

# The Impact of Thumb CMC Osteoarthritis on Function, Life Roles, and Life Satisfaction



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## Abstract

**Importance:** Occupational therapists need a good understanding of how thumb carpometacarpal (CMC) joint osteoarthritis (OA) impacts individuals' ability to complete life roles, perform functional tasks, and affects overall quality of life to include all aspects of occupation within patients' treatment plans.

**Objective:** To explore the lived experience of adults with carpometacarpal osteoarthritis of the thumb.

**Design:** This study used quantitative assessments and a phenomenological design.

**Setting:** Community-based settings with semi-structured interviews occurring face to face in the participants' physician office, workplace or home.

**Participants:** Twelve adults diagnosed with thumb carpometacarpal osteoarthritis.

**Outcomes and Measures:** Semi-structured interviews focusing on role completion, functional performance and quality of life, hand strength measured with Jamar Hand Dynamometer and B&L pinch meter, x-ray presentation using the Eaton-Littler Classification and AIMS2-SF.

**Results:** Participants identified many functional tasks which were difficult to perform. A theme of resiliency was identified as individuals completing tasks despite pain and difficulty.

**Conclusion:** Treatment for CMC OA should consider functional changes, daily hassles, pain, and the individual's drive to maintain life roles.

**Knowledge Translation Takeaway:** Previous literature supports the use of orthoses and adaptive equipment for individuals with thumb CMC OA. Occupational therapists should look beyond this and address patients with this pathology from a more holistic perspective understanding the fear for future increased pain and decreased strength, dependence because of functional decline, and decreased role performance so clinicians can improve their sensitivity and address these concerns with task analysis and activity modification for functional performance.

**Keywords:** Carpometacarpal; Osteoarthritis; Life satisfaction; Eaton Classification; Occupational therapists

**Abbreviations:** CMC: Carpo Meta Carpal; OA: Osteoarthritis; FDC: Four Dimensions Criteria

## Introduction

Osteoarthritis (OA) is the most common joint disorder in the United States. It is characterized by pain, aching, or stiffness in a joint along with changes/deterioration identified through x-ray [1]. The incidence of thumb carpometacarpal (CMC) joint OA is 15% in adults 30 years and older which increases to 33% in post-menopausal women [2]. Zhang et al. [3] notes hand OA is characterized by functional impairment, pain, instability, deformity, and loss of range of motion. Hand OA currently impacts 44.2% of women and 37.7% of men and is therefore identified as a common problem impacting daily functional performance

- most notably, a 13.7% decrease in lateral pinch strength [4,5]. Pereira et al. [6] performed a systematic review of the prevalence of OA and discovered the greatest incidence was found in the hand, however, knee OA is the most researched. Mahendira and Toweheed [7] reported treatment of hand OA has received less attention as compared to treatment of OA of the hip or knee, while Towheed [8] reported an insufficient amount of research pertaining to the clinical impact of hand OA. Most importantly for this project, research is lacking on the impact of thumb CMC joint OA on the completion of life roles, life satisfaction, and functional

limitations. Conservative interventions for CMC OA include orthotics, pain management, exercises and education on joint protection and activity modification [9]. As one pound of force produced with tip pinch translates to 13 pounds of force at the CMC joint of the thumb, joint protection and activity modification techniques are needed [10]. Villafane et al. [11] associated thumb CMC OA with decreased strength but did not assess the impact of OA on other factors such as the impact on life roles, quality of life/life satisfaction, or functional limitations.

**Method**

The Human Subject Institutional Review Board of \_\_\_\_\_ University approved this study.

**Participants**

Participants included 9 females and 3 males between the ages of 50 to 71 with a mean age of 63.83, SD 7.614. Participants were excluded with pathology to the central nervous system, cognitive limitations which would not allow them to be effective historians or follow directions, and/or an orthopedic injury to the upper quadrant in the last year for which they sought medical attention. Participants with carpal tunnel syndrome were included in the study given the high rate of co-occurrence with thumb CMC OA. Written consent was obtained from all participants following approved HSIRB procedures. Participant demographics are included in Table 1.

