage loss from tendonitis before these findings are apparent on x-rays (Altman et al., 1990; Estes et al., 2000; Swanson & de Groot, 1985). The severity or stage of OA is determined on the basis of the narrowing of the space between the joints, the formation of osteophytes and the presence of subchondral sclerosis (Burkholder, 2000).

According to the American College of Rheumatology, diagnostic criteria for hand OA are: pain in the hand, together with at least 3 of the following symptoms (Alonso Ruiz, 2010; Altman et al., 1990):

- Enlargement of more than 2 of 10 selected joints, 2nd and 3rd proximal interphalangeals, 2nd and 3rd distal interphalangeals, and the TMC joints of both hands.

- Enlargement of 2 or more distal interphalangeal joints.

- Numbness in less than 3 MCP joints.

- Deformity of at least 1 of 10 selected joints, 2nd and 3rd proximal interphalangeals, 2nd and 3rd distal interphalangeals, and the TMC joints of both hands.

In 2009, the European League Against Rheumatism analysed 184 proposals for establishing the characteristics, criteria and recommendations for hand OA on a European level. This led to the publication of a series of recommendations that differ from the objectives of the American College of Rheumatology. The European League aims to (1) guide clinical personnel in the diagnosis of hand OA, and not classify it for research purposes; (2) emphasise the possible existence of subtypes of hand OA and establish the criteria needed for differential diagnoses; (3) draw up recommendations applicable for all hand OA patients based on a broad range of scientific evidence; and (4) use reliable instruments, such as Delphi studies and the criteria of clinical experts from different countries to avoid European League recommendations being subject to personal bias. In this way, the European League aims to help clinicians identify which statements relating to hand OA have been previously approved, and which aspects of this condition are more open to the individual interpretation of healthcare professionals. Following 3 rounds of anonymous Delphi consultations, consensus was reached on 10 characteristics and common diagnostic criteria for hand OA (Zhang et al., 2009):

1. RFs for hand OA include female sex, increasing age over 40, menopausal status, family history, obesity, higher bone density, greater forearm muscle strength, joint laxity, prior hand injury, and occupation- or recreation-related use of the hand.
2. Typical symptoms of hand OA are pain on usage and only mild morning or inactivity stiffness affecting just 1 or a few joints at any one time. Symptoms are

often intermittent. With such typical features, a confident clinical diagnosis of hand OA can be made in adults aged over 40.

3. Clinical hallmarks of hand OA are Heberden and Bouchard nodes and/or bony enlargement with or without deformity (e.g., lateral deviation of interphalangeal joints, subluxation and adduction of thumb base) affecting characteristic target joints (distal interphalangeal joints, proximal interphalangeal joints, thumb base and index and middle MCP joints).
4. Functional impairment in hand OA may be as severe as in rheumatoid arthritis. Function should be carefully assessed and monitored using validated outcome measures.
5. Patients with polyarticular hand OA are at increased risk of knee OA, hip OA and OA at other common target sites (generalised OA).
6. Recognised subsets of hand OA can have different FRs, requiring different assessment and management. These subsets include interphalangeal joints OA (with or without nodes), thumb base OA and erosive OA. Each may be symptomatic or asymptomatic.
7. Erosive hand OA targets interphalangeal joints and shows radiographic subchondral erosion, which may progress to marked bone and cartilage attrition, instability and bony ankylosis. Typically, it has an abrupt onset, marked pain and functional impairment, inflammatory symptoms and signs (stiffness, soft tissue swelling, erythaema, paraesthesiae), mildly elevated C-reactive protein levels and a worse outcome than non-erosive interphalangeal joints OA.
8. The differential diagnosis for hand OA is wide.
9. A posteroanterior radiograph of both hands on a single film/field of view is adequate for diagnosis. Classical features are joint space narrowing, osteophyte, subchondral bone sclerosis, subchondral cyst and subchondral erosion. Further imaging modalities are seldom indicated for diagnosis.
10. Blood tests are not required for diagnosis of hand OA but may be required to exclude coexistent disease.

1.3 Definition and evaluation of the degree of upper limb disability and perceived self-efficacy in hand OA patients.

The International Classification of Functioning, Disability and Health - ICF defines disability as an umbrella term for impairment (problems in bodily systems and structures), activity limitations and participation restrictions. The information generated by the patient's diagnosis together with their level of disability can give a broader, more detailed picture of their health status (World Health Organization, 2001). Disability is directly related to individual capacity, which describes the patients’ ability to perform and certain task or action. This capacity indicates the individual's maximum ability to carry out a particular action at a particular time. Kjeken et al. (2005), showed that hand OA has a significant impact on physical function, manifested as activity limitations and social participation restrictions. These functional changes are related to reduced hand motion, loss of grip force, pain experienced during resisted motion, and activity- and participation-related problems (Kjeken et al., 2005). The thumb seems to contribute 60% of the overall movement of the hand, and is typically affected in hand OA patients (Dickson & Morrison, 1979; Gomes et al., 2010; Kjeken et al., 2005).

Evaluation of functional capacity should take into account performance in all occupational areas and in both basic and instrumental ADLs (Estes et al., 2000). The ability to perform these activities should be evaluated and rated by direct observation of the patient to identify which ADLs they can and cannot perform and the degree of help needed to carry out these activities. Functional limitations associated with hand OA include problems wringing out washcloths and opening bottles, a 60% reduction in grip force, and restricted mobility of the hands (Valdes & Marik, 2010). These patients can also experience difficulties in, or be wholly incapable of, gripping, holding or handling heavy objects or manipulating small objects (Culver & Fleegler, 1987; Estes et al., 2000; Stern & Ho, 1987). They also have difficulties with activities related to personal care, such as fastening buttons, holding a toothbrush, cutting their food with a knife, spreading butter on a piece of toast. Other limitations related to hobbies include mowing the lawn or playing cards, while domestic activities such as cooking and cleaning, and occupational skills such as using a keyboard are also affected (Estes et al., 2000). Inability to perform ADLs, fear that the disease will progress, loss of motion, or dependency on others can lead to depression and anxiety (Estes et al., 2000). Hand OA, moreover, is not recognised by society as a common, serious pathology, a situation that could deprive patients of the emotional support they need to cope with the changes experienced in the life style, daily routine, socialising and general motivation (Estes et al., 2000).

An evaluation of upper limb disability and function can be undertaken from 2 perspectives: an analysis of problems encountered by the patient in performing their daily activities due to upper limb injury, or an evaluation of the different factors that enable the upper limbs to function normally and provide the patient with an acceptable degree of independence and autonomy.

With regard to the first approach, Schoneveld, Wittink and Takken (2009) published a systematic review of the literature on the validity of the most commonly used measurement tools. The authors concluded that the DASH is the most extensively studied tool, and has good psychometric quality for evaluating disabilities of the upper limbs. The study also found that the DASH to be suitable for any type of upper limb injury, and analyses upper limb impairment as a whole (Beaton et al., 2001; Gummesson, Atroshi, & Ekdahl, 2003; Hudak et al., 1996; MacDermid & Tottenham, 2004; McClure & Michener, 2003; Schoneveld et al., 2009; SooHoo, McDonald, Seiler, & McGillivary, 2002; Wong, Fung, Chu, & Chan, 2007). The DASH, however, is less successful in evaluating hand OA patients presenting comorbidities that affect upper limb joints. In these cases, it can be difficult to determine the extent to which the disability is caused by OA or by co-existing conditions. Nevertheless, on a practical level, provided these conditions remain stable during treatment and no new conditions arise that could impair the affected joints, changes in DASH scores can be also be attributed to the therapeutic effect of the treatment given (Schoneveld et al., 2009). Despite the development of tools for evaluating hand function in patients with OA-like pathologies, such as the "Arthritis Hand Function Test", these have not been validated in Spain (Backman & Mackie, 1997), and are therefore not considered suitable for clinical or research purposes.

With regard to the second approach, motor components such as upper limb coordination and manual dexterity must be taken into consideration. The Purdue Pegboard Test, the Nine

Hole Peg Test, the Box and Blocks Test, and the Grooved Pegboard Test are just some examples of tests that have been validated for use in healthy adults with traumatic hand injuries or degenerative hand conditions (Buddenberg & Davis, 2000; Mathiowetz, Rogers, Dowe-Keval, Donahoe, & Rennells, 1986; Schmidt, Oliveira, Rocha, & Abreu-Villaca, 2000; Schoneveld et al., 2009; Shahar, Kizony, & Nota, 1998).

The ability to perform actions with the hands, called manual dexterity, is evaluated in part by the foregoing upper limb measurement tools. However, for an in-depth analysis of the musculoskeletal factors involved in hand function, other components such as muscle strength or range of motion of the joints more heavily involved in ADLs should be evaluated separately. Muscle strength is usually considered to reflect the hand function of individuals with some kind of rheumatic pathology (Stamm et al., 2002; Stern, Ytterberg, Krug, Mullin, & Mahowald, 1996). Although good muscle strength can reduce pain and improve joint stability (Cordery & Rocchi, 1998; Estes et al., 2000; Swanson & de Groot, 1985), pain in itself can undermine the accuracy of the evaluation (Nordenskiöld & Grimby, 1997; Stamm et al., 2002). For this reason, muscle strength should be measured when the joints involved in performing the resisted motion tests are not swollen. In clinical practice, a dynamometer is often used to obtain an objective evaluation of the muscle strength present in certain hand movements, which include different pinching and gripping movements performed with the thumb and first finger to grasp objects and tools (MacDermid, Kramer, Woodbury, McFarlane, & Roth, 1994; Mathiowetz et al., 1985; Mathiowetz, Weber, Volland, & Kashman, 1984). Range of motion is also considered to be a direct indicator of hand function. Conservation of the normal range of motion keeps the cartilage healthy, ensures the joint is lubricated, facilitates muscle function, distributes the load over the widest area possible, and prevents joint stiffness (Cordery & Rocchi, 1998; Estes et al., 2000; Palmoski, Colyer, & Brandt, 1980; Swanson & de Groot, 1985; Tiger, 1986). Range of motion should be measured both actively and passively, using goniometry to measure range in finger joints (Carey, Laird, Murray, & Stevenson, 2010; Engstrand, Krevers, & Kvist, 2012).

The functional capacity of the hand and upper limbs can also be affected by psychological factors, such as perceived self-efficacy, and this should also be evaluated and treated in hand OA patients. Perceived self-efficacy is defined as an individual's beliefs regarding their capability to succeed and attain a given level of performance (Bandura, 1977; Sitzmann & Yeo, 2013). In other words, the belief that one is capable of successfully engaging in the behaviour required to achieve a particular outcome (Bandura, 1982; Sitzmann & Yeo, 2013). The greater the individual's perceived self-efficacy, the more they will actively and persistently pursue different aims (Østerås et al., 2014). This is why this phenomenon is usually associated with the self-regulation domain (Sitzmann & Yeo, 2013; Vancouver & Day, 2005). According to self-efficacy theory, good perception of self-efficacy can enhance performance by escalating the level of effort that is expended, and enhancing the persistence required to achieve self-set goals (Bandura, 1977, 2012; Bandura & Locke, 2003; Sitzmann & Yeo, 2013). Promoting self-efficacy in the context of rehabilitation can encourage patients to adopt and maintain healthy habits and help them abandon unhealthy behaviours. The relationship between self-efficacy and performance is a broad field of research in which over 93% of studies have confirmed the correlation between these variables (Sitzmann & Ely, 2011; Sitzmann & Yeo, 2013). Studies suggest that self-efficacy increases function by 28%, helps set goals, can give feedback during treatment, and has the potential to modify behaviours during rehabilitation (Sitzmann & Yeo, 2013; Stajkovic & Luthans, 1998). Self-efficacy has also been shown to have a positive effect on pain management, allowing patients to seek help to manage the symptoms of hand OA, reducing anxiety and physical stress, and helping patients downplay their discomfort. Indeed, patients with a high degree of self-efficacy report less pain and disability and respond better to pain management programmes than those with a low level of self-efficacy (Koestler, 2010). Self-efficacy, therefore, can have a positive effect on the ability of the OA patient to successfully adapt to and cope with the pain and disability caused by this disease (Allegrante & Marks, 2003).

Clinicians specialised in hand rehabilitation, particularly occupational therapists, should determine the patient's level of self-efficacy. The study published by Hellström, Lindmark, Wahlberg and Fugl-Meyer (2003) showed that stroke patients with a low level of self-efficacy showed less pronounced clinical improvement than those with high self-efficacy.

Harrison (2004), in a series of patients with knee OA, concluded that self-efficacy affects functional performance outcomes. Self-efficacy accounted for some of the variance in physical performance of function among women with this pathology. Gaines, Talbot, and Metter (2002), in a study of patients with arthritis, suggested that high self-efficacy increases the likelihood of elderly individuals taking part in physical activity, while participation in physical activities and rehabilitation exercises can improve functional performance outcomes (Gaines et al., 2002). Self-efficacy, therefore, is linked to and affects physical performance and function (Buchmann, 1997; Hellström et al., 2003; Sitzmann & Yeo, 2013; Stajkovic & Luthans, 1998). Various scales have been developed to evaluate perceived self-efficacy in different populations. However, although some have been validated for OA patients, such as the Arthritis Self-efficacy Scale (ASES), Arthritis Self-Efficacy Scale-8 Item (ASES-8) and Chronic Disease Self-Efficacy Scale (CDSES), they have yet to be validated in Spain. Validated Spanish questionnaires, such as the general self-efficacy scale developed by Suárez, García, and Moreno (2000), although not specific to hand OA, can be used to evaluate overall a patient's subjective perception of efficacy in the performance of their usual activity (Suárez et al., 2000).

Healthcare professionals should make every effort to develop strategies that enhance self-efficacy, thus offsetting the negative effect of perceived exercise barriers during physical therapy. In this way, self-efficacy fulfils a protective function by tailoring exercise to the needs of each patient (Hanan & Sahar, 2011). Magklara, Burton, and Morrison (2014) found that postoperative self-efficacy is associated with the normalisation of variables measured, such a longer distance ambulation, walking speed, exercise repetition and frequency, and less disability (Magklara et al., 2014). However, although studies have explored the correlation between self-efficacy and various factors in different health contexts and processes, to the best of our knowledge there is still no scientific evidence showing the relationship between upper limbs and this psychological construct. Insight into how upper limb performance and disability affects perceived self-efficacy in hand OA patients could be of considerable value to rehabilitation specialists. Therefore, although some studies have evaluated upper limb function and the effectiveness of rehabilitation programmes on these structures, none have so far analysed the impact of upper limb dexterity and disability on self-efficacy in elderly hand OA patients.

1.4 Treatment of hand OA.

Treatment of hand OA can be divided into 2 approaches that typically complement each other: medical and surgical treatment, and non-pharmacological treatment or rehabilitation. According to the European League, optimal management of hand OA must include both approaches (Zhang et al., 2005). In a systematic review, Towheed (2005) explored the effectiveness of pharmacological and non-pharmacological therapy on hand OA patients. The authors identified 31 RCTs, but highlighted the need for RCTs in hand OA patients. In an update of the foregoing study, Mahendira and Towheed (2009) published a further systematic review that included a total of 44 RCTs. The authors concluded that the earlier studies were of poor quality, did not adequately define the population, did not use standard evaluation tools, and the methods used for randomization, blinding, and allocation concealment were rarely described. According to the authors, inherent methodological limitations in these studies make it difficult to offer any reliable practical recommendations for the choice of appropriate therapy in subjects with hand OA, and it is up to the clinician to decide the best approach in each case. Nevertheless, the authors found at least some evidence for the efficacy of various pharmacological therapies, including trolamine salicylate, fiorinal or dextrose prolotherapy, or rehabilitation techniques, such as occupational therapy (OT) or yoga (Towheed, 2005; Mahendira & Towheed, 2009).

The underlying principles of medical therapy include relieving symptoms when pain and inflammation are present, maintaining or improving function, limiting physical disability, and avoiding drug toxicity (Estes et al., 2000). Hand OA management programmes may also include strategies to allow the joints to rest and avoid overuse of the affected joints, and referral to physiotherapists (Culver & Fleegler, 1987; Estes et al., 2000; Stern & Ho, 1987; Tiger, 1986). A variety of pharmacological therapies are used. Local treatment is usually the first choice when only a few joints are affected and patients report mild to moderate pain. Paracetamol and nonsteroidal anti-inflammatory drugs have been used for pain management. The former is preferred for long-term treatment, while anti-inflammatory drugs are used for stronger pain relief and to reduce inflammation. Symptomatic slow-acting drugs, such as diacerein, chondroitin sulphate, glucosamine sulphate and hyaluronic acid, can also be used (Linares Ferrando, 2010; Walker-Bone et al., 2000). The SER, for its part, makes the following recommendations for hand OA patients: pain caused by mild to moderate osteoarthritis can be successfully managed with simple analgesics prescribed by your doctor. Episodes of inflammation, while they last, should be treated with anti-inflammatory drugs. If no improvement is perceived, consult your rheumatologist, as injections of steroids and local anaesthetics are sometimes needed to manage pain and inflammation. In the case of mild inflammation, the use of simple analgesics combined with anti-inflammatory creams or ointments will often suffice. A group of drugs called "symptomatic slow-acting drugs" or chondroprotective agents, have been developed to treat osteoarthritis. These include hyaluronic acid, glucosamine sulphate, diacerein and chondroitin sulphate. There is clinical evidence that chondroitin sulphate to be both safe and effective in the treatment of OA in the fingers. Surgical treatment is prescribed in patients with severe symptoms and functional impairment that have not improved with pharmacological treatment. The most common surgical interventions in hand OA are soft tissue arthrodesis of the TMC joint and arthroplasty with total or partial resection of the trapezium bone. This procedure can injure the nerve and radial artery, and can cause neurinoma, painful scar tissue with a risk for hypertrophy, infection, and reflex sympathetic dystrophy (Linares Ferrando, 2010).

Non-pharmacological therapy for hand OA patients usually includes the use of orthoses or splints, joint protection principles (JPP), hot paraffin, patient education and instruction in various techniques, or therapeutic exercise programmes (Valdes & Marik, 2010). Different rehabilitation specialists, including physiotherapists and occupational therapists, can become involved in helping these patients recover hand function (Walker-Bone et al., 2000; Ye et al., 2011). Generally speaking, therapeutic interventions in these patients pursue a variety of goals, such as reducing inflammation, maximising range of motion, strengthening muscles, mobilising both affected and unaffected joints, and the use of joint protection principles (Estes et al., 2000). Before designing a particular strategy or choosing one or a combination of these approaches or principles, clinicians should consider the many different factors associated with hand OA.

First, the different components of the musculoskeletal system must function as an integrated unit for optimum efficacy. This is why any non-pharmacological strategy for treating hand OA patients must be based on an in-depth understanding of the mechanisms causing inflammation and increased tissue destruction. In some patients, hand OA can be asymptomatic, except for some difficulty wearing rings due to enlargement of the phalanges following the formation of osteophytes, while in others it can be accompanied by episodes of acute inflammation (Burkholder, 2000). A reduced range of motion may increase the risk of OA, and maintaining a normal range of motion is essential for optimal function and pain control (Stamm et al., 2002). Avoiding overloading or applying pressure to joints, improving general health status and building up muscle strength can help stabilise bones and cartilage. Intervention programmes aimed at improving hand function when engaging in ADLs are also essential in the treatment of hand OA (Cordery & Rocchi, 1998; Stamm et al., 2002).

Secondly, in patients with hand OA muscle strength, range of motion and endurance can decrease and fatigue increase as a result of pain and inflammation (Beasley, 2012; Semble, Loeser, & Wise, 1990). Nevertheless, according to the review published by Beasley (2012), there is still moderate evidence to support hand exercises in OA for increasing grip strength, improving function and range of motion, and reducing pain (Beasley, 2012; Valdes & Marik, 2010). Therapeutic exercise programmes should take into account the arthritic process, including the amount of inflammation, joint stability, and muscle atrophy (Beasley, 2012). Muscle function can be improved by strengthening exercises (Beasley, 2012; Stenström & Minor, 2003). Low-impact activities such as swimming, walking, and cycling are better than high-impact activities that may contribute to exacerbations and increase the frequency of episodes of joint inflammation (Beasley, 2012). Joint mobility bathes the avascular articular cartilage with synovial fluid providing necessary nutrients to the joint matrix (Beasley, 2012).

Different rehabilitation and compensatory approaches or techniques used in hand OA patients have been shown to improve different skills, manual dexterity, and functional components. The following are the different strategies commonly used in clinical practice:

- **Orthoses or splints**. These are usually prescribed to control pain, minimize deformities, reduce inflammation, decrease stress to the joints and improve stability, facilitate correct joint alignment, and increase function (Beasley, 2012). In a study in which patients were given individual sessions with adaptive devices, structured advice, and either a semistable textile splint or a non-stabilising leather splint to improve function of the carpometacarpal joint of the thumb, these interventions were shown to reduce the need for CMC surgery (Berggren, Joost-Davidsson, Lindstrand, Nylander, & Povlsen, 2001; Valdes & Marik, 2010). In another study, the authors used custom-made CMC neoprene rigid rest orthoses for night time use. These devices reduced pain and increased hand function (Rannou et al., 2009; Valdes & Marik, 2010). Another study, custom made orthoses to improve pain management and hand function in patients with chronic wrist pain succeeded in improving hand function, performance of ADLs and grip strength, while reducing pain and stiffness (Thiele, Nimmo, Rowell, Quinn, & Jones, 2009; Valdes & Marik, 2010). Patients included in the study conducted by Weiss, LaStayo, Mills and Bramlet (2000, 2004) used the orthosis as required, during the day or at night, to alleviate symptoms in the thumb. The orthoses helped stabilise the CMC joint, reduce pain, and improved performance of ADLs (Valdes & Marik, 2010; Weiss et al., 2000, 2004). Buurke, Grady, De Vries and Baten, (1999), meanwhile, evaluated patient preference for 3 types of orthosis, made of either supple elastic material, elastic material with a semi-rigid thumb busk or a semi-rigid (polyethylene) material. After using all 3 devices, 80% of patients preferred a permanent splint, while 20% chose the semi-rigid version (Valdes & Marik, 2010; Buurke et al., 1999). The study published by Gomes et al. (2010) evaluated the effectiveness of functional orthoses on the TMC joint in patients with hand OA. The authors concluded that using an orthosis during ADLs reduced pain but did not improve hand function, grip and pinch strength (PS), or dexterity (Gomes et al., 2010).

- **Joint protection principles.** Joint protection should be introduced early on in the treatment of OA in order to reduce joint stress and possible damage (Beasley, 2012). General joint protection principles are the need to respect pain, to balance rest and activity (to achieve an appropriate level of activity), exercise in a pain-free range, avoid positions of deformity, and reduce effort and force that can damage joints. Movements that give natural leverage using stronger joints and muscles and rely on the more proximal joints to exert pressure should be used (Beasley, 2012; Cordery, 1965; Cordery & Rocchi, 1998). JPPs are guidelines for reducing overload on the joint cartilage and subchondral bone while performing ADLs, and include:

- Reduce joint overload by using appropriate bodily mechanics and lightweight materials, tools or objects (Cordery & Rocchi, 1998; Estes et al., 2000).
- Avoid pain during activity, increase muscle strength by using stabilising orthoses and technical aids, and change the sequence of ADLs (Cordery & Rocchi, 1998; Estes et al., 2000).
- Try to balance activity and rest to avoid exhaustion and muscle fatigue and prevent over-use of certain joints. This will help reduce the severity and duration of inflammation and slow down progression of the disease (Cordery & Rocchi, 1998; Estes et al., 2000). Patients must understand that they are entitled to take breaks, and that a correct use of joints can prevent stiffness. They must also know which factors can contribute to inflammation and pain (Estes et al., 2000; Schreuer, Palmon, & Nahir, 1994).
- Avoid staying in one position for more than 15-20 minutes, as this will help reduce stiffness (Cordery & Rocchi, 1998; Estes et al., 2000).

– **Adaptive devices and techniques.** These are usually recommended to reduce overload or the amount of effort made by joints needed to perform ADLs. These aids can also facilitate correct joint alignment, the use of the body's natural levers, together with the overall use of upper limbs and the incorporation of other JPPs (Beasley, 2012; Hammond & Freeman, 2004). When making a gripping or pinching movement to grasp an object, forces are transferred to the joints, which can contribute to joint instability if not distributed evenly (Beasley, 2012). Increasing the size of the handle of a tool reduces the effort made by the smaller, most distal joints. As an example, in healthy hands, the most comfortable handle is cylindrical in shape, with a circumference of 33 mm and measures 19.7% of the user's hand length (Beasley, 2012; Kong & Lowe, 2005; Sancho-Bru, Giurintano, Perez-

Gonzalez, & Vergara, 2003). Furthermore, to decrease the maximum push-pull force on a tool, a cylindrical handle must be parallel to the push/pull direction (Beasley, 2012; Seo, Armstrong, & Young, 2010).

- **Physical therapy modalities.** The aim of this therapy is to reduce inflammation, pain and stiffness in the joints. Cold causes vasoconstriction, which reduces the chemical mediators associated with inflammation. It can have an analgesic effect on irritation, and also decreases nerve conduction velocities, thus slowing transmission of information along sensory and motor pathways (Beasley, 2012; Welch et al., 2002). A cold compress applied for 10 to 15 minutes will help reduce pain and inflammation, although it is important to also consider the effect it can have on joint stiffness (Estes et al., 2000). Heat, meanwhile, is transmitted through mechanisms of conduction, convection and conversion. Heat increases blood flow through vasodilation, capillary permeability, muscle contraction velocity, nerve conduction, rate of cell metabolism, and collagen extensibility, and thus reduces pain. However, it can also increase swelling in inflamed joints (Beasley, 2012; Estes et al., 2000; Welch et al., 2002). Some studies have explored the effects of thermotherapy (Brosseau et al., 2003b; Valdes & Marik, 2010; Welch et al., 2002). Ultrasound can reduce swelling by activating inflammation mediators. It can also increase cellular permeability and the movement of histamine (Beasley, 2012; Brosseau et al. 2003a). The decision of whether to use physical therapy must be based on clinical reasoning The clinician should evaluate whether the time devoted to this type of intervention could be employed in some other approach, such as learning how to correctly place the orthosis, completing a home exercise programme, or ensuring that the therapeutic objectives meet the patient's functional needs (Estes et al., 2000).

- **Patient education**. Patient education is essential for achieving a positive outcome in the rehabilitation of OA patients (Estes et al., 2000). Knowledge of the disease process and prognosis reduces the patient's anxiety caused by misgivings about their future status and also encourages therapeutic compliance (Culver & Fleegler, 1987;

Estes et al., 2000; Swanson & de Groot, 1985; Tiger, 1986). Education should focus on correct joint alignment and the use of adaptive equipment (Beasley, 2012; Cordery, 1965; Cordery & Rocchi, 1998). The SER has drawn up the following guidebook with practical advice for hand OA patients: (1) use electrical appliances to squeeze, peel or beat ingredients, and to open tins; (2) use a dishwasher and tumble drier, if possible; (3) do not carry too much weight in your hands. Use a cart or trolley; (4) use lightweight cooking utensils, made of plastic or aluminium, with large handles; (5) attach handles to glasses or cups, or lift them up with both hands; (6) do not unscrew lids. Use an opener; (7) carry plates by placing both hands underneath, palm upwards, to avoid grasping the rim between the thumb and forefinger; (8) avoid using door knobs when opening doors. It is better to use door handles or latches; (9) do not carry handbags in your hand; distribute the weight between your forearm and shoulder; (11) do not hold books in your hand. Use a book stand; (12) when writing, use a large diameter pen or pencil; (13) do not use screw taps; use single mixer taps instead (*Sociedad Española de Reumatología* 2016).

- **Therapeutic exercise programmes.** Studies have shown that therapeutic exercises can be beneficial for OA patients, while avoiding the negative effects of joint overload that can damage cartilage and facilitate the formation of osteophytes (Coppard, Gale, & Jensen, 1998; Lockard, 2000). The current approach includes exercise programmes developed for use in different settings, such as the patient's home. Rogers and Wilder (2009) compared the effects of a daily home-based hand exercise programme and the application of a sham hand cream in hand OA patients. The results showed that the home-based exercise regimen moderately improved hand strength with respect to the placebo group (Rogers & Wilder, 2009). Other researchers have evaluated the effectiveness of whole body training. Rogers and Wilder (2007) evaluated the effect of whole body strength training and gripper exercises on hand strength, pain, and function. The study showed that the exercise programme improved overall muscle strength, reduced pain, and improved static and dynamic grip strength (Beasley, 2012; Rogers & Wilder, 2007). Garfinkel, Schumacher, Husain, Levy, and Reshetar (1994) compared a programme of relaxation techniques and yoga with a course of pharmacological therapy. After the yoga session, pain diminished and grip strength improved (Garfinkel et al., 1994; Valdes & Marik, 2010). Other studies have analysed the effectiveness of interventions focussed on individual functional components of the upper limbs, such as strength or range of motion. In the study published by Lefler and Armstrong (2004), the study group followed a daily programme of muscle strengthening exercises, while the control group was encouraged to continue with their normal daily routine. Grip strength and range of movement increased in the group following the exercise programme (Lefler & Armstrong, 2004; Valdes & Marik, 2010). In contrast, other studies have shown that the use of resistive pinch strengthening can cause some participants to abandon the study due to increased hand symptoms (Beasley, 2012; Rogers & Wilder, 2009; Valdes & Marik, 2010). Exercise programmes aimed at improving range of motion have been shown to be more effective than those aimed solely and improving grip strength (Beasley, 2012; Stamm et al., 2002).

– **Combined intervention strategies**. There is evidence in the literature to support the effectiveness of combining different rehabilitation strategies. Boustedt, Nordenskiöld and Nilsson (2009) compared a combination of day and night time orthosis, hot compresses, joint protection education sessions and home-based exercises with a series of educational-behavioural sessions. Pain and stiffness were more significantly reduced in the first group compared with the group receiving educational sessions (Boustedt et al., 2009; Valdes & Marik, 2010). In the study published by Stamm et al. (2002), the study group was included in a programme of home-based hand exercises and joint protection education sessions. The control group only received general information about hand OA. The combination of JPPs and home-base exercises increased grip strength and overall hand function (Stamm et al., 2002).

The aim of a recent review by Valdes and Marik (2010) was to guide therapists in their clinical decision making when the goal of treatment is to provide pain relief, prevent joint deformity, and/or increase hand function in patients with hand OA. The authors searched databases for studies published between 1986 and 2009, and concluded that the techniques with most support in the literature were orthotics, hand exercises, hot compresses and education on joint protection techniques, combined with technical aids or adaptive equipment and devices, and strategies to improving grip strength (Valdes & Marik, 2010). Eight of the 9 studies included in the review found that exercise therapy improved grip strength by between 1.94% and 25% over baseline. There is moderate evidence that hand exercises increase grip strength, hand function and range of motion, and reduce pain. There is also moderate evidence for the effectiveness of joint protection education and provision of adaptive equipment to increase hand function and reduce pain. Finally, there is strong evidence to support the effectiveness of CMC orthotics to decrease hand pain and improve hand function (Valdes & Marik, 2010). Other review studies have evaluated studies on the effectiveness of interventions, such as spa therapy (Françon & Forestier, 2009).

1.5 Therapeutic principles and scientific evidence for occupational therapy in the treatment of hand osteoarthritis.

The general principles of occupation therapy (OT) focus on enhancing a patient's ability to perform occupational tasks and ADLs, and on maximizing their independence and autonomy (Clark et al., 1997; Stamm et al., 2002). Occupation and purposeful activity, which is thought to enhance health and prevent disability, are at the root of OT (Lin, Wu, Tickle-Degnen, & Coster, 1997; Stamm et al. 2000). In hand OA, OT interventions can include joint protection, training in ADLs, and performing functional activities. The primary objective is to maintain and improve the function of arthritic hand joints (Clark et al., 1997; Stamm et al., 2002). Studies have shown that interventions focussed on motivational aspects (volition) and psychological components can have a positive effect on physical function (Cordery & Rocchi, 1998; Estes et al., 2000). For this reason, OT must take a holistic approach, considering aspects such as the importance of tasks performed during treatment, and evaluation of the patient's perception of their ability to perform ADLs.