**Table 1:** Participant Characteristics.

	Males	Females
Age	58.67 (8.083)	Median 67.56
AIMS2-SF	Males: 42.67 (0.074)	Females: 44.11 (8.192)
Pain	4.67 (2.404)	5.33 (.782)
Eaton Classification	I: 0	I: 0
	II: 0	II: 6
	III: 0	III: 1
	IV: 3	IV: 2
Employment Status	Full Time: 2	Full Time: 2
	Part Time: 0	Part Time: 1
	Unemployed: 0	Unemployed: 0
	Disabled: 0	Disabled: 1
	Retired: 1	Retired: 5
Educational Level	High School Grad: 1	High School Grad: 2
	1-4 Year College: 0	1-4 Year College: 3
	College Grad: 0	College Grad: 2
	Graduate School: 2	Graduate School: 2
Marital Status	Married: 2	Married: 6
	Divorced: 1	Divorced: 0
	Widowed: 0	Widowed: 0
	Never Married: 0	Never Married: 3
Living Situation	Alone: 0	Alone: 2
	With Spouse: 2	With Spouse: 6
	With Family: 0	With Family: 1
	With Friend: 1	With Friend: 0

**Procedure**

Data was collected at two hand surgeons’ offices using both qualitative and quantitative methods. The Eaton-Littler classification system was used to identify the x-ray presentation of each participant and was provided by the referring physician following written consent from each participant. The AIMS2-SF was administered, which is a 26-item questionnaire that

includes questions on hand and finger function, pain related to arthritis, social activities, mood, arm function, self-care, level of tension/frustration, and support from family and friends, with higher scores indicating greater disability [12]. Grip, lateral and 3-point pinch strength were assessed for each participant using procedures recommended by the American Society of Hand Therapists. The Jamar Hand Dynamometer was used to assess

grip strength, and the B&L Pinch Meter was used to assess pinch strength. Participants performed three repetitions (30 second rest period between repetitions) and an average of the three was calculated. To gain an understanding of the lived experience of those diagnosed with CMC OA of the thumb, individual, 30–90-minute semi-structured interviews were conducted by the first author. Using the phenomenological approach, the following interview questions were developed to provide insight of the loss which accompanies this chronic diagnosis:

- i. Rate your pain level on the scale from 0 to 10 with 10 being “going to the hospital” type pain.
- ii. Describe the daily hassles that occur because of your thumb osteoarthritis.
- iii. What kind of daily activities do you have difficulty with because of your osteoarthritis?
- iv. Are there activities that you can no longer perform because of your thumb osteoarthritis?
- v. Are you satisfied with the medical management of your thumb osteoarthritis?
- vi. Does your thumb osteoarthritis impact participation in social activities?
- vii. What life roles are impacted by the arthritis in your thumb? In what way?
- viii. How is your quality of life impacted by the arthritis in your thumb?

Additional follow-up questions were asked when appropriate. Qualitative data were handwritten during the interviews which were not audio recorded to increase participant comfort. The handwritten notes were transcribed by the first author. A phenomenological approach guided the one-on-one semi-structured interviews to obtain information on participants’ experience with CMC OA using the participants’ narrative for data collection and interpretative analysis for a comprehensive understanding [13]. All participants were offered free education on joint protection and energy conservation techniques and a custom orthosis, which might decrease pain and improve functional performance. Rigor of qualitative study methods was ensured by using the Four Dimensions Criteria (FDC). These criteria include credibility, confirmability, dependability, and transferability [14]. Credibility was maintained as the first author has more than 20 years of experience working with adults with hand OA and is a certified hand therapist. Confirmability was obtained through weekly debriefing calls between the first and second authors, which allowed for confirmation from an

additional researcher regarding study methods and data analysis. Additionally, confirmability was ensured through the review of transcripts by the third author, as well as triangulation of quantitative and qualitative data. Dependability was ensured by maintaining a detailed record of the data collection process, including dates and notes regarding data collection and analysis. This allows replicability of study methods. Operational and theoretical data saturation techniques ensured that the study results were transferable to other individuals with thumb CMC OA. Participant demographics were also reported to allow readers to determine if the results from the sample could be transferred to the people they are treating.

Following data collection with 6 subjects, results were reviewed looking for emergent ideas and classifying material into priori themes. The qualitative data analysis was an iterative process looking for patterns and similar statements referring to repeated tasks which were either difficult for subjects to perform or tasks which caused pain. Data were used to develop a textual description of what participants with thumb CMC OA experience [13]. Statements were copied and pasted from the typed notes from interviews into themes using initial a priori themes, which included the following: Pain, Functional Loss, Role Completion, Frustration/Hassles, QOL/Satisfaction, Beliefs of Value of Medical Management, Impact on Socialization. Three additional participants were then included within the study using the same process of data collection and analysis until operational and theoretical saturation occurred. This was determined after no new themes were identified in reviewing notes from the last two participants.