To make rehabilitation meaningful and significant to the patient, OT interventions must include therapeutic principles of hand OA and everyday occupational activities that are familiar to the patient. The therapist will first need to analyse, graduate and modify these activities using the most basic tool of OT - activity analysis - in order to identify what are known as the "therapeutic implications" underlying each activity. The activities thus selected and adapted to the pathology and needs of each patient should be performed over a long period of time, with the patient giving regular feedback on their performance (Estes et al., 2000). The patient's perception of improved function can be more clinically significant in the treatment of hand OA than improvement in particular hand skills and function, such as muscle strengthening. This has been demonstrated by studies in which muscle strengthening programmes failed to achieve significant improvement (Lefler & Armstrong, 2004; Østerås et al., 2014; Rogers & Wilder, 2009), while a programme based on flexibility exercises, being aimed at a functional purpose, significantly improved grip strength (Østerås et al., 2014; Stamm et al., 2002).

The use of activities as therapeutic tools in the rehabilitation of hand OA patients must take into account the many different factors involved in this pathology. First, with regard to muscle strength, successful manipulation of an object requires fine motor control of grip strength. During manipulation of an object, the grip force must be finely adjusted: if the grip is too strung, there is a risk of breaking or crushing the object; if it is too weak, the object will be dropped (de Oliveira et al., 2011; Gorniak, Zatsiorsky, & Latash, 2010; Johansson, 2002). Grip forces are adjusted in accordance with the physical properties of the object, such as weight, texture or shape, the type of grip needed, and the speed needed to grasp the object (de Oliveira et al., 2011; Johansson, 2002; Johansson & Westling, 1987). The role of the central nervous system in controlling grip force is evidenced by the changes that occur when performing a complex task requiring constant adjustment of pressure. When an imbalance occurs between the force applied and the force needed to pick up an object, healthy individuals are able to correctly calibrate the pressure needed on their second attempt. In hand OA patients, however, several mechanisms involved in making the adjustments needed to manipulate objects seem to be impaired (de Oliveira et al., 2011; Hermsdörfer, Elias, Cole, Quaney, & Nowak, 2008; Johansson, 2002; Johansson & Westling, 1987; Quaney, Nudo, & Cole, 2005). De Oliveira et al. (2011) evaluated control of grip force in hand OA patients when lifting an object. The results of the study showed that hand OA patients were able to modulate the magnitude and temporal parameters of grip force in order to perform the action, but applied higher grip forces and showed longer latency with respect to healthy subjects. This suggests that patients with hand OA present limitations and impairment of grip force control (de Oliveira et al., 2011). Therefore, more attention should be paid to calibrating and improving the quality of movement than to enhancing grip force. This is why resisted motion exercises alone are probably insufficient, and should be complemented by dynamic, three-dimensional resisted motion exercises. This would allow superficial and deep sensory information (propioceptive and kinesthetic), together with visual input from the eyes, to enhance the movement-related information received by the central nervous system. This information could become impoverished due to under-use of hand muscles secondary to the kinesiophobia caused by the pain associated with inflammation. Enhancing the information received in the brain could in turn improve execution of the movement in terms of timing and spatial parameters. This improvement could also enhance the patient's own perception of their performance and hand function. For these reasons, Oliveira et al. (2011) conclude that their findings suggest the need to design rehabilitation protocols to normalize grip force control in individuals with hand OA in order to improve manipulation of everyday objects and tools.

Secondly, dosage, intensity and capacity for repetition must also be adapted to the special characteristics of hand OA patients. According to Stamm et al. (2002), the resistive exercises used in their study might have increased strength, but could also have caused damage to the cartilage of the hand joints, as individuals with less muscle strength are more prone to this type of injury. In other words, the repetitive use of very high grip forces has been associated with an increased risk of developing hand OA, whereas appropriate hand strengthening may help prevent or even treat hand OA (Stamm et al., 2002). The authors go on to suggest that, although most participants reported a subjective beneficial effect when performing the exercise programme at home, some did not feel comfortable with the standard therapy programme, and several requested more specific procedures to improve their individual everyday activities and hand OA-related problems. The authors also suggest that the exercises should be incorporated into purposeful activities, thus replacing traditional exercise programmes with activities that are meaningful for the patient (Bernard, 1992; Lin et al., 1997; Stamm et al., 2002). These activities should include dynamic movements with a certain level of resistance (Coppard et al., 1998; Stamm et al., 2002). Although joint mobility in the context of an exercise programme can enhance joint lubrication and cartilage nutrition, further studies are needed to explore the benefits and effectiveness of exercise-based interventions on hand function and upper limb and hand dexterity (Beasley, 2012).

An intermediate approach to OT, therefore, should combine the advantages of a standard exercise programme in which patient monitoring is easy and less time consuming, with an activity adapted to the therapeutic needs of hand OA patients and designed to produce muscoloskeletal, psychological and functional changes. Rehabilitation programmes should be multidimensional; they should improve hand function, occupational performance, and perceived self-efficacy, and give patients the strategies they need to cope with their pathology. Patients should be encouraged to engage in activities that improve overall hand function (Kjeken et al., 2005). While the patients perform the task, the therapist should observe and monitor all upper limb tissues and joints to ensure the exercise is performed correctly, without compensating, and will not further damage the joints. In these cases, JPPs should be applied in order to avoid painful positions, movements, or muscle overload, and to support the patient's joints and functional activity (Lockard, 2000). While monitoring the patient, the therapist must ask about pain and crepitus. Therapists should analyse the movements biomechanically to determine the potential negative effect of the activity on joints, above all in asymptomatic patients. Compressive load, or joint reaction force, which occurs across the joint surfaces as a result of the force of the muscles contracting to produce the movement or stabilize the joint, should be taken into account (Lockard, 2000). The activities chosen for the exercise should minimise this compressive load. It is also important to bear in mind that pain in different regions of the upper limb may result in reduced grip and pinch strength due to disuse. Although patients need a certain amount of hand strength for function, it is importation to avoid stressing or overloading the structures involved in gripping or pinching movements. Excessive pinching exercises may aggravate the symptoms associated with osteoarthritis of the basal joint of the thumb. Compression force at the basal joint of the thumb during lateral pinch can be 12 times that produced at the fingertips (Cooney, Lucca, Chao, & Linscheid, 1981; Lockard, 2000). During hand rehabilitation exercises, the direction of the movement must also be changed frequently to avoid overloading joints and prevent the deformities (Beasley, 2012; Dunlop et al., 2005).

Studies have investigated the effectiveness of OT interventions on hand OA patients. In one such study, 3 therapeutic strategies were compare: (1) explaining and demonstrating to the patient the correct use of the hands; (2) verbal or written exercise programme to be done in the home; and (3) provision of technical aids for ADLs. Education on joint protection, together with the programme of exercises for the home, improved overall hand function (Moratz, Muncie, & Walsh, 1985; Valdes & Marik, 2010; Walker-Bone et al., 2000). Dziedzic et al. (2011) published an OT intervention protocol, following 2 years later by a study in which they reported their results (Dziedzic et al. 2011; Dziedzic et al., 2013). In both studies, the authors concluded that occupational therapists can improve autonomy in elderly hand OA patients, and the use of JPPs can be effective in the medium term (Dziedzic et al., 2011; Dziedzic et al., 2013). Adams et al. (2012), designed and published an intervention protocol for patients with rheumatoid arthritis, in which occupational therapists were involved in their rehabilitation programme. The protocol included JPPs, advice about exercise in general, use of functional orthoses and technical aids, and was compared with a programme aimed solely at muscle strengthening and stretching. The authors suggest that their protocol could provide evidence to support or refute the use of an optimised exercise programme for rheumatoid arthritis (Adams et al., 2012). Following this, Williams et al. (2015) published their findings after implementing this protocol, suggesting that the additional of hand and wrist exercises in rheumatoid arthritis is both clinically and cost-effective compared to standard care interventions in these patients (Williams et al., 2015).

As there is no known cure for OA, and the sole aim of pharmacological therapy is to alleviate symptoms, the effectiveness of non-pharmacological treatment should be studied in greater depth. Although exercises should form the basis of hand OA therapy, most studies have evaluated these in the context of knee and hip OA. Few studies have been published on the effectiveness of exercise programmes in hand OA patients, and the findings in general suggest that these are only moderately effective (Østerås et al., 2014).

Although OT is a means of educating hand OA patients and providing them with social support, few studies have specifically evaluated the role of the occupational therapist. Despite the lack of randomised controlled studies on different OT interventions, there is a wealth of historical and anecdotal evidence that supports their effectiveness in clinical practice. However, indications for referring hand OA patients to an occupational therapist have yet to be defined, and studies are needed to evaluate the effectiveness of OT interventions in hand OA patients (Walker-Bone et al., 2000). There is also a need for studies to evaluate the effectiveness of a rehabilitation programme aimed at improving upper limb skills and dexterity using occupational therapy hand manipulation in patients with chronic rheumatic pain.

1.6 Rationale for this thesis.

Hand OA patients are constantly at risk of losing their functional capacity, autonomy, independence, motivation, and perceived self-efficacy due to the clinical manifestations of this pathology. The symptoms and characteristics of hand OA patients have been widely studied; however, to the best of our knowledge, there is no evidence to show the effect of these symptoms, particularly those related to upper limb and hand function and impairment, on overall perceived self-efficacy.

Therapeutic interventions to improve functions such as strength, range of motion, coordination and motor skills in hand OA patients have so far focussed on improving individual impairments, and the exercises use are based on artificial, repetitive movements with little application beyond the clinical setting. Studies have shown that patient compliance with these interventions is poor, probably because they are not motivated to perform the tasks designed to treat these pathologies. The use of an appropriate ADL as the basis for a graduated exercise customised by the therapist to meet the needs of the hand OA patient can be both more motivating and encourage therapeutic compliance. Certain everyday activities can be adapted to achieve a therapeutic goal, as they involve physical components that can reduce impairment and improve symptoms in hand OA patients. There is no evidence in the literature of studies investigating the standardisation of a rehabilitation programme for hand OA patients based on a particular everyday activity, or combining such a programme with traditional therapeutic principles of joint protection, muscle and joint strengthening, and maintaining patient motivation and perceived efficacy.

This doctoral thesis, therefore, is based on the hypothesis that physical factors or components involved in the impairment of the functional capacity of the hand and UE in OA patients may be related to the patient's overall perception of self-efficacy, and can be risk factors for undermining this perception. Moreover, a specific OT protocol based on manipulations designed to achieve a pre-established functional goal could have both immediate and short-term benefits on UE functional capacity and the perceived self-efficacy of elderly institutionalised individuals with hand OA.

Specifically, the first study in this doctoral thesis was based on the hypothesis that upper limb impairment, grip strength, hand coordination and dexterity, and range of finger motion have an effect on the perceived self-efficacy of elderly institutionalised individuals with hand OA.

The second study was based on the hypothesis that implementation of an occupation therapy protocol for elderly institutionalised individuals with hand OA, consisting in OT exercises performed over a period of 2 months would improve their autonomy and ability to perform basic and instrumental activities of daily living, as well as improving upper limb function, hand dexterity, and perceived self-efficacy.

OBJETIVOS

OBJECTIVES

2. OBJETIVOS

2.1 Objetivos generales.

- Evaluar la influencia de los miembros superiores, la destreza manual y las habilidades motoras finas sobre la autoeficacia general en personas mayores institucionalizadas con artrosis de mano.

- Evaluar la efectividad de un programa de rehabilitación funcional mediante el uso de una actividad manipulativa de laborterapia sobre la discapacidad de los miembros superiores, el desempeño en las actividades de la vida diaria, habilidades motoras finas de la mano, independencia funcional y la autoeficacia general en personas mayores institucionalizadas con artrosis de mano.

2.2 Objetivos específicos.

- Describir los niveles de autoeficacia y funcionalidad de los miembros superiores en una muestra de personas mayores institucionalizadas con artrosis de mano.

- Comparar la funcionalidad de los miembros superiores entre una muestra de esta población con un nivel adecuado de autoeficacia general percibida con respecto a los que no se perciben como autoeficaces.

- Conocer el impacto de la discapacidad del brazo, hombro y mano sobre la percepción de autoeficacia en esta muestra.

- Evaluar el impacto de la coordinación de los brazos y destreza manual sobre la autoeficacia.

- Evaluar la influencia de la fuerza de las diferentes pinzas realizadas con la mano (dedos índice y pulgar) sobre la autoeficacia.

- Conocer la influencia que ejerce el rango activo de movimiento entre el primer y quinto dedo sobre la autoeficacia de personas con artrosis de mano.

- Evaluar la eficacia de un programa de rehabilitación funcional orientado a las destrezas motoras finas sobre la discapacidad de miembros superiores (alteración del brazo, hombro y mano) en personas mayores con artrosis de mano.
- Determinar la eficacia de este programa sobre el desempeño de las actividades básicas e instrumentales de la vida diaria y la independencia funcional.
- Evaluar la eficacia de esta intervención sobre la coordinación de los miembros superiores y destreza manual.
- Cuantificar la efectividad de este programa sobre la fuerza de las diferentes pinzas realizadas con el índice y pulgar de ambas manos.
- Valorar la efectividad de este tipo de intervención sobre el rango de amplitud articular activo y pasivo de los dedos índice y pulgar.
- Evaluar la efectividad de este programa de rehabilitación sobre la percepción general de autoeficacia.

2. <u>OBJECTIVES</u>

2.1 Overall objectives.

- To evaluate the effect of upper limb function, manual dexterity and fine motor skills on overall self-management in elderly institutionalised individuals with hand OA.
- To evaluate the effectiveness of a functional rehabilitation programme based on an occupation therapy exercise in improving upper extremity impairment, activities of daily living, fine motor skills, functional independence, and overall self-management in elderly institutionalised individuals with hand OA.

2.2 Specific objectives.

- To describe levels of self-efficacy and upper limb functional capacity in a sample of elderly institutionalised individuals with hand OA.
- To compare upper limb function of study participants with good perceived self-efficacy vs. participants with poor perceived self-efficacy.
- To analyse the impact of arm, shoulder and hand impairment on perceived self-efficacy in study subjects.
- To evaluate the impact of arm coordination and manual dexterity on self-efficacy.
- To evaluate the effect of grip force (thumb and first finger) on self-efficacy.
- To analyse the effect of range of thumb and fifth finger motion on self-efficacy in individuals with hand OA.
- To evaluate the effectiveness of a functional rehabilitation programme for improving fine motor dexterity in improving upper limb impairment (arms, shoulder and hands) in elderly individuals with hand OA.
- To determine the effectiveness of such a programme in improving performance of basic and instrumental activities of daily living and functional independence.

- To evaluate the effectiveness of such an intervention on upper limb coordination and manual dexterity.
- To measure the effectiveness of this programme on the different form of pinch strength of both hands.
- To evaluate the effectiveness of this type of intervention on the active and passive range of motion of the thumb and first finger.
- To evaluate the effectiveness of this rehabilitation programme on overall perceived self-efficacy.

METODOLOGÍA

METHODS

3. METODOLOGÍA/METHODS

3.1 Study I: "Influence of upper limb disability, manual dexterity and fine motor skill on general Self-efficacy in institutionalized elderly with Osteoarthritis".

The methods section of the Study I, included in the PhD thesis, has been summarized below. This study has been published in *The Journal of Hand Therapy* (Appendix 1). Tables 1 shows a summary of the methodology used in this observational study.

3.1.1 *Participants*

Participants were institutionalized older adults with OA, aged 65-95 years, who attended to six health community centers in Granada province, between May 2014 and January 2015. Oder adults have been defined as people with more than 60 years old in United States. Otherwise, most developed world countries have determined 65 years as cutoff to define this population (World Health Organization, 2010). In addition, some authors also identify subgroups of older adults as "younger old" (ages 65-75), "older old" (ages 75-85) and "oldest old" (ages 85+).

Inclusion criteria were: (1) being ≥ 65 years; (2) being institutionalized either on a full or part-time basis. Exclusion criteria were: (1) having cognitive impairment defined as a score <23 in educated people (with at least school studies) and < 20 points with not educated or illiteracy (without school studies), in the Spanish Mini-Mental State Examination-MMSE test (Lobo, Ezquerra, Gómez-Burgada, & Sala, 1979); (2) problems in postural control system; (3) balance disorders while the subject is seated.

Table 1. Summary of Material and Methods in Study I.

PAPER	STUDY DESING	PARTICIPANTS	PROCEDURES	MEASURES	METHODS
Influence of upper limb disability, manual dexterity and fine motor skill on general Self-efficacy in institutionalized elderly with Osteoarthritis.	Cross-sectional study.	Institutionalized older adults with OA (n=45). **Inclusion criteria were:** - Being ≥ 65 years. - Diagnosis of hand OA. - Being institutionalized either on a full or part-time basis. **Exclusion criteria were:** - Having cognitive impairment.	1) Screening to identification selection criteria. 2)Sociodemographic information was registered. 3) Evaluation was performed between May 2014 and January 2015. 4) Participants were subdivided into two groups: - Self-efficacy (n=22) group. - Non-self-efficacy (n=23) group.	Outcome measures were: - General self-efficacy. - Disability of the Arm, Shoulder and Hand. - Upper limb coordination / manual dexterity. - Pinch strength. ▪ Tip pinch strength. ▪ Lateral pinch strength. - Range of active movement between thumb and little finger.	Sample size was calculated. Statistical analysis were: 1) to describe the sample of hand OA. 2) to compare self-efficacy subgroups for each of the demographic variables, upper limb function scores and hand skills 3) to determine the association between previous variables and self-efficacy scores 4) To evaluate the influence of demographic variables, limb functions and hand skills on self-efficacy

Among the 257 subjects recruited from the available population, 45 met the selection criteria. The most common exclusions were due to cognitive impairment and medically instability. The flow of subjects through the study is depicted in Figure 1.

All participants were informed about the characteristics of the study, its objectives and the procedures. A written informed consent form was obtained from all participants. We received ethical approval to perform this study from the Investigation Ethic Committee of Granada province-CEI (Andalusian Health Service, Granada, Spain) May the 26th, 2014 (Appendix 2). The study was conducted in accordance with the modification of the Helsinki Declaration, 2013.

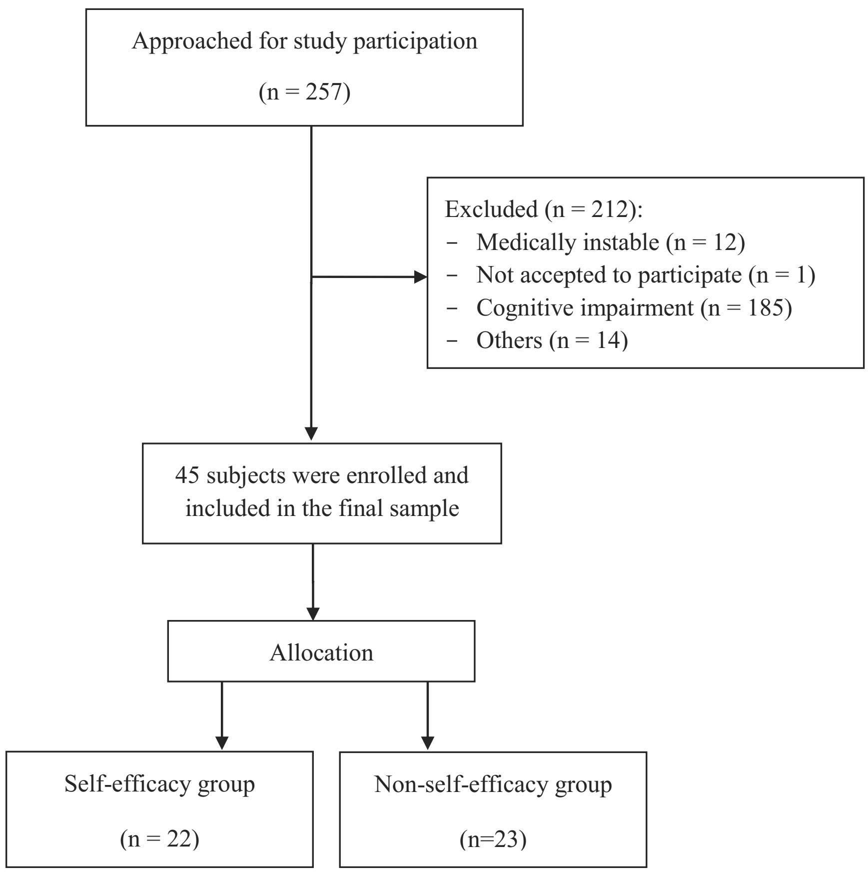

Figure 1. Flow diagram of subjects who participated in the study following STROBE guidelines.

3.1.2 *Procedures*

This is a cross-sectional study, in which eligible older adults at six health community centers in Granada province (Spain) were recruited. First, the subjects that accepted to participate in the study were screened using the Mini-Mental State Examination and requesting certain information about their health status. Participants were subdivided based on their scores on the general self-efficacy test using a cutoff point set at a score of 65, according to Suárez et al. (2000). Scores lower than 65 point meant that the participant was considered as not self-effective; whereas, a score equal or higher than 65 points signified that the subject was self-effective (Suárez et al., 2000).

3.1.3 *Measures*

Data collection included sociodemographic information such as age, gender, education level, years of schooling, literacy (reading and writing) and hand dominance. In the study, the presence of OA was determined by extracting the medical diagnosis (following the Spanish Society of Rheumatology criteria) from the medical chart. General self-efficacy and measures of upper limb functions/ disability and hand skills were evaluated including: pinch strength (PS), arm, shoulder and hand disability, upper limb coordination plus manual dexterity, and active movement between thumb and little finger.

The General Self-efficacy Scale was used to evaluate the stable feelings on personal competence to effectively manage a variety of stressful situations (Suárez et al., 2000). This instrument is a questionnaire composed of ten items, with a total score ranging from 10 to 100 points, with higher scores meaning greater self-efficacy. We used an adapted and validated scale to Spanish population. It has a high reliability with a Cronbach's alpha coefficient of 0.87 and a correlation between two halves of 0.88 (Suárez et al., 2000).

Pinch strength was evaluated by using the finger dynamometer named as Pinch Gauge, newly acquired for this study. This tool is held by the evaluator at the distal end to avoid dropping. Scores were read on the needle side of the red readout marker. The Pinch Gauge was used to measure two types of pinch strength between thumb and index fingers for both hands: the tip pinch strength and the lateral pinch strength. Subjects were seated with their shoulder adducted and neutrally rotated and elbow flexed at 90º. They were instructed to compress with the fingers the dynamometers as hard as possible. Three trials of roughly 3 or 4 s of time were completed. We registered the three outcomes and it was calculated the mean of these. The final score was defined as the average of three values measured. The calibration of that instrument was revised periodically during the study (Mathiowetz et al., 1984; Mathiowetz et al., 1985). The reliability of pinch strength testing in this manner has been shown to be high in young people. The mean correlations between three trial in different period of time was 0.82 for right-left lateral pinch strength and right r = 0.83; left r = 0.87 for tip pinch strength. (Mathiowetz et al., 1984). The interrater reliability of lateral pinch strength in patients with cumulative trauma disorders has been reported to be high with an intraclass correlation coefficient higher than 0.90 (MacDermid et al., 1994; MacDermid, Evenhuis, & Louzon, 2001).

The assessment of upper limb disability was performed using the Spanish version of Disability of the Arm, Shoulder and Hand (DASH) questionnaire, commonly used in different pathological conditions (Hervás et al., 2006). This instrument is a self-administered questionnaire that has been widely used for research purposes and its validity and reliability has been extensively investigated. It was developed as an outcome measure which considers the upper limb as a single functional unit. This scale has 30 items, which provide a disability score, varying from 0 (no disability) to 100 (severe disability). These 30 items measure physical and social function and upper limb symptoms (Case-Smith, 2002; Ceceli, Gül, Borman, Uysal, & Okumuş, 2012).

The upper limb dexterity, involving upper limb coordination and manual dexterity, was quantified using the Purdue Pegboard Tests (PPT) (Ben, Kizony, & Nota, 1998). The PPT (Model 32020) is made of 50 holes arranged in two parallel columns and pegs, washers, and collars placed in four cups at the top of the board. The test consists of four subsets and the final scores can be divided two outcomes: simple score (filled holes with pegs initially with the dominant hand, plus those inserted with the non-dominant hand, plus those introduced with both hands simultaneously) and assemble score (assemble is made in a sequence of a peg, a washer, a collar, and finally another washer, with alternating hands, starting with the dominant one first). Initially, this tool was designed to evaluate fine motor hand function in industrial setting. The test can be used to assess tasks that are similar to fine dexterity movements that are involved in activities of daily living (Amirjani, Ashworth, Olson, Morhart, & Chan, 2011).

A finger goniometer was used to assess the range of active movement between thumb and little finger of in both hands. We used a dorsal placement of the goniometer to measure finger joints and the wrist was placed over the table in supine position (Carey et al., 2010; Engstrand et al., 2012).

3.1.4 *Statistical analysis*

We follow the guidelines provided by Charan and Biswas (2013) about how to calculate sample size for cross-sectional studies to know the average of self-efficacy in older adults with OA. Based on a standard deviation of 12.23 points in general self-efficacy scale for Spanish population (Suárez et al., 2000), a sample size of 23 subjects per group was estimated to provide a 5% of type 1 error, assuming a $Z_{1-\alpha/2}$ value of 1.96.

SPSS software (version 20.0) was used to statistical analysis. First, descriptive analysis was calculated and normal distribution of variables was confirmed with Kolmogorov Smirnov test. The Levene's test was used to assess the equality of variances at the 0.05 significance level. We tested for differences in the self-efficacy subgroups (self-efficacy/non-self-efficacy) for each of the demographic variables, upper limb function scores and hand skills, using independent samples t-tests. We used the Pearson Correlation Coefficients to determine the association between demographic variables, upper limb functions, hand skills and self-efficacy scores. A scatterplot was used to check the violation of the assumptions of linearity and homoscedasticity and decide if we had to use parametric or non-parametric statistics. To evaluate the influence of demographic variables, limb functions and hand skills on self-efficacy, a multiple regression model was applied with self- efficacy as the dependent variable and age, pinch strength, DASH score, manual dexterity and the range of active pincer movement as independent variables. In the final multiple regression model variables were entered that showed a significant association with self- efficacy. There was no collinearity between the variables included. A p-value less than 0.05 were considered as a statistically significant value in all cases.

3.2 Study II: "Effectiveness of a rehabilitation programme for hand fine motor skills on upper limb disability, manual dexterity, performance in activities of daily living, pinch strength, range of fingers motion, functional independency, and general self-efficacy in Hand Osteoarthritis: A randomized clinical trial".

The methods section of Study II, included in the PhD thesis, is summarized and described below. Tables 2 shows a summary of the methodology used in this randomized clinical trial study.

3.2.1 *Participants*

Study participants were older adults with OA from six health community centers in the province of Granada (Spain) who participated in a previous cross-sectional study (Pérez-Mármol et al., 2016). Inclusion criteria were being more than or equal to 65 years old; having a diagnosis of hand OA; being stable at least 4 weeks before and during the period of the study; currently not receiving another specific rehabilitation therapy for upper limbs; and being institutionalized either on a full or part-time basis. Exclusion criteria were suffering from cognitive impairment (to obtain < 23 points in educated people (with a school diploma) or < 20 points in not educated or illiteracy (without a school diploma), in the Spanish validation of Mini-Mental State Examination test) (Lobo et al., 1979); suffering from a severe visual or sensory deficit, suffering from problems of postural control, experiencing balance disorders while being seated; or suffering from severe motor impairment of the upper limbs obstructing the appropriate evaluation or participation in this study. Out of 257 participants recruited from the accessible population, 48 met the study selection criteria. To control the participants´ treatment adherence, the therapists registered each intervention daily, collecting the date, time, duration of the activity and observations for each participant.

Table 2. Summary of Material and Methods in Study II.

MANUSCRIPT	STUDY DESING	PARTICIPANTS	INTERVENTION	MEASURES	METHODS
Effectiveness of a rehabilitation programme for hand fine motor skills on upper limb disability, manual dexterity, performance in activities of daily living, pinch strength, range of fingers motion, functional independency, and general self-efficacy in Hand Osteoarthritis: A randomized clinical trial.	Randomized clinical trial	Institutionalized older adults with hand OA (n=45). Aged 74 to 86 years old. From six health community centers in Granada province.	Enrolled participants were randomly assigned to: - A control group for a conventional occupational therapy intervention (n=20). - An experimental group for application of a standardized activity of occupational therapy (n=25). - Both interventions were applied: ▪ 3 times a week. ▪ During 45 minutes each session. ▪ In an 8-weeks period	**Primary outcome:** - Disability of upper limb. **Secondary outcomes:** - Performance in basic and instrumental activities of daily living. - Pinch strength. ▪ Tip pinch strength. ▪ Lateral pinch strength. - Upper limb coordination/ manual dexterity. - Active and passive range of index motion. - Active and passive range of thumb motion. - Functional independency - General self-efficacy.	Sample size was calculated. Randomized experimental and control group allocations. Participants and study researchers were blinded to treatment assignment. Outcome measures were registered by a blinded assessor at: - Baseline. - Post treatment (8 weeks after baseline). - Follow-up period (16 weeks after baseline).

3.2.2 *Design*

A randomized clinical trial was performed between May 2014 and January 2015. Enrolled participants were randomly assigned to the control group (n = 23) for receiving a conventional occupational therapy intervention for upper limbs or to the experimental group (n= 25) for the application of a treatment for improving fine motor skills. Both interventions were applied 3 times a week during 45 minutes for a period of 8 weeks. The present study received ethical approval from the Investigation Ethical Committee of Granada province-CEI (Andalusian Health Service, Granada, Spain) May the 26th, 2014 (Appendix 2). The study was conducted in accordance with the modification of the Helsinki Declaration, 2013 and under the Spanish law for clinical trial from Law 29/2006 of 26 July 2013. All enrolled participants in the study provided written informed consent.

The experimental and control group allocations were based on randomized codes. One investigator assessed the patients for eligibility criteria, registered baseline demographic data and used a computational random number generator (EPIDAT 4.0, Xunta de Galicia) to prepare the randomization code. This investigator was not involved in the rest of the study (e.g. the provision of therapy, data collection, data analyses, etc.). Upper limb disability, performance in ADLs (independent living skills), pinch strength, upper limb coordination and manual dexterity, range of active and passive movement of the hand pinch (range of finger motion), functional independency and general self-efficacy were measured by an assessor at baseline, at posttreatment (i.e. 8 weeks after baseline) and at follow-up period (i.e. 16 weeks after baseline). Two therapists with wide clinical experience were blinded to the outcome measures and baseline examination results.