## Results

### Quantitative

One outlier was noted when analyzing the age of the female participants, so the median age was reported. Otherwise, both age and AIMS2-SF values were normally distributed as evidenced by Shapiro Wilk values  $>.05$ , and no other outliers were noted through visual inspection of box plots. Grip and pinch strength values were normally distributed and are reported in Table 2. Outliers were noted with grip (4) and lateral pinch (1) scores of females using the left hand as evidenced by visual inspection of box plots. Therefore, median strength was reported for grip and lateral pinch of the female participants (See Table 2). Participants reported a range in thumb pain from 2/10-8/10 with some participants reporting greater symptoms in their non-dominant hand, while others reported greater symptoms in their dominant hand. A few participants reported using various non-traditional methods to control their symptoms of pain, such as eating hot peppers and adding turmeric supplements.

**Table 2:** Mean and standard deviation of grip and pinch strength of sample.

	Right Hand (lbs)		Left Hand (lbs)	
	Males	Females	Males	Females
Grip	72.57 (11.98)	53.44 (18.02)	69.10 (10.69)	Median 53.67
Lateral Pinch	21.13(2.38)	14.22 (3.81)	20.10 (4.26)	Median 12.00
3 Point Pinch	17.33 (0.35)	12.30 (4.32)	17.20 (4.42)	11.30 (3.41)

All participants readily identified several functional tasks which were difficult or painful to complete. Two of the 12 subjects even reached out to the investigator after the conclusion of the interview to report additional tasks causing difficulty. Female participants complained of difficulty performing tasks such as washing dishes, ironing, sewing, performing household chores, opening jars and food containers, zip lock bags, holding a bowl while stirring or holding heavy pans, and using a rolling pin, while male participants complained of difficulty using a hammer, screw gun or screwdriver, handling dry wall, and operating a chain saw. Difficulty with functional tasks did not seem to follow any pattern based on Eaton Classification as the same tasks were reported as difficult in participants with an Eaton II or an Eaton IV. However, there was no method of being able to identify if those who were classified as an Eaton IV had the same functional limitations at earlier stages of the disease. Participants frequently discussed the frustrations of living with CMC OA of the thumb as dropping/breaking items, having to use their other hand or both hands to complete tasks, and having to ask others for help.

**Qualitative**

The epistemological philosophical assumption guided the researcher to deeply explore each participant’s experience of living with thumb CMC OA. The phenomenological approach was used to help the researcher focus on the similarities of each participant’s unique experience [13]. A priori construction was established based on the researcher’s experience, and this guided

the semi-structured interview questions. The researcher was intentional in data analysis to look beyond that construction and found those themes supported, but also found significant themes related to the participants’ concern for independence and role completion in the future and the related loss of important roles for them. Participant involvement in social activities seemed to be the area which was least impacted by thumb CMC OA. A theme of resiliency was added following review of the qualitative data. All participants described the need and the desire to continue with tasks they wanted or required to achieve, and in fact were many times unable to come up with tasks they could no longer complete. Participants described tasks taking longer, causing pain, and requiring the need to develop or create adaptations to complete. Despite these difficulties, participants all described the ability to “suck it up”, “make do”, and “complete all of my life roles”. However, participants also reported feelings of hopelessness, sadness and worry given this is a chronic condition, which they were informed by their physician, will get worse with age. Although participants seemed to be pleased with the medical options to address their thumb arthritis, they reported they had hoped to have a “quick fix” with either a shot or surgical procedure. No participants included in the study had elected to have surgical intervention at the time of their physician appointment. In addition to feelings of hopelessness, participants expressed concerns about being able to complete tasks in the future as their symptoms worsened with age. Themes that emerged from the qualitative data are included in Table 3.

**Table 3:** Themes and representative comments.

Themes	Participant Comments
Pain	“I have pain with just moving it.”
	“When I pick up something it is like a knife going in my thumb.”
Functional Loss	Commonly reported tasks which were difficult:
	- Lifting pans/dishes
	- Reading tasks (holding book/turning pages)
	- Donning jewelry/socks/fastening bra/buttoning
	- Driving
	- Opening jars/baggies/food containers/cutting meat
	- Squeezing shampoo, conditioner, lotion bottles
	- Writing
	- Toilet hygiene
- Exercise (holding weights, bars, weight bearing)	

Role Completion	"I volunteer making quilts and I have trouble cutting the material, sewing and ironing."
	"I used to do things for my granddaughter. She is 8 years old. Now she helps me."
	"I used to like to bake and cook dinner for my grandkids. Now I cannot do it the same."
	"It limits the things that I do with my grandkids. I cannot play rough with them, throw a baseball. I just don't do it."
Frustration/Hassles	"It is annoying because I have to get someone else to do things."
	"I broke a bowl and a glass in the kitchen. Slips right out of my hand on a bad day."
	"I don't like having limitations."
	"The things I like to do are less and less and that is disappointing."
Quality of Life/Satisfaction	"I feel like at the age of 60 I am already having pain that limits my use of my hand. How will it be when I am 70 as I know it will get worse? Makes me sad and worried."
	"I have not been feeling as independent."
	"I am functioning as a health mentor at work. It is a depressing thing to look at how arthritis effects my life."
Beliefs of Value of Medical Management	"Honestly, I hoped something would be a quick fix. I thought I would just have a cyst or something that needed to be removed."
	"I used a splint but did not feel like it helped."
	"Even though I got a shot, I feel like surgery is inevitable."
Impact on Socialization Resiliency	"Does not impact my social activities."
	"I just make myself do things even if it hurts and then I take extra Motrin after."
	"I can still do everything. I just have to alter or change how I do things. I have to hold things with two hands and pick up my grandchild differently."
	"I have stubbornness and I suck it up and complete all of my life roles."
	"There is nothing I can do about it. I don't get upset and instead just have to make do."

## Discussion

Qualitative data clearly show that the diagnosis of CMC OA in the thumb is accompanied by pain and many functional complaints, and these complaints were significant enough for all participants in this study to seek medical attention. One participant described having thumb pain in his dominant hand many years ago which now has subsided, but now increased in his non-dominant hand. These reports were interesting given both of his thumbs demonstrated an Eaton IV classification based on x-ray presentation, but one thumb was currently pain free. Grip and pinch scores from this study were compared to normative data collected by Phillips et al. [15] of a sample of healthy Michigan workers with 49 subjects in the age group of 50-62. Male participants in this study demonstrated a 31-33% reduction in grip strength compared to norms reported by Phillips et al. [15]. However, females in this study demonstrated only a 1-3% reduction in grip strength compared to norms reported by Phillips et al. [15]. When comparing pinch strength in participants from this study to norms presented by Phillips et al. [15], there was a 15-27% reduction in strength. Therefore, it is possible this reduction in hand strength is the root behind functional changes, frustration, and hopelessness in adults with thumb CMC OA. It is critical for health care professionals to understand and empathize with all the symptoms related to living with CMC OA. Patients will not only demonstrate changes on x-ray and report complains

of pain with palpation, but will also have concerns about future functional independence, have frustrations and difficulty in performing tasks or taking extra time to complete tasks, and even having to give up loved activities.

## Limitations

Limitations of the study included a lack of participant diversity. Most participants were highly educated, had spouse or family support and were likely to have health insurance, as they all sought medical attention for their CMC OA. Eaton classification also lacked diversity as all male subjects were rated as an Eaton IV classification and most females were either an Eaton II or Eaton IV classification. No participants in this study were classified as an Eaton I, suggesting that symptoms related to Eaton I classification may not be significant enough to seek medical attention. Additionally, all data was collected at either the physician or occupational therapy clinic which can be a cramped or uncomfortable environment. There were also occasional interruptions during the interview process due to the location.

## Conclusion

The literature indicates that the onset of arthritis in many instances is a part of the aging process. Occupational therapists must be prepared to ask the right questions regarding functional loss and adaptation while also recognizing the loss of strength and



range of motion and the pain that co-occurs with osteoarthritis. Occupational therapists must also acknowledge the psychosocial impact of this chronic condition and address the frustration and difficulty that people experience as they strive to be resilient to maintain their life roles.

## Knowledge Translation Takeaway

Occupational therapists play a key role in activity analysis and modification or adaptation of tasks. It is important to use these skills to not only decrease the stress to joints resulting in progression of joint deterioration that will occur with osteoarthritis, but also to adapt activity to increase independence with tasks and educate patients how to recognize the need to make their own adaptations as functional performance worsens with this chronic condition. This could reduce frustrations and the daily hassles in activities of daily living and recognize feelings of sadness and hopelessness as individuals strive to continue to complete the needs for role performance. Future research would be beneficial to examine adaptation of activity specifically for individuals with thumb CMC OA to allow fulfillment of life roles and achievement of life satisfaction given the clear demonstration of resiliency in this population. Additional research with larger sample sizes including both males and females examining the reduction in hand strength with this diagnosis would also be beneficial.

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