3.2.3 *Intervention*

3.2.3.1 *Intervention for fine motor skill (experimental group)*

The experimental intervention was a treatment programme based on the standardized and structured activity of making a picture with tissue paper balls (a determined figure painted at the background of the picture). At first, participants were positioned on a comfortable chair, with back support, with their feet, hip and elbows flexed at 90º in front of a table. Before starting the activity participants were given squares of tissue paper with a standard size. Patients were taught for one session how to perform the activity properly, and physical and verbal feedback was provided during the intervention to correct imprecise or erroneous movements (Stamm et al., 2002). The therapist observed and monitored every joints and tissues in the upper limbs, during and after the intervention, to be sure that they were executing the movements correctly and that the activity was not harming other joints (Lockard, 2000). The activity was designed under the conception that rehabilitation on hand OA programmes should be pain free (Beasley, 2012). To implement the activity, we also took into account several aspects relevant to the arthritic process, such as the quantity of inflammation, joint balance and muscle atrophy (Beasley, 2012). Participants were instructed to make tissue paper balls with movements of thumb and index finger opposition, performing circular movements and to stick the balls in the picture. Specific circular movements consisted of hand movement presenting challenges in the direction and loading zone, to ensure that the activity did not stress or stimulate the progression of possible deformities (Beasley, 2012). During tissue paper manipulation to perform balls, pinch forces are adjusted in order to not be disproportionate or be too small to make wrong balls (de Oliveira et al., 2011; Johansson, 2002). Forces are usually modified according to the objects' physical characteristics, depending on shape, weight, texture (de Oliveira et al., 2011; Johansson, 1987) style of pinch (de Oliveira et al., 2011; Johansson, 2002) and movement cadence (de Oliveira et al., 2011; Iyengar, Santos, & Aruin, 2009). According to OT clinical experience, this activity has a high probability to improve the upper limb disability and maximize the fine motor skill of the hand. In addition, patients received the conventional occupational therapy treatment usually provided in their community center.

3.2.3.2 *Conventional Occupational Therapy (control group)*

The control group received a conventional occupational therapy intervention, directed to upper limb rehabilitation and to maintain the upper limb function. This intervention is usually provided in the community center of the patient as usual cares and it was based on body exercises involving general and broad exercises of hands and upper limbs. No specific and direct fine motor skills were trained and fine movements of hands were excluded in this intervention. In addition, patients received technical aids and adapted equipment (e.g. button hook or sock aid) for the ADLs, such as bathing, dressing or toileting.

3.2.4 *Outcome measures*

Data collection included socio-demographic information such as age, years of education, sex, mild perceptual deficits, mild upper limb and spine mobility restriction, diagnosis of restricted mobility and upper limb dominance. The existence of a diagnostic of hand OA was extracted from medical chart. Disability of the arm, shoulder and hand; performance in ADLs by independence of basic and instrumental ADLs; pinch strength; upper limb coordination and manual dexterity; active and passive range of fingers motion; general self-efficacy; and functional independency were evaluated at baseline using the following tools:

The Spanish version of Disability of the Arm, Shoulder and Hand (DASH) questionnaire was used to assess upper limb disability (Hervás et al., 2006). This test has been previously described in the first study.

The Barthel Index (BI) is a useful standardized scale to evaluate functional disability in basic ADLs. This scale scores the ten basic activities of bowel control, bladder control, grooming, toilet use, feeding, transfer, mobility, dressing, using the stairs and bathing. The final score varies from zero (totally dependent) to a maximum score of 100 (totally independent). The BI has an internal consistency with a Cronbach alpha between 0.86 and 0.92. This instrument has a good inter-observer reliability with a Kappa statistic between 0.47 and 1.00 and it presents good intra-observer reliability with a Kappa statistic between 0.84 and 0.97 (Cid-Ruzafa & Damián-Moreno, 1997).

The Lawton and Brody Scale is a questionnaire used to assess the ability to develop instrumental ADLs, essential to live autonomously in the community. This questionnaire is self-administered and it is validated for the Spanish population (Olazarán, Mouronte, & Bermejo, 2005). The maximum score is 8 points which correspond to complete independence; a score of 6-7 correspond to mild dependence; 4-5 to moderate dependence;

2-3 to severe dependency; and 0-1 to total dependence. This tool has an inter- and intra-observer coefficient of reliability of 0.94 and a test-retest reliability of 0.95 (Lawton & Brody, 1969; Olazarán et al., 2005).

Pinch strength was evaluated by using the finger dynamometer (Pinch Gauge), correctly and periodically calibrated during the study (MacDermid et al., 1994; MacDermid et al., 2001; Mathiowetz et al., 1984; Mathiowetz et al., 1985). This examination has been extensive developed in the first study.

The upper limb coordination and manual dexterity (upper limb dexterity) was assessed by using the Purdue Pegboard Test (PPT) (Ben et al., 1998). PPT has a high test–retest reliability with an interclass correlation coefficient of 0.97 (Amirjani et al., 2011). A complete description of the test has been previously included in the study I.

A finger goniometer made of stainless steel was used to assess the active and passive range of index and thumb motion (Carey et al., 2010; Talsania & Kozin, 1998). A dorsal placement of the goniometer to measure finger joints and the wrist was placed over the table in supine position was used (Carey et al., 2010; Engstrand et al., 2012). Index and thumb fingers are used to make the pinch necessary to take small objects. In the index finger (second finger), the active and passive flexion at the proximal interphalangeal joint; the flexion at the distal interphalangeal joint; and flexion and extension at the metacarpophalangeal joint measures were collected. In the thumb finger (first finger), the active and passive flexion at the interphalangeal joint; the flexion and extension at the metacarpophalangeal joint; the active and passive flexion, extension, abduction and opposition at the carpometacarpal joint were registered (Norkin, 2006).

The Functional Independence Measure (FIM) was developed by the American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation. This tool is usually used to measure level of functional independency and it has 18 items rated on a 7-point scale along a continuum from 1 (total assistance needed) to 7 (complete independence), yielding a final score ranging from 18 to 126. The items measured are basic self-care, sphincter control, transfers, locomotion, communication and social cognition (Hellström et al., 2003). Cronbach´s alpha coefficient reported was 0.93

(Ravaud, Delcey, & Yelnik, 1999). This instrument showed a high test-retest for FIM motor with an interclass correlation coefficient of 0.90 and a good test-retest with an interclass correlation coefficient of 0.80 (Pollak, Rheault, & Stoecker, 1996).

The general Self-efficacy scale was used to evaluate the stable feelings on personal ability to efficiently cope with a diversity of stressful circumstances (Hellström et al., 2003; Suárez et al., 2000). The characteristics of this questionnaire have been described in the study I.

3.2.5 *Statistical analyses*

SPSS for Windows version 20.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analyses. Normality of the variables was tested using the Kolmogorov-Smirnov goodness-of-fit test. Key baseline demographic variables and self-reported measures were compared between groups using independent t-tests for continuous data and chi-square tests for categorical data. Separate 2 × 3 repeated measures ANOVA were conducted in order to test the effect of the intervention on balance measure with DASH as primary outcome and performance in ADLs, pinch strength, upper limb coordination/manual dexterity, range of index and thumb motion, functional independency and self-efficacy as secondary outcomes with time (baseline, 2 months posttreatment and 2 months follow-up) as within-subject variable and group (experimental or control) as between-subjects variable. All analyses followed the intention-to-treat principle and groups were analyzed as randomized. Changes in variable scores within and between groups were measured by means of 95% confidential interval (CI) of t-tests for paired or independent samples as appropriate. The effect size was calcu¬lated according to Cohen's d statistic. An effect size <0.2 reflects a negligible difference, between ≥ 0.2 and ≤ 0.5 a small difference, between ≥ 0.5 and ≤ 0.8 a moderate difference, and ≥ 0.8 a large difference. $P < 0.05$ (2-tailed) was considered significant in all tests.

3.2.6 *Sample size*

Based on published research about rehabilitation using occupational therapy (Case-Smith, 2002), a clinically important difference of 26.6 points (basal mean score of 37.2 with SD of 18.9 and post-treatment mean score of 63.8 and SD of 16.6) on the DASH questionnaire (primary outcome) was used to calculate the sample size required to detect this decrease in disability of the arm, shoulder and hand for the experimental versus control group, using the G*power 3.1 software (Kiel, Germany) (Faul, Erdfelder, Lang, & Buchner, 2007). A sample size of 7 participants per arm was estimated to provide a 95% confidence interval (CI) with a power of 80%, assuming a significance level (α) of .05 (2-tailed). In response to the possible loss after follow-up period, the sample size was increased to a 22 patients per arm.

RESULTADOS

RESULTS

4. RESULTADOS/ RESULTS

4.1 Study I: "Influence of upper limb disability, manual dexterity and fine motor skill on general Self-efficacy in institutionalized elderly with Osteoarthritis".

The results section of the Study I is showed below.

4.1.1 *Participants*

At total of 257 older adults were recruited from health community centers to participate in this study. Forty-five (17.5%) older adults with OA met the inclusion criteria and were classified in to a self-efficacy (n = 22) or non-self-efficacy (n = 23) group. Thirty-six of the participants were female and nine, male. The mean (SD) age was 81.11 (9.16), where 93.3% showed right-hand dominance and 6.7% were ambidextrous. Baseline demographic characteristics were similar between groups for all variables. The general self-efficacy of older adults with OA was abnormal (≤ 65 points) showing a mean score (SD) of 61 (24.81).

Baseline demographic characteristics and main outcome measures are presented in Table 3 and table 4.

Table 3. Sociodemographic characteristics of the sample.

Osteoarthritis Group (*n* = 45)		
Sociodemographic characteristics	**Frequency**	**Percentage (%)**
Gender		
Female	36	80
Male	9	20
Education level		
No schooling	8	17.8
Unfinished primary school	20	44.4
Primary school	12	26.7
Secondary school	3	6.7
Associate´s degree	2	4.4
Years of schooling		
None	5	11.1
<5 years	20	44.4
5-10 years	15	33.3
>10 years	5	11.1
Literacy		
Illiterate	7	15.6
Reads and writes well	12	26.7
Reads and writes with difficulty	26	57.8

Table 4. Mean (SD) of self-efficacy, disability and upper limb functionality in the whole sample.

Outcomes measures	**Osteoarthritis Group (*n*=45)** **Mean (SD)**
Self-efficacy	61 (24.81)
Right tip PS [a]	3.79 (1.42)
Left tip PS	3.46 (1.25)
Right lateral PS	5.06 (1.71)
Left lateral PS	4.36 (1.52)
DASH [b] score	64.53 (28.40)
Simple score of PPT [c]	17.84 (6.95)
Assemble score of PPT	9.11 (3.49)
Active movement of right thumb and little finger	0.64 (0.87)
Active movement of left thumb and little finger	0.62 (0.91)

[a] PS: Pinch Strength; [b] DASH: Disability of the Arm, Shoulder and Hand questionnaire; [c] PPT: Purdue Pegboard Test.

4.1.2 *Differences in self-efficacy and upper limbs functions/disability*

In comparison to those who were self-efficacious, non-self-efficacious participants had poorer right tip pinch strength, simple score of The Purdue Pegboard test, active movement of thumb and little finger of both hands and DASH scores ($p \leq 0.05$). Table 5 shows the mean and level of significance for DASH, pinch strength, purdue pegboard test and active movement of thumb and little finger in adults suffering OA in general self-efficacy/non general self-efficacy groups.

Table 5. Mean (SD) and level of significance of differences between self-efficacy and non-self-efficacy group for upper limb disability and functional outcomes.

Outcomes measures	**Mean (SD) of self-efficacy group (*n*=22)**	**Mean (SD) of non-self-efficacy group (*n*=23)**	***p*-value**
Right tip PS [a]	4.47 (1.50)	3.20 (0.95)	0.002*
Left tip PS	3.82 (1.20)	3.17 (1.23)	0.079
Right lateral PS	5.46 (1.64)	4.72 (1.75)	0.155
Left lateral PS	4.61 (1.42)	4.19 (1.63)	0.370
DASH [b] score	53.59 (20.51)	76.64 (30.98)	0.006*
Simple score of PPT [c]	20.50 (7.71)	15.50 (5.14)	0.016*
Assemble score of PPT	10.09 (3.80)	8.27 (2.96)	0.084
Active movement of right thumb and little finger	0.98 (1.00)	0.30 (0.53)	0.008*
Active movement of left thumb and little finger	0.96 (0.92)	0.35 (0.68)	0.025*

*p <0.05; [a] PS: Pinch Strength; [b] DASH: Disability of the Arm, Shoulder and Hand questionnaire; [c] PPT: Purdue Pegboard Test.

4.1.3 *Function and disability factors of hand and upper limbs associated with self-efficacy*

Bivariate correlation analysis showed that right tip PS, right lateral PS, simple and assemble score of PPT were statistically directly associated with general self-efficacy, and DASH score was indirectly associated to this outcome, in adults with OA. Therefore, self-efficacy scores were higher in subjects with higher scores on right tip PS ($p = 0.005$), right lateral PS ($p = 0.038$), simple PPT ($p = 0.011$), assemble PPT ($p = 0.048$) and lower scores on whole disability of the arm, shoulder and hand ($p < 0.001$). Table 6 shows the results about the relationship between self-efficacy and upper limb factors outcomes in older adults with OA.

Table 6. Bivariate correlations between self-efficacy and disability/functional outcomes in adults with osteoarthritis (*n* = 45).

Outcomes measures	**Pearson (r)**	**p-value**
Age (years)	-0.219	0.154
Right tip PS [a]	0.418	0.005*
Left tip PS	0.240	0.117
Right lateral PS	0.313	0.038*
Left lateral PS	0.214	0.162
DASH [b] score	-0.567	0.000*
Simple score of PPT [c]	0.379	0.011*
Assemble score of PPT	0.300	0.048*
Active movement of right thumb and little finger	0.179	0.245
Active movement of left thumb and little finger	0.152	0.317

*$p < 0.05$; [a] PS: Pinch Strength; [b] DASH: Disability of the Arm, Shoulder and Hand questionnaire; [c] PPT: Purdue Pegboard Test.

Multivariate regression analysis showed that only the disability of the arm, shoulder and hand (DASH score) was significantly associated with the dependent variable, predicting almost the 40% of total variance on general self-efficacy, in older adults with OA. Table 7 illustrates the final multiple regression model of self-efficacy after the selection of independent variables.

Table 7. Final multiple regression model of predictive associated factors to self-efficacy in adults with osteoarthritis.

	Self-efficacy ($r^2 = 0.398$) [a]					
Independent variables	**B** [b]	**95% CI** [c]		**β** [d]	**SE** [e]	**p-value**
		Upper limit	**Lower limit**			
Age	-0.004	-0.804	0.797	-0.001	0.395	0.992
Right tip PS	4.875	-2.760	12.510	0.275	3.768	0.204
Right lateral PS	-3.771	-10.377	2.835	-0.261	3.260	0.255
DASH score	-0.472	-0.786	-0.158	-0.542	0.155	0.004
Simple score of PPT	0.173	-1.468	1.815	0.049	0.810	0.832
Assemble score of PPT	0.920	-2.302	4.141	0.129	1.590	0.566

[a] r^2, regression coefficient of determination; [b] B, regression coefficient; [c] CI, confidence interval; [d] β, adjusted coefficient from multiple linear regression analysis; [e] SE coefficient standard error.

4.2 Study II: "Effectiveness of a rehabilitation programme for hand fine motor skills on upper limb disability, manual dexterity, performance in activities of daily living, pinch strength, range of fingers motion, functional independency, and general self-efficacy in Hand Osteoarthritis: A randomized clinical trial".

The results section of the Study II is showed below.

4.2.1 *Participants*

Of the 257 patients recruited for the study, 48 patients with a mean age of 81.11 (9.15) years met the inclusion criteria and were randomly assigned to 1 of both intervention groups; a rehabilitation for fine motor skill group (n=25) and a conventional rehabilitation group (n=23). A flowchart of the recruitment, follow-up of the patients and details of the reasons for study exclusion are depicted in figure 2. Baseline demographic characteristics ($P > 0.125$) were similar between groups for all variables with the exception of perceptual impairment (table 8). The adherence of the program was 93.75% because 3 participants received a discontinued intervention due to medical problems.

Table 8. Characteristics of patients at baseline.

	Fine Motor skill OT group (n=25)	Conventional OT group (n=23)	P-value
Mean age	82.78±8.25	79.15±10.04	.202
Age range	79-86	74-84	
Years of schooling	8.64±3.69	10.20±5.21	.125
Females/males (%)	21(84)/4(16)	17(74)/6(26)	.352
Perceptual impairment (%)			
Sensitive	-	1 (4)	
Auditive	-	2(9)	.024*
Visual	-	6(26)	
Upper limb and spine mobility (%)	9 (36)	13 (56)	.127
No Diagnosis of restricted mobility (%)	15 (50)	8 (35)	.323
Upper limb dominance (%)			
Right	24(96)	18(78)	.428
Left	-	-	
Ambidextrous	1(4)	2(9)	

*p<0.05

Values are expressed as absolute and relative frequencies (N = 48) for categorical variables and as means ± standard deviations for continuous variables. No differences between groups (P>.125). Abbreviations: OT, Occupational Therapy

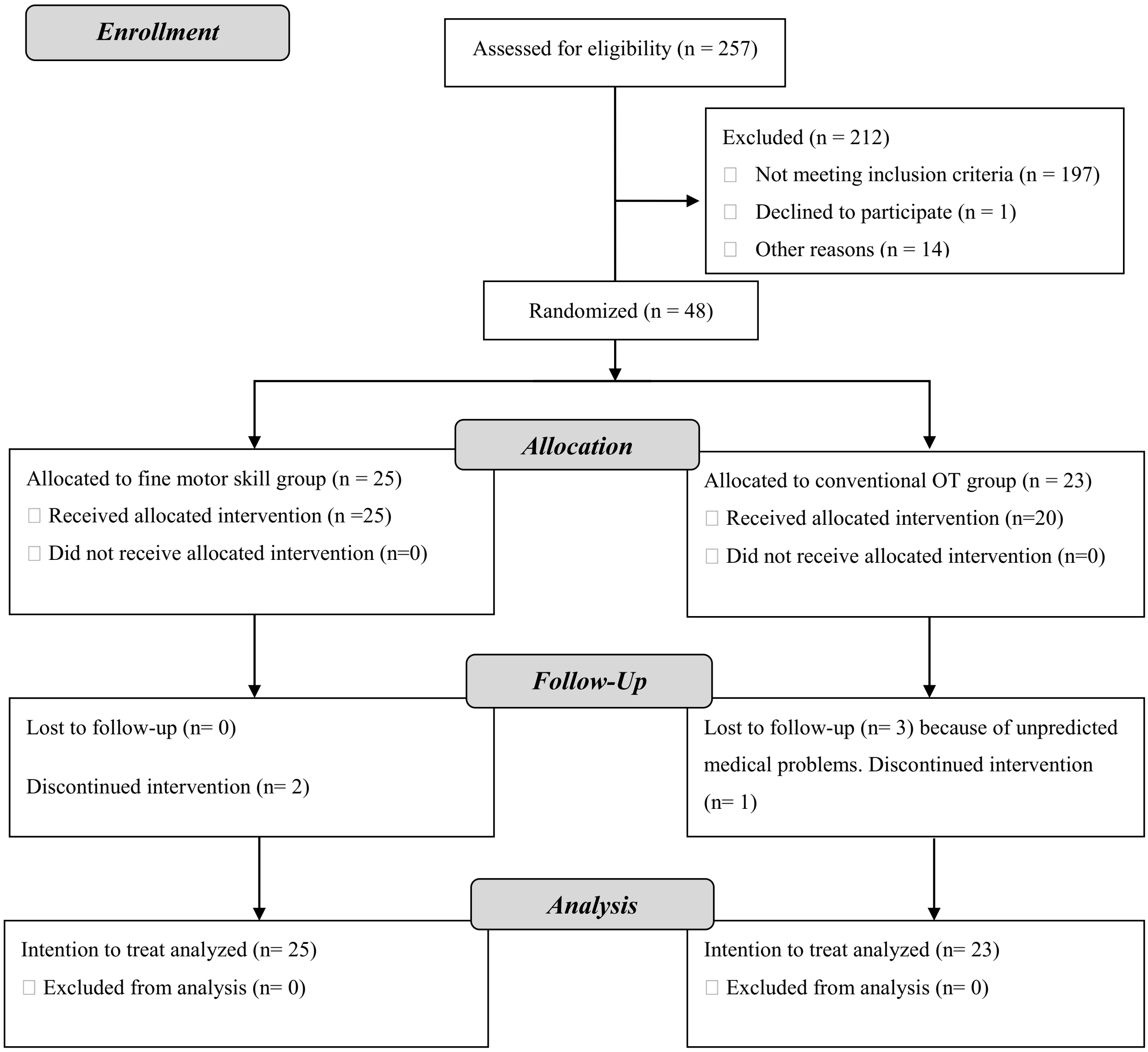

Figure 2. Flow diagram of the participant in the study following Consort guidelines.

4.2.2 *Upper limb disability and performance in activities of daily living*

The group * time interaction for the 2 × 3 repeated measures ANOVA showed no significant differences in the experimental *versus* control group on the DASH (F = 1.30; p =0.274), the BI (F = 0.029; p =0.909) and the Lawton & Brody Scale (F = 1.76; p =0.177). Table 9 shows baseline, post-intervention, follow-up, effect size, within-group and between-group differences with associated 95% CI for upper limb disability and functional independency.

Within-groups comparisons demonstrated no significant time effect in either group on the DASH, (Experimental: F = 0.81, p =0.414, control: F = 0.59, p =0.495), BI (Experimental: F = 1.76, p =0.183, control: F = 1.17, p =0.294) and Lawton & Brody Scale (Experimental: F = 1.44, p =0.246, control: F = 1.88, p =0.167).

4.2.3 *Pinch strength, upper limb coordination/manual dexterity and range of fingers motion*

At the end of the 2 months follow-up period, the group * time interaction for the 2 × 3 ANOVA showed that the experimental group presented significantly higher values on simple score of PPT (F= 7.01, p = 0.02), assemble score of PPT (F= 3.54, p = 0.034), active index flexion at the proximal interphalangeal joint (F= 11.64, p < 0.001), passive index flexion at the proximal interphalangeal joint (F= 26.66, p < 0.001), active index flexion at the metacarpophalangeal joint (F= 4.25, p = 0.018), passive index flexion at the metacarpophalangeal joint (F= 6.48, p = 0.004), active index extension at the metacarpophalangeal joint (F= 10,68, p < 0.001), passive index extension at the metacarpophalangeal joint (F= 17.95, p < 0.001), passive thumb flexion at the interphalangeal joint (F= 3.80, p = 0.027), active thumb flexion at the metacarpophalangeal joint (F= 6.20, p = 0.006), passive thumb flexion at the metacarpophalangeal joint (F= 7.64, p = 0.001), active thumb extension at the metacarpophalangeal joint (F= 10.73, p < 0.001), passive thumb extension at the metacarpophalangeal joint (F= 13.32, p < 0.001), global active thumb flexion (F= 6.79, p = 0.002), global passive thumb flexion (F= 8.37, p = 0.001), global active thumb extension (F= 10.92, p < 0.001), global passive thumb extension (*F*= 15.06, *p* < 0.001), global active thumb abduction (*F*= 12.60, *p* < 0.001) and global passive thumb abduction (*F*= 12.23, *p* < 0.001) than the control group. No differences were present for the rest of variables.

Pairwise comparisons with baseline values demonstrated significant improvements in the experimental group for simple score of PPT (F= 14.70, p = 0.001), assemble score of PPT (F= 6.99, p = 0.02), active index flexion at the proximal interphalangeal joint (F= 11.53, p = 0.001), active index flexion at the distal interphalangeal joint (F= 22.68, p < 0.001), active index flexion at the metacarpophalangeal joint (F= 12.79, p <0.001), passive index flexion at the metacarpophalangeal joint (F= 14.92, p < 0.001), active index extension at the metacarpophalangeal joint (F= 22.24, p < 0.001), passive index extension at the metacarpophalangeal joint (F= 20.20, p < 0.001), passive thumb flexion at the interphalangeal joint (F= 9.21, p < 0.001), active thumb flexion at the metacarpophalangeal joint (F= 18.65, p < 0.001), passive thumb flexion at the metacarpophalangeal joint (F= 19.66, p < 0.001), active thumb extension at the metacarpophalangeal joint (F= 12.57, p < 0.001), passive thumb extension at the metacarpophalangeal joint (F= 19.45, p < 0.001), global active thumb flexion (F= 11.55, p < 0.001), global passive thumb flexion (F= 8.29 p < 0.001), global active thumb extension (F= 12.34, p < 0.001), global passive thumb extension (F= 11.06, p < 0.001), global active thumb abduction (F= 10.49, p < 0.001), global passive thumb abduction (F= 8.84, p = 0.001). In general, the program for fine motor skills showed a small effect in dexterity and a moderate-high effect in range of motion.

The control group showed significant changes from baseline for passive index flexion at proximal the interphalangeal joint (*F*= 7.81, *p* = 0.002), active index flexion at the metacarpophalangeal joint (*F*= 3.65, *p* = 0.037), passive index extension at the metacarpophalangeal joint (*F*= 4.27, *p* < 0.023), active thumb extension at the metacarpophalangeal joint (*F*= 4.25, *p* = 0.023), passive thumb extension at the metacarpophalangeal joint (*F*= 9.61, *p* = 0.001), global passive thumb extension (*F*= 6.20, *p* = 0.005), global active thumb abduction (*F*= 3.99, *p* = 0.028) and global passive thumb abduction (*F*= 4.67, *p* = 0.017), showing a moderate-large effect. However, those changes in range of index and thumb motion were associated with a worsening in mobility. Table 10-

12 shows baseline, post-intervention, effect size, within and between-group changes scores (with 95% CI) for manual strength, dexterity and range of motion.

Table 9. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for upper limb disability and independency on activities of daily living.

Outcome/ Group	Baseline	2 Months Post-treatment	2 Months Follow-up	Cohen's *d*	Within-Group Score Change	Between-Group Score Change
DASH (0-100)						
Experimental	68.35 ± 28.59	64.13 ± 23.83	63.87 ± 28.81	0.15	4.48 (-5.70, 14.75)	-3.35 (23.80, 17.09)
Control	62.17 ± 29.58	64.16 ± 28.94	67.22 ± 35.96	0.15	-5.05 (-17.11, 7.00)	
Barthel (0-100)						
Experimental	87.17 ± 13.30	90.43 ± 9.28	90.65 ± 10.25	0.29	-3.47 (-8.50, 1.54)	9.54 (0.98, 18.09)
Control	78.33 ± 20.65	81.11 ± 16.67	81.11 ± 10.67	0.16	-2.77 (-8.18, 2.63)	
Lawton & Brody (0-8)						
Experimental	3.74 ± 3.57	3.61 ± 2.19	3.09 ± 2.33	0.21	0.65 (-0.24,1.55)	-1.08 (-2.36, 0.20)
Control	4.00 ± 8.93	4.00 ± 1.28	4.17 ± 1.50	0.02	-0.16 (-0.42, 0.08)	

Values are expressed as means ± standard deviation for baseline, 2 months post-treatment and 2 months follow-up and as mean (95% confidence interval) for within (baseline to follow-up) and between-group change scores (at follow-up).

* Significant Group * Time interaction (ANOVA, $p < 0.05$).

Abbreviations: DASH, Disability of the Arm, Shoulder and Hand.

Table 10. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for manual dexterity and pinch strength.

Outcome/ Group	**Baseline**	**2 Months Post-treatment**	**2 Months Follow-up**	**Cohen's *d***	**Within-Group Score Change**	**Between-Group Score Change**
Right tip PS						
Experimental	3.76 ± 1.53	3.56 ± 1.29	3.84 ± 1.81	0.04	0.07 (-0.55, 0.39)	0.03 (-1.04, 1.10)
Control	3.72 ± 1.25	3.64 ± 1.18	3.81 ± 1.43	0.06	-0.09 (-0.49, 0.30)	
Left tip PS						
Experimental	3.40 ± 1.23	3.09 ± 1.07	3.29 ± 1.35	0.08	0.11 (-0.33, 0.56)	-0.15 (-1.00, 0.70)
Control	3.55 ± 1.40	3.38 ± 1.41	3.44 ± 1.27	0.08	0.10 (-0.33, 0.54)	
Right lateral PS						
Experimental	4.79 ± 1.59	4.52 ± 1.52	4.71± 1.64	0.04	0.09 (-0.43,0.60)	-0.56 (-1.82, 0.68)
Control	5.21 ± 1.84	4.98 ± 2.10	5.17 ± 2.27	0.02	-0.06 (-0.67, 0.54)	
Left lateral PS						
Experimental	4.19 ± 1.29	3.92 ± 1.17	3.93 ± 1.31	0.19	0.25 (-0.22,0.73)	-0.56 (-1.59, 0.45)
Control	4.56 ± 1.83	4.44 ± 2.02	4.50 ± 1.88	0.03	0.05 (-0.44, 0.55)	
Simple score of PPT						
Experimental	18.12± 7.57	22.82 ± 8.98	22.49 ± 9.16	0.52	-4.60 (-6.86,-2.52)	-0.50 (-6.20, 5.20)*
Control	17.39± 6.28	17.74 ± 5.68	20.09 ± 9.17	0.34	-2.47 (-6.00, -2.93)	

Table 10. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for manual dexterity and pinch strength (continuation).

Outcome/ Group	**Baseline**	**2 Months Post-treatment**	**2 Months Follow-up**	**Cohen's *d***	**Within-Group Score Change**	**Between-Group Score Change**
Assemble score of PPT						
Experimental	8.16± 3.07	10.28 ± 3.32	9.96 ± 4.32	0.48	-1.80 (-2.94,-0.65)	0.54(-1.94, 3.04)*
Control	9.76 ± 3.27	9.88 ± 3.46	9.41 ± 3.22	0.10	0.35 (-1.17, 1.88)	

Values are expressed as means ± standard deviation for baseline, 2 months post-treatment and 2 months follow-up and as mean (95% confidence interval) for within (baseline to follow-up) and between-group change scores (at follow-up).

* Significant Group * Time interaction (ANOVA, $p < 0.05$).

Abbreviations: PS: Pinch Strength; PPT: Purdue Pegboard Test.

Table 11. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for active and passive range of index motion in the dominant side.

Outcome/ Group		Baseline	2 Months Post-treatment	2 Months Follow-up	Cohen's *d*	Within-Group Score Change	Between-Group Score Change
Active Index Flexion at the IP joint (º)							
Experimental	D	53.30 ± 14.40	59.30 ± 6.84	59.18 ± 10.87	0.46	-5.88 (-12.44, 0.67)	7.27 (-0.35, 16.29)
	P	89.98 ± 17.29	101.02± 10.17	102.71 ± 9.27	0.91	-12.72 (-19.69, -5.75)	8.06 (2.11, 14.01)*
Control	D	40.37 ± 18.40	52.64 ± 11.40	51.21 ± 15.17	0.64	-4.84 (-13.24,3.56)	
	P	97.50 ± 5.71	93.15 ± 8.22	94.74 ± 9.07	0.36	2.86 (-1.32, 7.05)	
Passive Index Flexion at the IP joint (º)							
Experimental	D	63.78 ± 8.41	72.85 ± 7.46	68.43 ± 10.56	0.48	-4.65 (-8.76,-0.54)	8.23 (-0.01, 16.26)
	P	98.69 ± 12.79	110.63 ± 9.16	108.69± 8.13	0.93	-10.00 (-14.08,-5.91)	8.12 (2.83, 13.41)*
Control	D	60.82 ± 20.76	62.84 ± 12.98	60.19 ± 15.16	0.03	0.63 (-7.12, 8.38)	
	P	105.66 ± 5.87	100.37 ± 6.29	100.56± 8.20	0.71	5.09 (1.19,8.99)	
Active Index Flexion at the MCP joint (º)							
Experimental		70.30 ± 15.42	80.34 ± 9.36	80.26± 11.62	0.72	-9.95 (-15.30,-4.60)	-3.5 (-10.32, 3.22)*
Control		78.98 ± 9.01	79.94 ± 8.13	83.82 ± 8.66	0.54	-4.84 (-9.20, -0.48)	
Passive Index Flexion at the MCP joint (º)							
Experimental		81.01 ± 15.40	93.44 ± 8.54	90.10 ± 10.13	0.69	-9.08 (-14.57,-3.60)	-0.07 (-6.20, 6.05)*
Control		86.62 ± 8.35	87.13 ± 7.07	90.17 ± 8.46	0.42	-3.54 (-8.60, 1.50)	

Table 11. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for active and passive range of index motion in the dominant side (continuation).

Outcome/ Group	**Baseline**	**2 Months Post-treatment**	**2 Months Follow-up**	**Cohen's *d***	**Within-Group Score Change**	**Between-Group Score Change**
Active Index Extension at the MCP joint (º)						
Experimental	18.98± 10.10	26.20 ± 11.46	29.11 ± 10.12	1.00	-10.13 (-13.41,-6.84)	7.50 (0.23, 14.78)*
Control	22.58± 10.49	22.14 ± 11.25	21.50 ± 13.01	0.05	1.08 (-3.00, 5.16)	
Passive Index Extension at the MCP joint (º)						
Experimental	32.08± 12.42	44.31 ± 15.04	42.42 ± 10.94	0.58	-10.33 (-14.03,-6.63)	7.97(-0.04, 15.98)*
Control	40.66 ± 13.16	37.81 ± 15.93	34.39 ± 14.58	0.45	6.27 (1.32, 1.21)	

Values are expressed as means ± standard deviation for baseline, 2 months post-treatment and 2 months follow-up and as mean (95% confidence interval) for within (baseline to follow-up) and between-group change scores (at follow-up).

* Significant Group * Time interaction (ANOVA, $p < 0.05$).

Abbreviations: IP, interphalangeal, MCP, metacarpophalangeal, P, proximal, D, distal

Table 12. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for active and passive range of thumb motion in the dominant side.

Outcome/ Group	Baseline	2 Months Post-treatment	2 Months Follow-up	Cohen's *d*	Within-Group Score Change	Between-Group Score Change
Active Thumb Flexion at the IP joint						
Experimental	63.50± 13.54	70.37 ± 9.69	71.02 ±13.44	0.55	-5.88 (-12.44,-0.67)	5.42(-2.95, 13.80)
Control	64.62 ± 10.85	67.45 ± 10.03	65.60 ± 12.20	0.08	-4.84 (-13.24, 3.56)	
Passive Thumb Flexion at the IP joint						
Experimental	71.06± 14.42	78.07 ± 10.60	77.98 ± 12.67	0.50	-6.92 (-10.80,-3.03)	7.41(0.93, 15.76)*
Control	71.31 ± 11.41	72.94 ± 10.63	70.56 ± 13.17	0.06	0.74 (-2.86, 4.35)	
Active Thumb Flexion at the MCP joint						
Experimental	41.53± 15.05	50.56 ± 13.33	51.89 ± 16.32	0.66	-10.36 (-14.77,-5.94)	0.29(-10.13, 10.71)*
Control	52.19 ± 15.58	53.25 ± 13.30	51.60 ± 15.73	0.04	0.58 (-6.04, 7.22)	
Passive Thumb Flexion at the MCP joint						
Experimental	49.78± 14.95	61.50 ± 16.17	58.44 ± 17.18	0.54	-8.66(-12.65,-4.67)	1.01(-9.98, 12.02)*
Control	60.15 ± 17.31	60.52 ± 14.76	57.43 ± 16.73	0.15	2.72 (-1.13, 9.18)	
Active Thumb Extension at the MCP joint						
Experimental	14.68± 9.29	23.08 ± 7.75	20.24 ± 7.76	0.65	-5.56(-8.81,-2.31)	6.71(1.78,11.64)*
Control	18.68 ± 10.97	17.49 ± 7.46	13.52 ± 7.40	0.55	5.15 (1.13, 9.18)	
Passive Thumb Extension at the MCP joint						
Experimental	25.26± 11.11	36.60 ± 8.95	29.17 ± 8.67	0.39	-3.91 (-7.42,-0.40)	8.68(3.32, 14.04)*
Control	29.11 ± 11.62	27.80 ± 7.72	20.49 ± 7.70	0.87	8.62 (4.13, 13.11)	
Global Active Thumb Flexion						
Experimental	25.88± 7.79	35.02 ± 11.69	35.71 ± 10.59	1.05	-9.82 (-13.67,-5.97)	4.77(-2.11, 11.65)*

Table 12. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for active and passive range of thumb motion in the dominant side (continuation).

Outcome/ Group	**Baseline**	**2 Months Post-treatment**	**2 Months Follow-up**	**Cohen's *d***	**Within-Group Score Change**	**Between-Group Score Change**
Control	30.70 ± 11.75	27.13 ± 7.96	30.94 ± 10.69	0.02	-0.23 (-7.05, 6.58)	
Global Passive Thumb Flexion						
Experimental	37.84± 10.46	46.85 ± 12.46	47.66 ± 13.31	0.82	-9.82 (-15.23,-4.42)	7.43(-0.69, 15.66)*
Control	43.76 ± 10.41	37.03 ± 6.68	40.23 ± 11.42	0.32	3.52 (-4.29, 11.35)	
Global Active Thumb Extension						
Experimental	21.81± 9.68	32.46 ± 11.41	31.95 ± 10.70	0.99	-10.14 (-14.75,-5.53)	6.70(0.30, 13.10)*
Control	28.92 ± 10.96	24.86 ± 6.74	25.25 ± 8.64	0.37	3.66 (-2.27, 9.61)	
Global Passive Thumb Extension						
Experimental	34.28± 10.94	46.92 ± 9.63	43.46 ± 12.40	0.78	-9.17(-15.47,-2.87)	9.99(2.70, 17.28)*
Control	41.62 ± 11.52	35.01 ± 6.35	33.47 ± 9.44	0.77	8.15 (2.72, 13.59)	
Global Active Thumb Abduction						
Experimental	32.20± 10.15	43.13 ± 13.20	45.52 ± 14.37	1.07	-13.32 (-20.54,-6.09)	12.44(4.25, 20.63)*
Control	43.86 ± 15.31	39.00 ± 10.28	33.07 ± 9.77	0.84	10.78 (-2.02, 19.54)	
Global Passive Thumb Abduction						
Experimental	43.37± 10.61	55.65 ± 12.71	55.85 ± 14.68	0.97	12.47 (-20.79,-4.15)	14.63(6.07, 23.20)*
Control	53.45 ± 14.82	46.51 ± 10.94	41.21 ± 10.29	0.95	12.23 (3.29, 21.17)	
Active Opposition of the Thumb						
Experimental	0.88± 0.97	0.52 ± 0.90	0.85 ± 1.31	0.03	0.02 (-0.52,0.56)	0.44(-0.26, 1.14)
Control	0.39 ± 0.71	2.72 ± 7.90	0.41 ± 0.66	0.03	-0.01 (-0.26, 0.22)	

Table 12. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for active and passive range of thumb motion in the dominant side (continuation).

Outcome/ Group	**Baseline**	**2 Months Post-treatment**	**2 Months Follow-up**	**Cohen's *d***	**Within-Group Score Change**	**Between-Group Score Change**
Passive Opposition of the Thumb						
Experimental	0.11± 0.45	0.04 ± 0.19	0.03 ± 0.11	0.24	0.07 (-0.07,0.23)	0.0.3(-0.02, 0.09)
Control	0.01 ± 0.06	0.26 ± 0.66	0.01 ± 0.01	0.00	0.01 (-0.01, 0.03)	

Values are expressed as means ± standard deviation for baseline, 2 months post-treatment and 2 months follow-up and as mean (95% confidence interval) for within (baseline to follow-up) and between-group change scores (at follow-up).

* Significant Group * Time interaction (ANOVA, $p < 0.05$).

Abbreviations: IP, interphalangeal, MCP, metacarpophalangeal

Table 13. Baseline, post-treatment, follow-up differences and change scores in each group (95% confidence interval) for self-efficacy and functionality.

Outcome/ Group	Baseline	2 Months Post-treatment	2 Months Follow-up	Cohen's *d*	Within-Group Score Change	Between-Group Score Change
FIM total						
Experimental	109.65 ± 14.09	110.17 ± 14.15	110.22 ± 12.84	0.04	-0.56 (-4.99, 3.86)	3.05 (-5.48, 11.58)
Control	109.39 ± 13.59	108.61 ± 12.12	107.17 ± 14.09	0.19	2.22 (-0.88, 5.33)	
FIM motor						
Experimental	79.52 ± 12.44	79.26 ± 13.65	80.30 ± 12.10	0.06	-0.78 (-4.17, 2.60)	5.19 (-2.93, 13.32)
Control	77.56 ± 11.42	76.61 ± 11.62	75.11 ± 13.58	0.19	2.44 (-0.36, 5.25)	
FIM cognitive						
Experimental	30.57 ± 3.31	31.00 ± 3.61	30.35 ± 3.06	0.06	0.21 (-1.32, 1.75)	-1.70 (-3.50, 0.08)
Control	31.83 ± 2.30	32.00 ± 2.37	32.06 ± 2.46	0.09	-0.22 (-1.57, 1.12)	
Self-efficacy						
Experimental	58.13± 25.08	65.09 ± 28.31	50.04 ± 29.53	0.29	8.08 (-2.18,18.35)	-11.73(-27.95, 4.48)
Control	64.56 ± 26.08	62.39 ± 22.57	61.78 ± 19.00	0.12	2.77 (-8.91, 14.47)	

Values are expressed as means ± standard deviation for baseline, 2 months post-treatment and 2 months follow-up and as mean (95% confidence interval) for within (baseline to follow-up) and between-group change scores (at follow-up).

* Significant Group * Time interaction (ANOVA, $p < 0.05$).

Abbreviations: FIM, Functional Independence Measure.

4.2.4 *General self-efficacy and functionality*

The group *time interaction for the 2 × 3 ANOVA showed no differences between groups for FIM total ($F = 0.58$; $p = 0.558$), FIM motor ($F = 1.12$; $p = 0.329$) FIM cognitive ($F = 0.37$; $p = 0.688$) and self-efficacy ($F = 2.09$; $p = 0.130$). No significant improvements were achieved from baseline values in both groups. Table 13 shows baseline, post-intervention, effect size within and between group changes in scores (with 95% CI) for functionality and self-efficacy.

DISCUSIÓN

DISCUSSION

5. DISCUSIÓN/ DISCUSSION

5.1 General self-efficacy and upper limb disability levels. Differences in self-efficacy and upper limbs functions/disability.

The whole collected sample presented low general perception of self-efficacy (Suárez et al., 2000) and the level of arm, shoulder and hand disability was higher than the previous reported standard for general Spanish population with upper limb impairment (Hervás et al., 2006). It may mean that patients with hand OA show a disturbance in self-efficacy perception when analysing and interpreting their own capacity to face obstacles. In addition, this population seems to show a general upper limb disability, probably caused by the degenerative process produced in the affected joints of this rheumatic disease.

The first study found significant differences between self-efficacy/non-self-efficacy groups. This determined that patients with higher self-efficacy had less physical impairments in strength, better dexterity and movement, and better self-reported disability. According to these results, it can be deduced that patients with hand OA and symptoms in upper limbs, expressed as pinch strength, dexterity and self-perception of impairment may have a tendency to feel less self-efficacious, and vice versa. This new perspective in the field of physical rehabilitation stresses the need to take into account patient's perception before, during and after the therapeutic process, since the characteristics of OA and self-efficacy construct can be interconnected in this population.

5.2 Association between the continuum function-disability of hand and upper limbs and self-efficacy.

The significant differences between subgroups based on self-efficacy was further confirmed by a high correlation between self-efficacy and DASH scores and a moderate association between self-efficacy and individual upper limb impairment (lower right tip and lateral pinch strength and manual/upper limb dexterity). The DASH was more strongly associated with self-efficacy than what individual impairments were. This may have occurred for several reasons. Firstly, we expect that each of the impairments may have contributed to the patient's assessment of their own ability in some type of additive way. It would be reflected in the overall disability experience of the patient as reflected on the DASH. However, even if the impairments that were present were not the primary determinants of the patient's ability, we would expect a relationship between DASH score and self-efficacy as both are self-reported and would reflect tendencies towards positive or negative attribution.

To our knowledge, this is the first study to examine the influence of upper limb functions and disability on general self-efficacy in institutionalized older adults with OA. We found evidence that generalized self-efficacy is associated with both upper limb impairments and disability. Previous studies have also investigated the relationship between self-efficacy and disability (Allegrante & Marks, 2003; Buckelew et al., 1996; Hanan & Sahar, 2011; Harrison, 2004; Hellström, 2003; Lin, 1998; Shin, Hur, Pender, Jang, & Kim, 2006), but they have conceptualized self-efficacy as the mediator of different disability variables. We have explored how some upper limb characteristics can mediate on general self-efficacy. This is an important distinction to be considered for clinical application. When clinicians detect low self-efficacy, either using standardized scales or clinical observations, it is important to know which therapeutic interventions are needed. An assumption that low self-efficacy requires that therapists focus solely on psychological components of self-efficacy would be wrong. To a certain extent, self-efficacy could also be related to the alteration of patients' actual abilities. Accordingly, improvements in patients' abilities are likely to be associated with positive improvements in self-efficacy.

Prior research has revealed that self-efficacy can be a predictor for several variables such as pain, functional performance, balance, commitment to exercise, perceived lack of barriers or improvement after interventions (Gaines et al., 2002; Hanan & Sahar, 2011; Harrison, 2004). These investigations have used diverse samples and have usually examined this construct linked to a specific task. Schulz et al. (2014) analysed the influence of self-efficacy on pain intensity and pain-related disability in multimorbid older adult patients with OA and found that self-efficacy explains 39% of the variance in pain-related disability. In patients with low back pain and chronic cancer, pain intensity and its impact on daily life have been inversely correlated with self-efficacy (Lin, 1998). Self-efficacy is also known to be related to self-reported function. Gaines et al. (2002) explored the relationship between arthritis self-efficacy and self-reported functional performance among elder men and women with knee OA and found that the association between arthritis self-efficacy and functional performance varies with gender. That is to say, higher self-efficacy beliefs are related to better functional performance in women. In line with this, Harrison (2004) studied the influence of pathology, pain, balance, and self-efficacy on function in women with knee OA and they concluded that functional self-efficacy was a relevant factor acting on the functional performance outcome for this population.

5.3 Relevance of self-efficacy in the context of rehabilitation.

Other studies in different populations have pointed to the relevance of self-efficacy for rehabilitation programmes. Hellström et al. (2003) addressed a study with a sample of stroke patients to determine if fall-related self-efficacy changes over time in a prospective study. The results showed that patients with low self-efficacy at discharge had less improvement than those perceived themselves as higher self-effective. They stated that "rehabilitation interventions should incorporate self-efficacy enhancement to minimize dependence in activities of daily living." (Hellström et al., 2003). For this reason, it is necessary to know which factors have influenced self-efficacy and our results suggest that low self-efficacy is related to having lower upper limb functions in older adults with OA. Other investigations have reported a positive correlation between self-efficacy and commitment to exercise, perceived lack of barriers and belief in exercise benefits in people with OA (Hanan & Sahar, 2011; Shin et al., 2006). In patients with fibromyalgia, a higher level of self-efficacy was related to better treatment outcomes after rehabilitation interventions. This perception can predict the effectiveness of these treatments in higher levels of self-efficacy. (Buckelew et al., 1996). Hence, self-efficacy seems to have an impact on health and daily living, and, upper limb factors may influence the general perception of self-efficacy.

There have been a few studies that have considered self-efficacy as a component of intervention or hand therapy. A theoretical paper by Dewan, MacDermid, & Packham (2013) suggested that rehabilitation of distal radius fractures in patients with poor self-efficacy could be enhanced by incorporating a number of strategies including screening for self-efficacy problems and incorporating a theoretical framework into treatment. The proposed treatment strategies were designed to improve exercise performance, provide encouragement and verbal cues through persuasion, addressing unpleasant symptoms to reduce emotional arousal, incorporating positive reinforcement from others through vicarious experience, and negating disability by addressing negative attitudes and behaviours (Dewan et al., 2013). These components were based on the conceptual components of self-efficacy proposed by Bandura. The review of Allegrante and Marks (2003) pointed that increased self-efficacy can protect function and maintain physical well-being in patients with chronic arthritis. They suggested that therapists should analyse and reinforce the patient's past and present achievements, lead them to detect the accomplishment of others, ensure positive feedback and encourage patients to make their own social efforts.

Although there has been a theoretical discussion of how to apply self-efficacy to upper limb rehabilitation, there are few empirical studies on this topic. Thus, empirical testing of the strategies to consider self-efficacy in treatment is needed to determine if the associations observed in the study can be leveraged to improve outcomes in a hand OA population.

5.4 Rehabilitation programmes for hand fine motor skills.

In the second study, we have investigated immediate and short-term effect of a structured and standardized treatment for fine motor skills in patients with hand OA in comparison with those receiving a conventional rehabilitation treatment for upper limb. To our knowledge, no previous studies have been published exploring the effectiveness of the same intervention in that population, although this type of rehabilitation approach is very common in the clinical setting. A previous study investigated the efficacy of OT intervention for fine motor skills but they used a sample of preschool children from OT services (Case-Smith, 1996). The randomized controlled trial of Stamm et al. (2002) studied the efficacy of joint protection and home hand exercises to improve hand functions in patients with hand OA. These and other authors did not use an activity as intervention but they pointed that exercise interventions should be included in purposeful activities or substituted by meaningful activities (Lin et al., 1997; Stamm et al., 2002). The standard activity of the present trial was designed to ensure that every participant performed the same type of movements and received equal perception of performance and motivation in the rehabilitation process.

5.5 Effectiveness of a rehabilitation programme for hand fine motor skills on upper limb disability and range of fingers motion.

The results of this study showed that the intervention group for fine motor skills showed significantly better coordination/manual dexterity, range of index motion, and range of thumb motion compared to the patients in the conventional occupational therapy group. We found a significant small mean effect on upper limb coordination/manual dexterity and a moderate-high mean effect on range of index and thumb motion of dominant side after the programme for fine motor skills. This improvement can be attributed to general joint mobility and specific movements performed that could have provided synovial fluid to avascular articular cartilage, perfusing required nutrients to the joint matrix (Beasley, 2012; Kleinert & Gateley, 1998; McCloy, 1982). The results reinforce the position that specific movements, executed by performing the tissue paper balls, may lead to increase the upper limb coordination/manual dexterity. This improvement is represented by the ability to fill more holes with pegs in the Purdue Pegboard test in the times estimated by the manual of this instrument: 1) in a simple way by using only an upper limb in each essay; 2) with both hands at the same time; and 3) with both hands in an alternative manner. In this line, several authors have reported the effectiveness of exercise programmes after using an active range of motion as opposed to pinch strengthening (Beasley, 2012; Stamm et al., 2002; Valdes & Marik, 2010), suggesting that range of motion was more effective. In the study performed by Rogers and Wilder, some patients left the study because hand symptoms increased after a resistive pinch strengthening intervention (Beasley, 2012; Rogers & Wilder, 2009). Inadequate pressure located among joints may have led to a worsening of the inflammatory processes; hence, it is relevant to consider the type of resistance offered in pinch strengthening. Beasley et al. (2012) also highlighted that excessive loading of the cartilage may led to impairment of the articular cartilage or subchondral bone (Beasley, 2012). Conversely, suitable hand strengthening can prevent or even treat hand OA (Stamm et al., 2002). The proposed programme in this study included an activity of making a picture with tissue paper balls, previously analysed and adjusted to the needs of OA patients, that involves a pinch strengthening with low resistance. However, the strengthening was not enough and no changes were observed in pinch strength in either group. In spite of this, the dexterity and motor control improved, as reflected in the increase of upper limb coordination. Thus, we may suggest that this treatment may be a possible approach to enhance this fine motor component acting mainly in manual dexterity.

5.6 Effectiveness of a rehabilitation programme for hand fine motor skills on manual dexterity, performance in activities of daily living, pinch strength, functional independency and general self-efficacy.

There were no significant improvements in upper limb disability, performance in activities of daily living, pinch strength, general self-efficacy and functionality in both groups. Therefore, our hypothesis that an intervention for hand fine motor skills would improve upper limb disability, independence of ADLs, upper limb functionality and pinch strength, in patients with hand OA was not supported by our results. We selected DASH as the primary outcome measure for this research because it has been reported to be a good instrument for representing upper limb disability for general activities performed with arms, shoulders and hands. However, the patients with hand OA included in this study were institutionalized. Probably, they have not been able to estimate their real performance in these specific activities. Then, this tool may have not been a sensitive tool to register specific changes in upper limb function associated to the experimental intervention.

Regarding general self-perception, research has suggested that enhance self-efficacy can cause reduced disability, better quality of life, enhanced health outcomes (Schulz et al., 2014), increased intentions to perform painful activities, and less pain (Rejeski, Craven, Ettinger, McFarlane, & Shumaker, 1996). According to Rejeski et al. (1996), we expected that self-efficacy can enhance after a training programme (Gaines et al., 2002; Rejeski et al., 1996). In this trial, however, self-efficacy level did not improve significantly in any of the groups. Maly, Costigan, & Olney (2007) pointed that joint stiffness can suppose a negative feedback to patients suffering knee OA during physical activity and it can consequently influence on self-efficacy. In our study, this symptom might therefore influence self-efficacy negatively and support the absence of results in this outcome after the experimental intervention.

Even if no improvements in outcome measures were observed after 8 weeks of treatment, the participants reported a lack of targeted interventions aimed to improve their activities of daily living (Stamm et al., 2002). In our study, we embedded the hand exercises in a manual related activity, resulting in an improvement on hand range of motion and manual dexterity.

5.7 Effectiveness of an occupational therapy conservative upper limb rehabilitation intervention.

The control group, which received only a conservative upper limb rehabilitation intervention with no implication of specific hands exercises or movements, showed a moderate-large mean effect for range of index and thumb motion. However, this mean effect size should be interpreted as patients in that group worsened at least on range of fingers motion involved in hand pinch and they had no treatment effect for the other outcomes measured, probably due to normal aging and symptomatology of hand OA. This finding highlights the importance of including specific interventions of the hand in order to prevent a worsening in range of finger motion.

To our knowledge, no studies were found reporting specific information about the changes in range of finger motion or the other outcomes measured such as upper limb disability, performance in activities of daily living, pinch strength, upper limb coordination, general self-efficacy or functionality, after an OT conservative upper limb rehabilitation intervention in patients with OA. However, the present results are in line with similar studies evaluating the effectiveness of OT treatments but using other populations or different OT approaches. The research performed by Hart, Tepper, and Lieberman (2001) reported that patients with wrist or hand impairments receiving OT showed no significant differences on participants' perceptions of improvement in functional abilities after intervention. The results of the Rannou et al. (2009) study showed a small negative effect in the short-term on hand range of motion in one trial of splinting in base-of-thumb OA. In contrast, Case-Smith (2002) concluded that their results after an OT intervention suggested that patients with general impaired hand function made substantial progress in a six to eight week OT program for hand rehabilitation. Thus, there is still controversy in literature about the effectiveness of conservative OT interventions on hand impairments.

5.8 Limitations of this PhD thesis

The results of these studies should be considered in light of some limitations: First, in the observational study of this PhD, the associations were cross-sectional; therefore, cause and effect cannot be determined. Self-efficacy and physical impairment are likely to be bidirectionally related, so that self-efficacy may influence the physical impairment and vice versa. Secondly, specific scales exist to assess self-efficacy in patients with OA (Brady, 2011). However, to our knowledge, the general self-efficacy scale by Suárez et al. (2000) is the only one translated and adapted to the Spanish population, and in turn, we can only infer and make interpretations according to the general perception of self-efficacy. Thirdly, since the first investigation is an observational study, we cannot be certain that the differences between the two groups in factors such as, medical comorbidities among others did not contribute to the differences observed. Fourthly, since almost all the study subjects were right-hand dominant, these results cannot be guaranteed with left-handed individuals. Yet it turned out to be possible to remove dominance as a covariate, which could have confounded our conclusions. Fifthly, in the randomized clinical trial study, we did not register joint stiffness and it could have been a possible outcome that influence self-efficacy during the completion of the study. Finally, the due to the short duration of the experimental intervention, longer interventions are likely to produce more positive effects and result in major improvements.

CONCLUSIONES

CONCLUSIONS

6. CONCLUSIONES

- Nuestros resultados muestran que las personas mayores institucionalizadas con AM con niveles más altos de autoeficacia, presentan con mayor probabilidad menos alteraciones físicas en la fuerza, las destrezas y movilidad de las manos, y mejor funcionalidad percibida de los miembros superiores que esta misma población con niveles más bajos de autoeficacia.

- Las diferencias significativas entre los subgrupos basados en el nivel de autoeficacia fueron confirmadas mediante correlaciones. La autoeficacia general y la discapacidad de los miembros superiores parece estar relacionada de una manera bidireccional. La discapacidad general de los brazos, hombros y manos estuvo más fuertemente asociada con la autoeficacia que la alteración de los componentes individuales de funcionalidad de los miembros superiores.

- La discapacidad de los miembros superiores parece explicar parte de los niveles de autoeficacia in esta población, influyendo sobre estos de forma negativa. Por lo tanto, los profesionales del área de rehabilitación deberían prestar atención a aspectos como la motivación y la autoeficacia general percibida de los pacientes a la hora de planificar y ejecutar las intervenciones terapéuticas.

- Una intervención estandarizada de terapia ocupacional mediante el uso de una actividad estructurada para aumentar las habilidades motoras finas ha demostrado ser una herramienta efectiva para el aumento de la coordinación de los MMSS, destreza manual, y el rango de movimiento activo y pasivo del índice y del pulgar del miembro dominantes. Sin embargo, su efecto sobre la mejora de la discapacidad de los MMSS, el desempeño en las actividades básicas e instrumentales de la vida diaria, la fuerza de la pinza, independencia funcional y la autoeficacia general permanece incierto aún.

- Esta tesis doctoral ofrece un enfoque sistemático para analizar como los pacientes con AM pueden mejorar los componentes funcionales de los MMSS tras recibir una intervención libre de efectos adversos, de fácil realización y cercana a las actividades diarias realizadas en el contexto natural o real del paciente. Tanto los clínicos como los investigadores podrían considerar la actividad utilizada en este ensayo clínico para aumentar las habilidades motoras finas en personas con AM.

6. CONCLUSIONS

- Our results show that institutionalized older adults with hand OA with higher self-efficacy are more likely to have less physical impairments in strength, dexterity and hand movement; and better self-reported upper limb disability than this population with less self-efficacious.

- The significant differences between subgroups based on self-efficacy were further confirmed by correlations. General self-efficacy and disability-impairment of upper limb seem to be related in a bidirectional manner. The arm, shoulder and hand disability was more strongly associated with self-efficacy than individual impairments.

- The upper limb disability can explain part of the self-efficacy levels in this population, influencing negatively. Then, the rehabilitation professionals should pay attention to motivation and self-efficacy when planning and executing their therapeutic intervention.

- A standardized Occupational Therapy intervention by using a structured activity to enhance fine motor skills was found to be an effective tool to increase upper limb coordination/manual dexterity and active and passive range of index and thumb motion in dominant side. However, its effects on upper limb disability, performance in basic and instrumental activities of daily living, pinch strength, functional independency, and general self-efficacy remain uncertain.

- This PhD thesis provides a systematic approach to examine how patients with hand OA might improve upper limb functions after an intervention that is free of side effects, easily performance and close to the natural everyday environment. Clinicians and researchers could consider the activity implemented in this trial to enhance fine motor skills in individuals with hand OA.

MENSAJES CLÍNICOS

CLINICAL MESSAGES

7. MENSAJES CLÍNICOS

- La percepción de autoeficacia general parece estar relacionada con la discapacidad física real y la discapacidad percibida en personas mayores institucionalizadas con artrosis de mano.

- Los resultados del presente estudio aportan una nueva perspectiva sobre la relación existente entre las destrezas y discapacidad de los miembros superiores y el constructo de autoeficacia, apoyando la literatura científica previa a nivel teórico sobre cómo se debe incorporar la autoeficacia en el ámbito de la rehabilitación de los miembros superiores.

- La presente tesis doctoral señala la necesidad de considerar las intervenciones basadas en la mejora de las habilidades-destrezas físicas y en la percepción de autoeficacia general como enfoques potencialmente complementarios en el tratamiento de la artrosis de mano.

- Las actividades previamente analizadas, modificadas y adaptadas a las necesidades del paciente con artrosis de mano pueden considerarse como una herramienta de rehabilitación. El protocolo de intervención de este estudio puede ser utilizado por el terapeuta como tratamiento de la artrosis de mano cuando el paciente presenta alteraciones de la coordinación de los miembros superiores, de la destreza manual o en el rango de movimiento. Utilizar actividades de la vida diaria previamente estructuradas como medio de intervención puede interpretarse como una perspectiva ecológica de rehabilitación ya que son fáciles de administrar, económicas y bajo supervisión pueden usarse en el contexto domicilio del paciente.

7. CLINICAL MESSAGES

- Self-efficacy can be related to actual physical impairments and self-reported disability in institutionalized older adults with hand Osteoarthritis.
- The present results yield a new perspective about how the upper limb ability and disability are related to the construct of self-efficacy that is aligned with theoretical papers on how self-efficacy might be incorporated in upper limb rehabilitation.
- This PhD thesis sets the stage for considering interventions based on improving physical abilities and self-efficacy as potentially complementary approaches in treatment of hand OA.
- An activity, previously analysed, modified and adapted to the needs of hand OA population, can be considered as a rehabilitation tool. This protocol can be used by the hand therapist to treat hand OA patients when they present problems in upper limb coordination, manual dexterity or range of motion.
- The use of structured activities is probably an ecological way of rehabilitation, since they are economic and easily administered and could be performed at home under supervision.

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8. BIBLIOGRAFÍA/ REFERENCES

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APPENDIX 1

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Influence of upper limb disability, manual dexterity and fine motor skill on general Self-efficacy in institutionalized elderly with Osteoarthritis.

ELSEVIER

Journal Of Hand Therapy

Certificate of publication for the article titled:

"Influence of upper limb disability, manual dexterity and fine motor skill on general self-efficacy in institutionalized elderly with osteoarthritis. "

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APPENDIX 2

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The Investigation Ethic Committee of Granada province-CEI (Andalusian Health Service, Granada, Spain)

Servicio Andaluz de Salud
CONSEJERÍA DE SALUD

DON FRANCISCO JAVIER SALMERÓN ESCOBAR, EN CALIDAD DE PRESIDENTE DEL COMITÉ DE ÉTICA DE LA INVESTIGACIÓN DE LA PROVINCIA DE GRANADA,

CERTIFICA

Que este Comité ha evaluado favorablemente, en su reunión celebrada el día 26 de mayo de 2014, el proyecto presentado por la *I. P profesora* de la Universidad de Granada del *Departamento de Fisioterapia, Dª Mª Encarnación Aguilar Ferrándiz.* El proyecto titulado: "Efectividad de un programa de laborterapia en personas mayores institucionalizadas: estudio clínico randomizado. Effectiveness of an occupational therapy program for fine motor abilities on the hand in institutionalized elderly residents: a randomized clinical trial".

Que se cumplen los requisitos necesarios de idoneidad del protocolo en relación con los objetivos del estudio y están justificados los riesgos y molestias previsibles para el sujeto.

La capacidad del investigador y los medios disponibles son apropiados para llevar a cabo el mencionado estudio.

Es adecuado el procedimiento para obtener el consentimiento informado.

Y que este Comité acepta que dicho proyecto sea realizado en dicho Centro.

Lo que firmo en Granada, a veintinueve de mayo de dos mil catorce.

CONSEJERÍA DE SALUD
Consejería de Salud
Granada
Comité de Ética de la Investigación
Servicio Andaluz de Salud

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